GREENBELT
GODDARD GEOPHYSICAL AND ASTRONOMIC OBSERVATORY
CO-LOCATION SURVEY
REPORT

Dates of Survey: November 2007; January and March 2008
Date of Report: September 30, 2008
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1.   Introduction

The realization of the International Terrestrial Reference Frame (ITRF) is a product of the International Earth Rotation and Reference Frames Service (IERS) International Terrestrial Reference System (ITRS) Product Center. The ITRS is a world-wide spatial reference system providing a common reference frame for points on the surface of the Earth.   The latest realization is ITRF2005. The ITRF2005 point coordinates are obtained by the combination of individual TRF solutions computed from the observations of the different space geodesy techniques: Very Long Baseline Interferometry (VLBI), Satellite Laser Ranging (SLR), Global Positioning System (GPS), and Doppler Orbitography and Radiopositioning Integrated by Satellite (DORIS) located at sites distributed around the whole Earth.   Two very important components of this combination of space geodesy solutions are the co-location site, where multiple space geodesy techniques are located in close proximity, and the local tie survey, which provides an accurate ground connection between the different space geodesy systems.

This report describes the co-location survey conducted at the Goddard Geophysical and Astronomic Observatory (GGAO) Greenbelt site, and presents the results of the adjustment and analysis.

2.   Acknowledgements

This survey effort benefited greatly from the cooperation and support of the operational personnel from the VLBI MV3 and the SLR MOBLAS 7 at the GGAO, and the cooperation and support of all the IERS services: International VLBI Service (IVS), International Laser Ranging Service (ILRS), International GNSS Service (IGS), and International DORIS Service (IDS).

3.   GGAO Site Description

The GGAO site is located near Greenbelt, Maryland, about 12 miles northeast of Washington D.C. The site is owned and operated by the NASA Goddard Space Flight Center (GSFC) for space geodesy research and development. GGAO is an important co-location site with four space geodesy techniques:

   a. VLBI
   b. SLR
   c. GPS
   d. DORIS

The local survey control network at GGAO consists of a large number of stable, inter-visible ground monuments and concrete pillars. The concrete pillars are equipped with stainless steel self-centering fixtures or stainless steel plates with a 5/8"-11 threaded stud to accept standard survey tribrachs.

3.1   VLBI Station – DOMES Number: 40451M125

This station refers to the ground survey mark, designated 7108, at the base of the VLBI antenna pedestal. The survey mark is a standard 100 mm diameter brass disk set in 300 mm diameter concrete pier, set flush with and isolated from the concrete foundation for the VLBI antenna pedestal.

The VLBI antenna is named MV3 (IVS designation: GGAO7108). MV3 consists of a 5 m diameter dish with an Az/El mount pedestal on a cylindrical steel riser. The antenna pedestal riser is permanently mounted on steel anchor bolts imbedded in the concrete pad. See Figure 1.

The conventional reference point for the VLBI antenna is the intersection of the horizontal axis of rotation projected onto the vertical axis of rotation. This conventional reference point is not accessible and cannot be measured directly. The VLBI reference point is horizontally and vertically eccentric from the 7108 station survey mark.

Figure 1. Global View of VLBI 5-meter Antenna

3.2   SLR Station – DOMES Number: 40451M105

This station refers to the ground survey mark, designated 7105, beneath the SLR telescope. The survey mark is a standard NASA 100 millimeter (mm) diameter brass disk set flush the large concrete foundation for the SLR mount.

The SLR is transportable system named MOBLAS 7 (ILRS designation: GODL). The system consists of a 0.76 meter (m) telescope on an azimuth/elevation (Az/El) mount supported by three legs, isolated from the mobile trailer enclosure. The trailer has a roll-back roof and sides that can be lowered to expose the SLR telescope. The foundation for the mobile trailer is separate and isolated from the foundation for the SLR telescope.

The conventional reference point for the SLR telescope is the intersection of the horizontal and vertical axes of rotation. This reference point is not accessible and cannot be measured directly. The SLR reference is horizontally and vertically eccentric from the station mark. See Figure 2.

Figure 2. Global View of SLR Telescope and Trailer

3.3   GPS Station – DOMES Number: 40451M123

This station refers to the drill hole point at the center of a 457 mm diameter stainless steel plate, set in a 0.76 m diameter concrete pier. The concrete pier projects 0.4 m above the ground. The steel plate is inscribed "JPL 4006 -1992."

The GPS station is designated GODE by the IGS and it is an IGS Reference Frame station. The GODE antenna is a JPL Dorne/Margolin element choke ring installed on a JPL-designed steel mount fixture with a fixed-height center spike. GODE has a JPL-type clear plastic hemispherical radome. See Figure 3. The height of the GODE antenna reference point (ARP) is 0.0614 m above the station mark.

Figure 3. GPS GODE antenna on pier monument

3.4   DORIS Antenna – DOMES Number: 40451S176

The DORIS station is designated GREB by the IDS and the station refers to the GREB antenna reference point (400 MHz phase center). The GREB antenna is mounted on a stainless steel plate fixture attached to the top of a 300 mm diameter reinforced concrete pillar. See Figure 4. The DORIS pillar survey mark is the intersection of the centerline of the 5/8"-11 threaded stud and the top of the stainless steel plate, flush with the top of the concrete pillar. The height of the GREB antenna reference point above the pillar survey mark is 0.518 m.

Figure 4. DORIS GREB antenna on the pillar monument

3.5   Main Survey Monument – North GEOS Pier

This station refers to the main survey monument at the Greenbelt site and it is designated North GEOS Pier (PID: JV5895). North GEOS Pier is a Federal Base Network Control Station of the National Geodetic Survey (NGS). The station mark is the center point of a standard 100 mm GSFC brass disk set in the top of a triangular concrete pier, 0.9 m on a side. The top of the concrete pier is 0.6 m above the ground.

4.   Survey Description

4.1   Organization

The survey work was completed by Honeywell surveyors Jim Long and Troy Carpenter, under the NASA NENS Contract Task Order (TO) 27 and TO 40. The majority of the survey data was collected during November 2007, as part of a comprehensive survey project to determine the local ties for the co-located space geodesy systems at GGAO and the survey ground control network. Additional survey data was collected in January and April 2008.

4.2   Instruments and Equipment

All of the survey instruments and equipment utilized for this project are owned by NASA and administered by Honeywell under NENS Contract TO 27.

The following are the most important survey instruments:

a. Leica electronic theodolites T3000 and T2002, with angular accuracy standard deviation of 0.5 seconds, were used to measure horizontal and vertical angles.

b. Three Leica electronic distance measurement (EDM) instruments DI2000 (two) and DI2002 (one), with an accuracy standard deviation of 1 mm + 1 ppm, were used to measure slope distances.

c. Leica electronic level instruments NA2000 and NA3003, with an accuracy standard deviation of 1.5 mm and 1.2 mm, respectively, were used for the differential level measurements.

d. Four Trimble 4000SSE receivers with Trimble choke ring antennas, with a horizontal accuracy standard deviation of 5 mm + 1 ppm and a vertical accuracy standard deviation of 10 mm + 1 ppm, were used for GPS observations.

Other useful equipment and accessories included:

a. Leica optical plummet.

b. Wild T-2 Targets.

c. Tripods.

d. Trivet plates, tribrachs, and tribrach adapters.

e. Calibrated 40 mm mini-prisms.

f. Translation stages.

g. Special target rods and fixing brackets.

Prior to the start of the survey measurements, the calibration constants for the EDM instruments were verified on a 3-station baseline temporarily established at GGAO. The distance measurement targets were corner cube prisms previously calibrated at the NGS Corbin facility.

4.3   Survey Network and Strategy

The survey strategy was developed utilizing the extensive network of existing survey ground control monuments with a goal of 1 mm accuracy in each coordinate direction, and conducted with the high-precision methods and equipment to achieve this goal. As much as possible, the instruments were set on concrete pillars with self-centering fixtures or imbedded steel plates with 5/8"-11 threaded studs to ensure stability and eliminate plumbing errors. A Wild NL precise optical plummet was used for all tripod setups to minimize plumbing errors.

All inter-visible lines-of-sight between survey stations were observed. Refer to the diagram in Appendix H. Horizontal directions were observed in sets of 4 observations, with each set consisting of an observation in both direct and reverse telescope pointings. Zenith distances were observed in sets of 3 observations, both direct and reverse telescope pointings. Observations were rejected and then repeated if the observation value was greater than 5 seconds from the mean value of the set of observations.

Distance measurements were observed from each station standpoint with two different EDM instruments to all inter-visible target points, with the effective result that the measurement of a line was repeated a total of 4 times (two each way). Atmospheric pressure and temperature data were recorded at the beginning and end of each distance observation period.

Direct differential levels were observed to determine orthometric height differences between the survey stations in the control network. All observations were double run: forward run and

backward run and with a third run completed in the difference between the forward run and backward run was greater than 1 mm.

All of the survey observations, except for GPS, were recorded by hand on the appropriate Honeywell survey data form. The GPS observations were recorded electronically on the internal memory of the Trimble receiver and subsequently downloaded for post-processing.

4.4   VLBI Antenna Conventional Reference Point Observations

The conventional reference point for the VLBI antenna is defined by the intersection point of the horizontal axis of rotation projected onto the vertical axis of rotation and the perpendicular offset distance between the horizontal axis and the vertical axis. So, the determination of the VLBI conventional reference point is accomplished by separately determining each axis of rotation. In general, the method to determine an axis of rotation is to observe a target fixed on the antenna from ground control points while the antenna is systematically rotated about that axis only.

For MV3, the 5 meter antenna positioner pedestal is manufactured as unit, with tolerances typically expected for precise machinery. It is assumed that the horizontal rotation axis and the vertical rotation axis intersect and the horizontal axis offset distance is equal to 0.000 m.

A special target rod, with a 3 mm diameter spherical target at one end, was temporarily fixed at the apex of the antenna quadripod structure, such that the view of the target would be the least obstructed; and, visible from the most ground control points for the longest period of arc of the antenna motion. See Figure 5.

Figure 5. VLBI Antenna Apex Target

The VLBI antenna observations were completed over a period of 3 days. For the first set of observations, the VLBI antenna controller was placed in manual control and was oriented to 000 degree azimuth (+/- 0.01 degree). Due to potential pointing offsets between the electrical radio frequency (RF) pointing and the mechanical pointing of the antenna, it is necessary to verify the accuracy of the digital azimuth readout on the antenna controller to the true azimuth and then account for any offset.

The VLBI antenna was then rotated in elevation (about the horizontal axis of rotation) to a starting point of 10 degrees above the horizon. The VLBI antenna was held in this position by turning the antenna servo drive controller to stand-by. Next, the target was located by forward intersection methods by observing horizontal directions and zenith distances (two sets each) from all the surrounding ground control network stations that had visibility. Next, the VLBI antenna was systematically rotated in 15 degree increments about the elevation axis to a maximum 165 degrees pointing angle, stopping for survey observations at each increment. The antenna target describes an arc in a plane orthogonal to the elevation axis of rotation.

This initial process was repeated three more times at antenna azimuth positions of 090, 180, and 270 degrees. At each of the four azimuth positions, the antenna target was observed with the antenna at zenith (90 degree elevation position) to provide a point of comparison between the four different arcs. To ensure the best accuracy the forward intersection observations were completed from at least three ground control stations, and sometime from four ground control stations. However, because of site terrain constraints in the ground survey control network, sometimes the antenna target was only visible from two ground stations.

The four different orientations allow for redundant determinations of the rotations axes and thus a check.

4.4.1   VLBI Conventional Reference Point Eccentricities

The eccentricities from the 7108 station survey mark to the VLBI conventional reference point are computed from the results of the least-squares adjustment of the survey observation data.

4.5   SLR Conventional Reference Point Observations

The conventional reference point for the SLR telescope was determined in two separate steps. The first step determined the location of the vertical axis of rotation relative to a horizontal plane at the top of the mount. The second step determined the height difference from the horizontal plane to the horizontal axis of rotation.

To begin the first step for MOBLAS 7, the SLR telescope is inverted and leveled with a carpenter's level (i.e., at the 180 degree telescope elevation angle position) to expose the self-centering plate permanently mounted on the underside of the telescope housing. This self-centering plate is located approximately on the vertical axis of rotation. A trivet plate with a translation stage assembly (with two slides in orthogonal directions) is set on the self-centering plate. See Figure 6. A theodolite with an EDM instrument was set up on a tripod approximately 20 meters away, and a prism is placed in the tribrach at the top of the translation stage assembly. The center of the prism is sighted and the distance measurement recorded. Then the SLR telescope is rotated 180 degrees about the vertical axis and the distance to the prism target is observed again. The translation stage is adjusted one-half of the value of the difference in the distance observations. The SLR telescope is rotated 90 degrees from the original position and

the process is repeated again. The whole process is repeated until the distance measurement to the prism stays within 0.5 mm throughout a 360 degree rotation of the SLR telescope.

Figure 6. Translation Stage on MOBLAS 7 Telescope

The survey observations are then completed with instruments and targets set up on the translation stage assembly as a typical survey standpoint. The instrument height and target heights are measured relative to the top of the self-centering plate. See Appendix E for more information.

During the second step for MOBLAS 7, the vertical offset from the top of the self-centering plate to the horizontal axis of rotation was determined by running direct differential levels to the top of the self-centering plate and also to the top of the top side of spotting telescope eyepiece located on the horizontal (elevation) rotation axis of the mount. Then the measurements were repeated to the eyepiece with the mount telescope plunged 180 degrees. The diameter of the telescope eyepiece was measured with calipers. All measurements were repeated again as a check. This measured value of this offset is 0.489 m.

4.5.1   SLR Conventional Reference Point Eccentricities

It is necessary to measure the eccentricities from the 7105 station survey mark to the conventional reference point of the SLR telescope. After the horizontal location of the vertical axis of rotation was determined, as previously described, it was transferred to the 7105 station mark by the following method. The method utilizes two theodolites set up on tripods located such that there will be a lines-of-sight (as close to 90 degrees apart as possible) to both the survey target on the top of the SLR telescope (representing the vertical axis of rotation) and the 7105 station survey mark beneath the trailer. The theodolite is sighted on the survey target and

then the theodolite telescope is plunged down to 7105 station survey mark. This line-of-sight is graphically marked on the brass disk. The procedure is repeated with the second theodolite. The determined plumb point below the survey target (again representing the vertical axis of rotation) is the graphical intersection of the two theodolite lines-of-sight. The distance from the center point of the 7105 station survey mark to the graphical intersection point is measured with a pocket scale, relative to the North and East directions.

The vertical eccentricity is determined by direct differential levels between the 7105 station survey mark and the top of the self-centering plate mounted on the SLR telescope housing.

4.6   GPS Antenna Observations

The conventional reference point for the JPL Dorne/Margolin choke ring antenna is defined as the center of the 5/8"-11 threaded insert at the base of the power amplifier (BPA). This is also referred to as the Antenna Reference Point (ARP).

Since the GODE GPS antenna could not be removed, the conventional reference point was determined by indirect methods. However, before starting the observations, arrangements were made with the IGS station data analysis and operations coordinator to remove the GPS antenna radome during the survey observation time period. The GODE radome was removed at 0930 on 11 March 2008 and replaced at 1600 on 12 March 2008.

For the horizontal position, the forward intersection method was used by observing horizontal directions (4 sets, direct and reverse pointings) to tangent point of both the left side and right side of the outer-most choke ring element from four different ground survey control stations. In the adjustment, the mean of the left and right directions was used as input for the horizontal directions.

The vertical position was determined by running direct differential levels to the top of the choke ring elements at three different points from three different ground survey control stations. In the adjustment, the height difference was reduced to the ARP and the JPL 4006 survey point based on the published dimensions in the site log for the JPL choke ring antenna (0.102 m TCR) and the fixed-height of the center spike in JPL antenna mount fixture (0.0614 m).

4.7   DORIS Antenna Observations

The survey observations for DORIS were completed in accordance with the instructions received from the IGN DORIS maintenance group. At 0900 on 2 April 2008, the DORIS transmitter was placed in stand-by and the GREB antenna was carefully removed from the pillar fixture. The DORIS/GPS interface adapter was fastened to the triangular plate of the pillar fixture with three bolts. A standard survey tribrach was fixed to the adapter and the typical survey observations, as described elsewhere in this report, were performed to determine the horizontal and vertical position of the GREB pillar survey mark.

At the completion of the survey observations, the GREB antenna was replaced at 1300 on 4 April 2008, and the DORIS transmitter turned back on in accordance with the IGN instructions. The horizontal offset of the GREB 2 GHz phase center from the GREB pillar survey mark was verified to be less than 0.5 mm in accordance with the IGN instructions. The instructed method utilized two theodolites, set up on tripods south and west of the pillar, to sight on the 2 GHz

phase center and then plunge the theodolite telescope to sight on the pillar survey mark. The offset of the line-of-sight from the center of the survey mark is measured with a pocket scale.

In the adjustment, the horizontal position of the GREB reference point is identical to the pillar survey mark, while the vertical offset is 0.518 m above the pillar survey mark. This previously determined height was verified by a measurement with a pocket tape.

4.8   GPS Observations for Network Orientation

In order to provide for orientation of the topocentric survey network with the ITRF, GPS data was collected on select survey ground control monuments and pillars. The GPS observations consisted of five sessions on four different days, with session durations ranging from from 3.5 hours to 7.5 hours. For each session, GPS observations were collected with the four Trimble 4000SSE receivers and the appropriate GODE RINEX data was subsequently downloaded for post processing with the collected Trimble GPS data.

5.   Survey Computations

5.1   Survey Control Network

The conventional electro-optical survey data recorded in the field (distances, horizontal directions, zenith distances, and direct differential levels) was reduced and organized in abstract forms for subsequent input into a preliminary least-squares adjustment.   The distance measurements were corrected for the deviations in atmospheric pressure and temperature.

The National Geodetic Survey (NGS) software HAVAGO was used for the preliminary least-squares adjustment. The input file was developed from the conventional survey observations. The coordinates for JPL 4006 were constrained and a control azimuth was developed from the GPS observations and analysis. The preliminary adjustment was used to identify any blunders or outliers in the survey observations, and verify the accuracy of the survey meets the requirements.

5.2   GPS Network

The Trimble GPS data was post-processed with the Trimble software GPSurvey, version 2.35a, along with the RINEX data for GODE. The final precise orbit ephemeris for the GPS satellites, as produced by IGS, was utilized during the post-processing. For these solutions, the reference station GODE was constrained (at 1 mm) to the ITRF2005 coordinates at epoch 2008:010.

5.3   VLBI Conventional Reference Point

The survey data recorded in the field for the VLBI antenna observations was reduced and organized for subsequent input into a least-squares adjustment for each quadrant arc: north, east, south, and west. The NGS software HAVAGO was used for the least-squares adjustment of the VLBI antenna observations. The ground survey control stations, occupied during the antenna observations, and the VLBI station 7108 were constrained for the adjustment at the coordinate results from a separate preliminary HAVAGO adjustment of the survey control network. An approximate assumed position for the VLBI conventional reference point was also held constrained.

The HAVAGO input format offers an option to calculate (and provide in the output file) miscellaneous data for selected lines (such as DX, DY, DZ and DN, DE, DU). These output

values are then used as input for a circle fit software program that computes the best fit circle properties (delta coordinates values for the circle center and the radius) for a series of points on a described arc. For example on the north quadrant arc, the HAVAGO miscellaneous data DN and DU output values describe the points on a circle with the center on the horizontal (elevation) axis of rotation. These DN and DU values are formatted as input to circle fit software, which then provide the change in coordinates (from the preliminary value to the final value) and the radius of the circle. This procedure is then repeated for the other three quadrants. Any points on the computed circle with a standard error of greater than 1 mm are rejected, and the circle fit computations are repeated. The computed mean delta values (DN, DE, DU between preliminary VLBI conventional reference point and the final VLBI conventional reference point) will then be used as input for the final adjustment.

As an example of the accuracy of the method, a summary of the computed radii of the circle encompassing the survey points on each of the independently scribed arcs is shown in Table 1. The standard deviation of the computed radii is 0.0002 m. The full HAVAGO adjustments and circle fit outputs are shown in Appendix F.

Table 1. Computed Radii of the Circle Encompassing the Survey Points

Quadrant	Circle Radius
North	3.6029 m
East	3.6034 m
South	3.6031 m
West	3.6032 m
MEAN	**3.60315 m**

6.   Results

The final comprehensive least-squares adjustment of survey is completed with the GeoLab3 v3.72 software, and is a combination of the survey control network observations and the GPS observations. The conventional survey observations for the survey control network are used to develop the input file, along with an input file developed from the output from the GPSurvey GPS post-processing (vector coordinate values and extracted covariance matrix) for the selected baselines. The coordinates for the GODE station were constrained at 1 mm to the ITRF2005, epoch 2000.0 values.

6.1   Summary Results of Final Adjustment

The summary of the adjusted coordinates from GeoLab are shown below, after Table 2. The full results are provided in Appendix G.

Table 2 is a translation table provided to help coordinate the survey point description and the name used in the adjustment for selected points of interest.

Table 2. Translation Table for Survey Point Names

Survey Point Description/Name	DOMES Number	Adjustment Name
VLBI station survey mark/7108	40451M125	7108(93)
SLR station survey mark/7105	40451M105	7105
DORIS antenna reference point/GREB	40451S176	DORIS(07)ANT
DORIS pillar survey mark		DORIS(07)MK
GPS GODE station survey mark/JPL 4006	40451M123	GODE
SLR MOBLAS 7 conventional reference point		MOB7(07)
VLBI MV3 conventional reference point		MV3(07)
VLBI MV3 preliminary reference point		MV3(07PRE)

```
Adjusted PLH Coordinates:
                                  LATITUDE        LONGITUDE   ELIP-HEIGHT
     CODE FFF STATION             STD DEV           STD DEV      STD DEV
     ---- --- ------------ ----------------- ----------------- ------------
     PLH  000 4005W        N 39  1 18.02141 W 76 49  37.51424    14.2471 m
                                     0.0003            0.0003     0.0002
     PLH  000 7105         N 39  1 14.17774 W 76 49  39.69961    19.2023 m
                                     0.0004            0.0003     0.0005
     PLH  000 7108(93)     N 39  1 18.93345 W 76 49  35.55268    13.7522 m
                                     0.0003            0.0004     0.0002
     PLH  000 7108RM1      N 39  1 18.36798 W 76 49  34.47771    13.3632 m
                                     0.0003            0.0003     0.0002
     PLH  000 7125         N 39  1 12.96910 W 76 49  38.81114    18.5144 m
                                     0.0003            0.0002     0.0003
     PLH  000 CAL(A)01     N 39  1 15.64029 W 76 49  35.69141    16.4353 m
                                     0.0002            0.0002     0.0003
     PLH  000 CAL(D)98     N 39  1 12.14136 W 76 49  40.64780    19.8925 m
                                     0.0003            0.0003     0.0004
     PLH  000 CALB         N 39  1 13.63304 W 76 49  32.47151    16.9770 m
                                     0.0002            0.0002     0.0003
     PLH  000 CALC         N 39  1 12.74602 W 76 49  32.85840    17.3173 m
                                     0.0002            0.0002     0.0003
     PLH  000 DORIS(07)ANT N 39  1 12.25175 W 76 49  40.42900    20.4416 m
                                     0.0007            0.0009     0.0011
     PLH  000 DORIS(07)MK  N 39  1 12.25176 W 76 49  40.42901    19.9236 m
                                     0.0004            0.0004     0.0004
     PLH  111 GODE         N 39  1 18.21864 W 76 49  36.58553    14.5160 m
                                     0.0000            0.0000     0.0000
     PLH  000 GORF         N 39  1 12.78722 W 76 49  39.68633    18.3576 m
```

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                                      0.0002           0.0002       0.0003
  PLH  000 MOB7(07)     N 39  1  14.17751 W 76 49  39.70101     22.3402 m
                                      0.0003           0.0002       0.0003
  PLH  000 MV3(07)      N 39  1  18.93366 W 76 49  35.55258     16.8205 m
                                      0.0010           0.0010       0.0010
  PLH  111 MV3(07PRE)   N 39  1  18.93300 W 76 49  35.55200     16.8000 m
                                      0.0000           0.0000       0.0000
  PLH  000 NG2000(07)   N 39  1  12.96645 W 76 49  38.92812     22.2107 m
                                      0.0003           0.0002       0.0004
  PLH  000 NGEO         N 39  1  15.43407 W 76 49  38.96124     18.9750 m
                                      0.0002           0.0002       0.0002
  PLH  000 PIER(B)95    N 39  1  16.36231 W 76 49  38.36595     17.7602 m
                                      0.0003           0.0002       0.0003
  PLH  000 PIER(C)95    N 39  1  19.44903 W 76 49  37.49959     12.6633 m
                                      0.0002           0.0003       0.0002
  PLH  000 SGEOS        N 39  1  12.63708 W 76 49  38.94302     18.8743 m
                                      0.0003           0.0002       0.0003
  PLH  000 VLBA         N 39  1  19.91877 W 76 49  35.36276     13.7710 m
                                      0.0002           0.0003       0.0002
```

Adjusted XYZ Coordinates:

```
                         X-COORDINATE       Y-COORDINATE        Z-COORDINATE
  CODE FFF STATION          STD DEV            STD DEV             STD DEV
  ---- --- ------------ ------------------ ------------------ ------------------
  XYZ      4005W         1130752.8943       -4831262.1947      3994195.5197 m
                             0.0003             0.0002             0.0002
  XYZ      7105          1130719.5906       -4831350.5873      3994106.5515 m
                             0.0003             0.0005             0.0005
  XYZ      7108(93)      1130794.7158       -4831233.8245      3994217.0589 m
                             0.0004             0.0003             0.0003
  XYZ      7108RM1       1130822.3276       -4831238.3273      3994203.2662 m
                             0.0003             0.0002             0.0003
  XYZ      7125          1130745.6270       -4831368.0452      3994077.1612 m
                             0.0003             0.0003             0.0003
  XYZ      CAL(A)01      1130806.5132       -4831298.8718      3994139.8498 m
                             0.0002             0.0002             0.0002
  XYZ      CAL(D)98      1130706.5129       -4831394.8040      3994058.1974 m
                             0.0003             0.0004             0.0004
  XYZ      CALB          1130890.9103       -4831319.5746      3994092.1004 m
                             0.0002             0.0003             0.0003
  XYZ      CALC          1130885.8336       -4831338.7218      3994071.0627 m
                             0.0002             0.0003             0.0003
  XYZ      DORIS(07)ANT  1130711.2466       -4831391.9332      3994061.1878 m
                             0.0009             0.0010             0.0009
  XYZ      DORIS(07)MK   1130711.1547       -4831391.5412      3994060.8618 m
                             0.0004             0.0004             0.0004
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XYZ	GODE	1130773.8221	-4831253.5782	3994200.4142 m
		0.0000	0.0000	0.0000
XYZ	GORF	1130725.9044	-4831376.1626	3994072.7049 m
		0.0002	0.0003	0.0003
XYZ	MOB7(07)	1130720.1143	-4831352.9730	3994108.5218 m
		0.0002	0.0003	0.0003
XYZ	MV3(07)	1130795.2604	-4831236.1411	3994218.9958 m
		0.0010	0.0010	0.0010
XYZ	MV3(07PRE)	1130795.2734	-4831236.1349	3994218.9670 m
		0.0000	0.0000	0.0000
XYZ	NG2000(07)	1130743.5533	-4831371.5327	3994079.4249 m
		0.0003	0.0004	0.0003
XYZ	NGEO	1130731.2866	-4831322.6171	3994136.5082 m
		0.0002	0.0002	0.0002
XYZ	PIER(B)95	1130740.9079	-4831300.8866	3994157.9824 m
		0.0002	0.0003	0.0003
XYZ	PIER(C)95	1130746.6402	-4831233.9269	3994228.7255 m
		0.0003	0.0002	0.0002
XYZ	SGEOS	1130744.0709	-4831375.3171	3994069.4329 m
		0.0002	0.0003	0.0003
XYZ	VLBA	1130794.8076	-4831214.1699	3994240.6770 m
		0.0003	0.0002	0.0002

2-D and 1-D Station Confidence Regions (95.000 and 95.000 percent):

STATION	MAJOR SEMI-AXIS	AZ	MINOR SEMI-AXIS	VERTICAL
4005W	0.0007	49	0.0006	0.0003
7105	0.0011	11	0.0008	0.0009
7108(93)	0.0010	120	0.0007	0.0005
7108RM1	0.0007	145	0.0006	0.0004
7125	0.0007	165	0.0006	0.0007
CAL(A)01	0.0006	149	0.0005	0.0005
CAL(D)98	0.0008	170	0.0007	0.0008
CALB	0.0005	179	0.0004	0.0006
CALC	0.0006	13	0.0005	0.0006
DORIS(07)ANT	0.0026	56	0.0013	0.0022
DORIS(07)MK	0.0010	9	0.0009	0.0008
GORF	0.0006	172	0.0005	0.0006
MOB7(07)	0.0008	7	0.0006	0.0007
MV3(07)	0.0025	0	0.0025	0.0020
NG2000(07)	0.0007	167	0.0006	0.0008
NGEO	0.0005	2	0.0004	0.0005
PIER(B)95	0.0006	19	0.0005	0.0007
PIER(C)95	0.0008	71	0.0006	0.0003
SGEOS	0.0006	163	0.0006	0.0006

```
VLBA                    0.0007  99           0.0006              0.0003
```

6.2   VLBI Conventional Reference Point Eccentricity and Axis Offset

Table 3 shows values for the eccentricity of the VLBI conventional reference point (intersection of mechanical axes) from the VLBI station survey mark (7108) were computed from the observations taken during this survey and the results of the adjustment.

While it was assumed that the horizontal axis of rotation intersects with the vertical axis of rotation (i.e. – offset distance is 0.000 m), the analysis of the survey results indicate the actual horizontal axis offset is more accurately equal to +0.001 m.

Table 3. Values for the Eccentricity of the VLBI Conventional Reference Point

DN (m) Sigma	DE (m) Sigma	DU (m) Sigma
+0.0060 0.0006	+0.0020 0.0006	+3.0690 0.0012
DX (m) Sigma	**DY (m) Sigma**	**DZ (m) Sigma**
+0.5440 0.0006	-2.3170 0.0010	+1.9370 0.0009

6.3   SLR Conventional Reference Point Eccentricity

Table 4 shows values for the eccentricity of the SLR conventional reference point (intersection of mechanical axes) from the SLR station survey mark (7105) were computed from the observations taken during this survey and the results of the adjustment.

Table 4. Values for the Eccentricity of the SLR Conventional Reference Point

DN (m) Sigma	DE (m) Sigma	DU (m) Sigma
-0.0070 0.0003	-0.0340 0.0003	+3.1380 0.0004
DX (m) Sigma	**DY (m) sigma**	**DZ (m) sigma**
+0.5240 0.0003	-2.3850 0.0003	+1.9700 0.0004

6.4   Co-location Vector Components

The local tie vectors were computed from the results of the final least-squares adjustment.

Table 5 contains a summary of the local tie vectors, as determined during this survey, compared with the local tie vectors used in the combination solution of ITRF2005 shown in Table 6.

Table 5. Local Tie Vectors Computed from Survey Results

From DOMES	To DOMES	DX Sigma	DY Sigma	DZ Sigma	Code/CDP	Code/CDP
40451M123	40451M105	-54.2315 0.0004	-97.0089 0.0004	-93.8628 0.0004	GODE	7105
40451M123	40451M125	20.8938 0.0003	19.7538 0.0003	16.6445 0.0003	GODE	7108
40451M123	40451S176	-62.5753 0.0008	-138.3553 0.0008	-139.2262 0.0008	GODE	GREB

Table 6. Local Tie Vectors Used in Combination of ITRF2005

From DOMES	To DOMES	DX Sigma	DY Sigma	DZ Sigma	Code/CDP	Code/CDP
40451M123	40451M105	-54.2300 0.0003	-97.0090 0.0030	-93.8630 0.0030	GODE	7105
40451M123	40451M125	20.8950 0.0500	19.7530 0.0500	16.6470 0.0500	GODE	7108
40451M123	40451S176	-62.5730 0.0030	-138.3550 0.0030	-139.2260 0.0030	GODE	GREB

Appendix A. GPS GODE IGS Site Log

```
      International GPS Service
      GODE Site Information Form
      See Instructions at:
        ftp://igscb.jpl.nasa.gov/pub/station/general/sitelog_instr.txt

0.    Form

      Prepared by (full name)  : Oivind Ruud
      Date Prepared            : 2008-02-07
      Report Type              : UPDATE
      If Update:
       Previous Site Log        : gode_20060420.log
       Modified/Added Sections  : 6.6-9, 11

1.    Site Identification of the GNSS Monument

      Site Name                : GGAO (Greenbelt)
      Four Character ID         : GODE
      Monument Inscription      : JPL 4006
      IERS DOMES Number         : 40451M123
      CDP Number                : (none)
      Monument Description      : PILLAR
        Height of the Monument  : 0.5
        Monument Foundation     : CONCRETE PIER
        Foundation Depth        : (m)
      Marker Description        : DIVOT on stainless steel plate
      Date Installed            : 1993-04-02
      Geologic Characteristic   : (BEDROCK/CLAY/CONGLOMERATE/GRAVEL/SAND/etc)
        Bedrock Type            : (IGNEOUS/METAMORPHIC/SEDIMENTARY)
        Bedrock Condition       : (FRESH/JOINTED/WEATHERED)
        Fracture Spacing        : (1-10 cm/10-50 cm/50-200 cm/over 200 cm)
        Fault zones nearby      : (YES/NO/Name of the zone)
          Distance/activity     : (multiple lines)
      Additional Information    : (multiple lines)
                                : See Question #5
                                : There appears to be an error in Question #5,
                                : Table "GORF 1993 HAVAGO ADJUSTMENT", the first
                                : line indicates that CDP 7102 corresponds to
                                : IERS-40451-DOMES#  M123. According to "IERS
                                : Technical Note 20, Results and Analysis of the
                                : ITRF94" March 1996, Table T2 "Directory of IERS
                                : Stations" pT21, CDP 7102 corresponds to
                                : 40451M102. GODE, 40451M123, does not have a CDP
                                : number.

2.    Site Location Information

      City or Town             : Greenbelt
      State or Province         : Maryland
      Country                   : USA
      Tectonic Plate            : NOAM
      Approximate Position (ITRF)
        X coordinate (m)        : 1130773.7180
        Y coordinate (m)        : -4831253.5810
        Z coordinate (m)        : 3994200.4220
        Latitude (N is +)       : +390118.2193
        Longitude (E is +)      : -0764936.5898
```

```
     Elevation (m,ellips.)  : 14.5046
     Additional Information  :


3.  GNSS Receiver Information


3.1  Receiver Type           : ROGUE SNR-8000
     Satellite System        : GPS
     Serial Number           : 129
     Firmware Version        : 93.06.08
     Elevation Cutoff Setting : 4
     Date Installed          : 1993-04-17T00:00Z
     Date Removed            : 1994-12-12T00:00Z
     Temperature Stabiliz.   : none
     Additional Information  : (multiple lines)

3.2  Receiver Type           : ROGUE SNR-8000
     Satellite System        : GPS
     Serial Number           : R148
     Firmware Version        : 3.2
     Elevation Cutoff Setting : 4
     Date Installed          : 1994-12-12T00:00Z
     Date Removed            : 1999-05-18T14:45Z
     Temperature Stabiliz.   : none
     Additional Information  : (multiple lines)

3.3  Receiver Type           : AOA SNR-12 ACT
     Satellite System        : GPS
     Serial Number           : R253-U
     Firmware Version        : 3.3.32.2
     Elevation Cutoff Setting : 4
     Date Installed          : 1999-05-18T14:45Z
     Date Removed            : 2002-04-16T18:00Z
     Temperature Stabiliz.   : none
     Additional Information  : operated at 1s samprate
                             : converted to 30s data at JPL
                             : using do_npt with lfit_2 option

3.4  Receiver Type           : AOA SNR-12 ACT
     Satellite System        : GPS
     Serial Number           : R253-U
     Firmware Version        : 3.3.32.5
     Elevation Cutoff Setting : 4
     Date Installed          : 2002-04-16T18:00Z
     Date Removed            : 2002-05-03T19:00Z
     Temperature Stabiliz.   : none
     Additional Information  : firmware update,
                             : now run at 30s samprate

3.5  Receiver Type           : AOA SNR-8000 ACT
     Satellite System        : GPS
     Serial Number           : T341-U
     Firmware Version        : 3.3.32.5
     Elevation Cutoff Setting : 4
     Date Installed          : 2002-05-03T19:10Z
     Date Removed            : 2006-04-10T13:10Z
     Temperature Stabiliz.   : none
     Additional Information  : failed receiver replacement

3.6  Receiver Type           : ASHTECH UZ-12
     Satellite System        : GPS
     Serial Number           : ZR520013801
```

```
        Firmware Version         : CQ00
        Elevation Cutoff Setting : 4
        Date Installed           : 2006-04-11T00:00Z
        Date Removed             : (CCYY-MM-DDThh:mmZ)
        Temperature Stabiliz.    : none
        Additional Information   :

3.x     Receiver Type            : (A20, from rcvr_ant.tab; see instructions)
        Satellite System         : (GPS/GLONASS/GPS+GLONASS)
        Serial Number            : (A5)
        Firmware Version         : (A11)
        Elevation Cutoff Setting : (deg)
        Date Installed           : (CCYY-MM-DDThh:mmZ)
        Date Removed             : (CCYY-MM-DDThh:mmZ)
        Temperature Stabiliz.    : (none or tolerance in degrees C)
        Additional Information   : (multiple lines)

4.      GNSS Antenna Information


4.1     Antenna Type             : AOAD/M_T        JPLA
        Serial Number            : 129
        Antenna Reference Point  : BPA
        Marker->ARP Up Ecc. (m)  : 0.0614
        Marker->ARP North Ecc(m) : 0.0000
        Marker->ARP East Ecc(m)  : 0.0000
        Alignment from True N     : 0
        Antenna Radome Type      : JPLA
        Radome Serial Number     :
        Antenna Cable Type       : (vendor & type number)
        Antenna Cable Length     : (m)
        Date Installed           : 1993-04-17T00:00Z
        Date Removed             : 2001-06-01T17:00Z
        Additional Information   : (multiple lines)

4.2     Antenna Type             : AOAD/M_T        JPLA
        Serial Number            : 129
        Antenna Reference Point  : BPA
        Marker->ARP Up Ecc. (m)  : 0.0614
        Marker->ARP North Ecc(m) : 0.0000
        Marker->ARP East Ecc(m)  : 0.0000
        Alignment from True N     : 0
        Antenna Radome Type      : JPLA
        Radome Serial Number     :
        Antenna Cable Type       : (vendor & type number)
        Antenna Cable Length     : (m)
        Date Installed           : 2001-06-01T19:00Z
        Date Removed             : (CCYY-MM-DDThh:mmZ)
        Additional Information   : antenna electronics modified internally;
                                 : LNA replaced with lower NF unit,
                                 : bandpass element relocated from between
                                 : antenna element and LNA, to after LNA.
                                 :
                                 : Note radome changes (on/off) in 2002 -
                                 : (local survey/testing)
                                 : DAY  Dome Removed    Dome Replaced
                                 : 135  13:30 UTC       21:30 UTC
                                 : 136  15:30 UTC       20:30 UTC
                                 : 141  14:00 UTC       19:00 UTC
                                 : 144  13:30 UTC       21:00 UTC
                                 : 148  13:30 UTC       21:00 UTC
                                 : 150  14:00 UTC       21:00 UTC
                                 : 151  13:30 UTC       21:00 UTC
```

```
4.x  Antenna Type            : (A20, from rcvr_ant.tab; see instructions)
     Serial Number           : (A*, but note the first A5 is used in SINEX)
     Antenna Reference Point  : (BPA/BCR/XXX from "antenna.gra"; see instr.)
     Marker->ARP Up Ecc. (m)  : (F8.4)
     Marker->ARP North Ecc(m) : (F8.4)
     Marker->ARP East Ecc(m)  : (F8.4)
     Alignment from True N    : (deg; + is clockwise/east)
     Antenna Radome Type      : (A4 from rcvr_ant.tab; see instructions)
     Radome Serial Number     :
     Antenna Cable Type       : (vendor & type number)
     Antenna Cable Length     : (m)
     Date Installed           : (CCYY-MM-DDThh:mmZ)
     Date Removed             : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)

5.   Surveyed Local Ties


5.1  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   :
     Tied Marker DOMES Number :
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 :
       dy (m)                 :
       dz (m)                 :
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : see IGSMAIL #233

5.x  Tied Marker Name         :
     Tied Marker Usage        : (SLR/VLBI/LOCAL CONTROL/FOOTPRINT/etc)
     Tied Marker CDP Number   : (A4)
     Tied Marker DOMES Number : (A9)
     Differential Components from GNSS Marker to the tied monument (ITRS)
       dx (m)                 :
       dy (m)                 :
       dz (m)                 :
     Accuracy (mm)            : (mm)
     Survey method            : (GPS CAMPAIGN/TRILATERATION/TRIANGULATION/etc)
     Date Measured            : (CCYY-MM-DDThh:mmZ)
     Additional Information   : (multiple lines)

6.   Frequency Standard


6.1  Standard Type            : H-MASER
     Input Frequency          : 5 MHz
     Effective Dates          : 1993-08-01/1999-11-03T17:00Z
     Notes                    : clock steering disabled

6.2  Standard Type            : INTERNAL
     Input Frequency          : 5 MHz
     Effective Dates          : 1999-11-03T17:00Z/1999-11-05T17:30Z
     Notes                    : clock steering enabled

6.3  Standard Type            : H-MASER
     Input Frequency          : 5 MHz
     Effective Dates          : 1999-11-05T17:30Z/2002-06-03
     Notes                    : clock steering disabled
```

```
6.4   Standard Type          : INTERNAL
      Input Frequency        : 5 MHz
      Effective Dates        : 2002-06-03/2002-06-25T16:27Z
      Notes                  : clock steering enabled

6.5   Standard Type          : H-MASER
      Input Frequency        : 5 MHz
      Effective Dates        : 2002-06-25T16:27Z/2008-02-04T14:07Z
      Notes                  : clock steering disabled

6.6   Standard Type          : H-MASER
      Input Frequency        : 5 MHz
      Effective Dates        : 2008-02-04T14:07Z/2008-02-04T14:08Z
      Notes                  : clock steering disabled
                             : during this minute the H-Maser lost
                             : phase lock, and the LO was drifting

6.7   Standard Type          : H-MASER
      Input Frequency        : 5 MHz
      Effective Dates        : 2008-02-04T14:08Z/2008-02-06T16:30Z
      Notes                  : clock steering disabled
                             : normal H-Maser operations

6.8   Standard Type          : H-MASER
      Input Frequency        : 5 MHz
      Effective Dates        : 2008-02-06T16:30Z/2008-02-06T22:15Z
      Notes                  : clock steering disabled
                             : during this maintenance period the
                             : H-Maser lost phase lock, and the
                             : LO was drifting

6.9   Standard Type          : H-MASER
      Input Frequency        : 5 MHz
      Effective Dates        : 2008-02-06T22:15Z/CCYY-MM-DD
      Notes                  : clock steering disabled
                             : normal H-Maser operations

6.x   Standard Type          : (INTERNAL or EXTERNAL H-MASER/CESIUM/etc)
      Input Frequency        : (if external)
      Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
      Notes                  : (multiple lines)

7.    Collocation Information


7.1   Instrumentation Type   : SLR/VLBI
      Status                 : PERMANENT
      Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
      Notes                  : (multiple lines)

7.x   Instrumentation Type   : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/TIME/etc)
      Status                 : (PERMANENT/MOBILE)
      Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
      Notes                  : (multiple lines)

8.    Meteorological Instrumentation


8.1.1 Humidity Sensor Model  :
      Manufacturer           :
      Serial Number          :
      Data Sampling Interval  :
      Accuracy (% rel h)     : (% rel h)
```

```
        Aspiration              : (UNASPIRATED/NATURAL/FAN/etc)
        Height Diff to Ant      : (m)
        Calibration date        : (CCYY-MM-DD)
        Effective Dates         : CCYY-MM-DD/CCYY-MM-DD
        Notes                   : (multiple lines)

8.1.x   Humidity Sensor Model   :
        Manufacturer            :
        Serial Number           :
        Data Sampling Interval  : (sec)
        Accuracy (% rel h)      : (% rel h)
        Aspiration              : (UNASPIRATED/NATURAL/FAN/etc)
        Height Diff to Ant      : (m)
        Calibration date        : (CCYY-MM-DD)
        Effective Dates         : (CCYY-MM-DD/CCYY-MM-DD)
        Notes                   : (multiple lines)

8.2.1   Pressure Sensor Model   :
        Manufacturer            :
        Serial Number           :
        Data Sampling Interval  :
        Accuracy                : (mbar)
        Height Diff to Ant      : (m)
        Calibration date        : (CCYY-MM-DD)
        Effective Dates         : CCYY-MM-DD/CCYY-MM-DD
        Notes                   : (multiple lines)

8.2.x   Pressure Sensor Model   :
        Manufacturer            :
        Serial Number           :
        Data Sampling Interval  : (sec)
        Accuracy                : (hPa)
        Height Diff to Ant      : (m)
        Calibration date        : (CCYY-MM-DD)
        Effective Dates         : (CCYY-MM-DD/CCYY-MM-DD)
        Notes                   : (multiple lines)

8.3.1   Temp. Sensor Model      :
        Manufacturer            :
        Serial Number           :
        Data Sampling Interval  :
        Accuracy                : (deg C)
        Aspiration              : (UNASPIRATED/NATURAL/FAN/etc)
        Height Diff to Ant      : (m)
        Calibration date        : (CCYY-MM-DD)
        Effective Dates         : CCYY-MM-DD/CCYY-MM-DD
        Notes                   : (multiple lines)

8.3.x   Temp. Sensor Model      :
        Manufacturer            :
        Serial Number           :
        Data Sampling Interval  : (sec)
        Accuracy                : (hPa)
        Aspiration              : (UNASPIRATED/NATURAL/FAN/etc)
        Height Diff to Ant      : (m)
        Calibration date        : (CCYY-MM-DD)
        Effective Dates         : (CCYY-MM-DD/CCYY-MM-DD)
        Notes                   : (multiple lines)

8.4.1   Water Vapor Radiometer  :
        Manufacturer            :
        Serial Number           :
        Distance to Antenna     : (m)
```

```
      Height Diff to Ant    : (m)
      Calibration date      : (CCYY-MM-DD)
      Effective Dates       : CCYY-MM-DD/CCYY-MM-DD
      Notes                 : (multiple lines)

8.4.x  Water Vapor Radiometer :
      Manufacturer          :
      Serial Number         :
      Distance to Antenna   : (m)
      Height Diff to Ant    : (m)
      Calibration date      : (CCYY-MM-DD)
      Effective Dates       : (CCYY-MM-DD/CCYY-MM-DD)
      Notes                 : (multiple lines)

8.5.1  Other Instrumentation  : (multiple lines)

8.5.x  Other Instrumentation  :

9.   Local Ongoing Conditions Possibly Affecting Computed Position


9.1.x  Radio Interferences    : (TV/CELL PHONE ANTENNA/RADAR/etc)
       Observed Degredations  : (SN RATIO/DATA GAPS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information  : (multiple lines)

9.2.x  Multipath Sources      : (METAL ROOF/DOME/VLBI ANTENNA/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information  : (multiple lines)

9.3.x  Signal Obstructions    : (TREES/BUILDLINGS/etc)
       Effective Dates        : (CCYY-MM-DD/CCYY-MM-DD)
       Additional Information  : (multiple lines)

10.   Local Episodic Effects Possibly Affecting Data Quality


10.1 Date                     : 2002-05-15/2002-05-31
     Event                    : see section 4.2 of sitelog for detail

10.2 Date                     : 2003-09-10/2003-09-10
     Event                    : Antenna removed/replaced for survey
                              : (14:02-20:35UTC)

10.x Date                     : (CCYY-MM-DD/CCYY-MM-DD)
     Event                    : (TREE CLEARING/CONSTRUCTION/etc)

11.   On-Site, Point of Contact Agency Information

     Agency                   : NASA Goddard Space Flight Center
     Preferred Abbreviation   : GSFC
     Mailing Address          : Space Geodesy Branch, Code 926.9
                              : NASA/GSFC
                              : Greenbelt, MD 20771 USA
     Primary Contact
       Contact Name           : Irv Diegel
       Telephone (primary)    : 301-805-3959
       Telephone (secondary)  :
       Fax                    : 301-805-3974
       E-mail                 : Irv.Diegel@Honeywell.com
     Secondary Contact
       Contact Name           :
       Telephone (primary)    :
```

```
         Telephone (secondary)  :
         Fax                     :
         E-mail                  :
      Additional Information  : (multiple lines)

12.   Responsible Agency (if different from 11.)

      Agency                  : Jet Propulsion Laboratory
      Preferred Abbreviation  : JPL
      Mailing Address         : 4800 Oak Grove Drive
                              : Pasadena, CA 91109 USA
      Primary Contact
        Contact Name          : David A. Stowers
        Telephone (primary)   : 818-354-7055
        Telephone (secondary) :
        Fax                   : 818-393-4965
        E-mail                : dstowers@jpl.nasa.gov
      Secondary Contact
        Contact Name          : Network Engineer/UNAVCO
        Telephone (primary)   : 303-381-7500
        Telephone (secondary) :
        Fax                   : 303-381-7451
        E-mail                : ruud@unavco.org, andreatta@unavco.org
      Additional Information  : Oivind Ruud (303.381.7476) or Victoria
                              : Andreatta (303.381.7458)
13.   More Information

      Primary Data Center   : JPL (ODC-Operational Data Center)
      Secondary Data Center : CDDIS (GDC-Global Data Center)

      URL for More Information :
        Hardcopy on File
        Site Map              : (Y or URL)
        Site Diagram          : (Y or URL)
        Horizon Mask          : (Y or URL)
        Monument Description   : (Y or URL)
        Site Pictures         : (Y or URL)
      Additional Information  : (multiple lines)
      Antenna Graphics with Dimensions




TURBOROGUE: AOA/M_T


                       -----
                    /      +     \                          <-- 0.128  L2
                    |       +      |                         <-- 0.110  L1
      +-------------------------------------------------+   <-- 0.102  TCR
      |                                                 |
      |                                                 |
      |                                                 |
      |                                                 |
   +-+-------------------------------------------------+-+  <-- 0.038
   +------------------+-----------+------------------+    <-- 0.035  BCR
                      |           |
                    =|            |
                     +----+-x-+----+  ------------          <-- 0.000  BPA=ARP
                      |  |  |    |              |
                      |  |  |    |              |
                      |  |  |    |           "Spike"
                      |  |  |    |           6.14 cm
                      \     /                  |
```
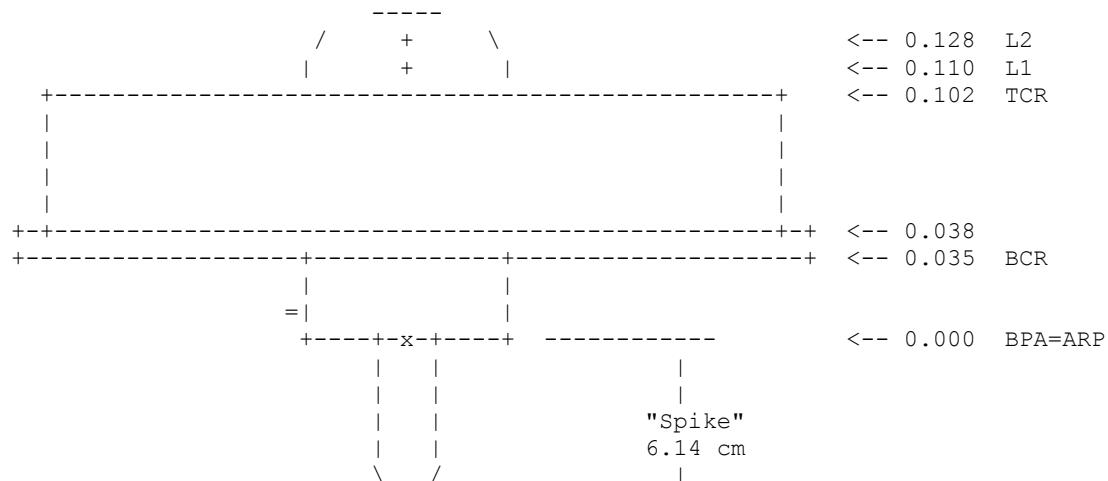
```
                              \  /                    |
                               V                     |        Stainless-steel
        ====================X====================    plate in concrete
                                                     pier. "X" is survey
                                                     reference point.
<--                        0.381                -->
```

```
    ARP: Antenna Reference Point        BPA: Bottom of Preamplifier
    L1 : L1 Phase Center                L2 : L2 Phase Center
    TCR: Top of Chokering               BCR: Bottom of Chokering
```

Appendix B. SLR MOBLAS 7 ILRS Site Log

```
ILRS Site and System Information Form
      International Laser Ranging Service

  0.    Form

        Prepared by (Full Name)    : Van S. Husson, Paul Stevens
        Preparer E-mail            : van.husson@honeywell-tsi.com
                                     paul.stevens@honeywell-tsi.com
        Date Prepared              : 2002-07-09
        Report Type                : UPDATE
        Format Version             : 1.0



  1.    Identification of the Ranging System Reference Point (SRP)

        Site Name                  : Goddard Geophysical Astronomical Observatory
        IERS DOMES Number          : 40451M105
        CDP Pad ID                 : 7105
        Subnetwork                 : NASA
        Description                : MONUMENT
        Monument Description        : STANDARD NASA DISK
        Monument Inscription       : 7105-1981
        Mark Description           : Chiselled Cross
        Date Installed             : 1981-03-01
        Date Removed               : (yyyy-mm-dd)
        Geologic Characteristic    : CRETACEOUS SAND AND GRAVEL
        Additional Information     : (multiple lines)



  2.    Site Location Information

        City or Town               : Greenbelt
        State or Province          : Maryland
        Country                    : USA
        Tectonic Plate             : North American
        Approximate Position
          X coordinate        [m]:  1130719.703
          Y coordinate        [m]: -4831350.572
          Z coordinate        [m]:  3994106.526
          Latitude          [deg]: 39.0056 N
          Longitude         [deg]: 76.6610 W
          Elevation           [m]: 19.195
        Additional Information     : (multiple lines)



  3.    General System Information

  3.01 System Name                 : MOBLAS 7
        4-Character Code           : GODL
        CDP System Number          : 07
        CDP Occupation Number      : 25
        Eccentricity to SRP (if Not Identical With SRP)
          North               [m]: -0.008 +- 0.002
          East                [m]: -0.032 +- 0.002
```

```
     Up                   [m]:  3.139 +- 0.002
       Date Measured        : 1998-12-12
     Date Installed         : 1981-03-01
     Date Removed           : (yyyy-mm-dd)
     Additional Information : (multiple lines)




  4.   Telescope Information

  4.01 Receiving Telescope Type  : CASSEGRAIN
       Aperture          [m]: 0.762
       Mount                 : AZ-EL
     Xmitting Telescope Type   : REFRACTOR
       Aperture          [m]: 0.163
     Tracking Camera Type      : CCD
       Model                 : GEN II INTENSIFIER
       Manufacturer          : HTSI
       Field of View     [deg]:
       Minimum Magnitude  [mag]:
     Transmit/Receive Path     : SEPARATE
     Transmit/Receive Switch   : NONE
     Max Slew Rate Az   [deg/s]: 20
     Max Slew Rate El   [deg/s]: 5
     Max Used Tracking Rate Az  : 5
     Max Used Tracking Rate El  : 3
     Telescope Shelter         : ROLL-BACK ROOF
     Daylight Filter Type      : Omega Optical 532NB1 9114
     Dayl. Filt. Bandwidth  [nm]: 100
     Adjustable Attenuation    : RECEIVE
     Transmit Efficiency       : 0.94
     Receive Efficiency        : 0.76
     Date Installed            : 1981-03-01
     Date Removed              : (yyyy-mm-dd)
     Additional Information    : CCD built from Coho CCD head and
                                 Litton image intensifier, receive
                                 efficiency is .76 without daylight
                                 filter and .54 with daylight filter




  5.   Laser System Information

  5.01 Laser Type              : ND:YAG
     Number of Amplifiers      : 1
     Primary Wavelength    [nm]: 1064
     Primary Maximum Energy [mJ]: 200
     Secondary Wavelength  [nm]: 532
     Secondary Max. Energy  [mJ]: 100
     Xmit Energy Adjustable    : YES
     Pulse Width (FWHM)    [ps]: 200
     Max. Repetition Rate  [Hz]: 5
     Fullw. Beam Divergence  ["]: 30
     Final Beam Diameter   [m]: 0.093
     Eyesafe                   : NO
     Eyesafe Standard          : ANSI 136.1
     Date Installed            : 1981-03-01
     Date Removed              : (yyyy-mm-dd)
     Additional Information    : 1) Laser repetition rate is 10 Hz,
                                 but the time interval counter
                                 restricts the maximum rate to 5 Hz.
```

```
                              2) Laser Cavity Upgrade 2001-09-07.




   6.    Receiver System

   6.01.01 Primary Chain
           Wavelength         [nm]: 532
           Detector Type        : MCP
             Manufacturer       : ITT
             Model              : F4129F
             Quantum Efficiency [%]: 17.7
             Nominal Gain       : 1E+06
             Rise Time      [ps]: 350
             Jitter (Single PE)[ps]: 100
             Field of View    ["]: 360
             Date Installed     : 1986-03-31
             Date Removed       : (yyyy-mm-dd)
           Signal Processing    : CFD
             Manufacturer       : Tennelec
             Model              : TC454
             Date Installed     : 1986-03-31
             Date Removed       : (yyyy-mm-dd)
             Amplitude Measurement : YES
             Return-rate Controlled: YES
             Mode of Operation    : Few to Multi Photons
           Time of Flight Observ.  : INTERVAL
             Manufacturer         : Hewlett-Packard
             Model                : 5370B
             Resolution       [ps]: 20
             Precision        [ps]: 35
             Date Installed       : 1986-03-31
             Date Removed         : (yyyy-mm-dd)
           Additional Information  : (multiple lines)

   6.02.01 Secondary Chain
           Wavelength         [nm]: 532
           Detector Type        : MCP
             Manufacturer       : ITT
             Model              : F4129F
             Quantum Efficiency [%]: 17.7
             Nominal Gain       : 1E+06
             Rise Time      [ps]: 350
             Jitter (Single PE)[ps]: 100
             Field of View    ["]: 360
             Date Installed     : 1986-03-31
             Date Removed       : (yyyy-mm-dd)
           Signal Processing    : CFD
             Manufacturer       : Tennelec
             Model              : TC454
             Date Installed     : 1986-03-31
             Date Removed       : (yyyy-mm-dd)
             Amplitude Measurement : YES
             Return-rate Controlled: YES
             Mode of Operation    : Single to Multi Photons
           Time of Flight Observ.  : INTERVAL
             Manufacturer         : Hewlett-Packard
             Model                : 5370B
             Resolution       [ps]: 20
             Precision        [ps]: 35
             Date Installed       : 1986-03-31
```

```
        Date Removed            : (yyyy-mm-dd)
        Additional Information  : High sensivity laser receiver configuration,
                                  installed 1996-05-19. Everything is the same
                                  as the primary chain except the discriminator
                                  threshold has been lowered to accept single
                                  photons and the signal is amplified with
                                  24 dB of gain




  7.    Tracking Capabilities

  7.01 Satellites
        Very Low Alt (<400 km)  : YES
        Low Altitude (400-2000) : YES
        Lageos                  : YES
        GLONASS                 : YES
        Etalon                  : NIGHT
        GPS                     : NIGHT
        Moon                    : NO
      Avge Pass Switch Time  [s]: 60
      Average values for Lageos
        Single Shot RMS     [mm]: 10
        # of Obs per NP         : 150
        Use of Semi-trains      : NO
        # of Semi-train Tracks  : N.A.
      Range Gate Width      [ns]: 2000
      Beam Pointing Accuracy ["]: 0.6
      Angle Encoder Resolution["]: 0.6
      Min. Tracking Elev.  [deg]: 20
      Operation
        Months per Year         : 12
        Days per Week           : 7
        Hours per Day           : 24
        Staff per Shift         : 1
        System Shared With      : R&D
        Time Allocated to SLR [%]: 100
        Remotely Controllable   : NO
      Date First Applicable     : 1996-12-01
      Date Last Applicable      : (yyyy-mm-dd)
      Additional Information     : Station is not available for ranging
                                   on US holidays.




  8.    Calibration

  8.01 Calibration Type         : PRE+POST
      Target Location           : EXTERNAL
      Target Type               : CORNER CUBE
      Target Structure          : CONCRETE PIER
      Target Distance       [m]: 170
        Date Measured           : 1998-12-12
        Accuracy (mm)       [mm]: 2
        Verification            : first order survey and
                                : ranging to multiple ground targets
      Return-rate Controlled    : YES
      Mode of Operation         : FEW to MULTI
      Average Cal Interval [min]: 3.5
      Single Shot RMS      [mm]: 5 +- 1
      Edit Criterion 1st Chain  : ITERATIVE 3 SIGMA
```

```
        Edit Criterion 2nd Chain   : N.A.
        Application of Cal Data    : AVERAGE
        Date Installed             : 1990-07-24
        Date Removed               : (yyyy-mm-dd)
        Additional Information     : (multiple lines)
```

```
  9.    Time and Frequency Standards
```

```
  9.01.01 Frequency Standard Type : Rubidium disciplined by GPS
        Model                    : XL-DC 151-358-108-2
        Manufacturer             : TrueTime
        Short Term Stab.  [e-12]: 10
        Long Term Stab.   [e-12]: 3
        Time Reference           : GPS
        Synchronization          : GPS
        Epoch Accuracy      [ns]: <100
        Date Installed           : 1999-05-23
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : This Truetime model contains the
                                   Stanford PRS10 Rubidium Frequency
                                   Standard
```

```
  9.02.01 GPS Timing Rcvr Model   : XL-DC 151-358-108-2
        Manufacturer             : TrueTime
        Date Installed           : 1999-03-04
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : CNS clock used for comparisons
```

```
  10.    Preprocessing Information
```

```
  10.01 On-site NP Generation     : YES
        Data Screening           : IRV+POLYNOMIAL
        Edit Criterion 1st Chain  : ITERATIVE 3.0 SIGMA
        Edit Criterion 2nd Chain  : N.A.
        Upload interval          : HOURLY
        Date First Applicable    : 1991-12-09
        Date Last Applicable     : 2001-02-08
        Additional Information   : (multiple lines)
```

```
  10.02 On-site NP Generation     : YES
        Data Screening           : IRV+POLYNOMIAL
        Edit Criterion 1st Chain  : ITERATIVE 3.0 SIGMA
        Edit Criterion 2nd Chain  : N.A.
        Upload interval          : HOURLY
        Date First Applicable    : 2001-02-08
        Date Last Applicable     : (yyyy-mm-dd)
        Additional Information   : Generic Normal Processing Version 2.0
                                   installed 2001-02-08.
```

```
  11.    Aircraft Detection
```

```
  11.01 Detection Type            : RADAR
        Date Installed           : 1994-08-31
        Date Removed             : (yyyy-mm-dd)
```

```
         Additional Information    : (multiple lines)




12.    Meteorological Instrumentation

12.01.01 Pressure Sensor Model   : MET3
         Manufacturer            : Paroscientific
         Recording Interval      : PER PULSE
         Accuracy        [mbar]: 0.1
         Height Diff to SRP   [m]: -0.15
         Date Installed          : 2000-03-30
         Calibration Interval    : yearly
         Date Removed            : (yyyy-mm-dd hh:mm UT)
         Additional Information  : (multiple lines)

12.02.01 Temp Sensor Model       : MET3
         Manufacturer            : Paroscientific
         Recording Interval      : PER PULSE
         Accuracy       [deg C]: 0.5
         Date Installed          : 2000-03-30
         Calibration Interval    : yearly
         Date Removed            : (yyyy-mm-dd hh:mm UT)
         Additional Information  : (multiple lines)

12.03.01 Humidity Sensor Model   : MET3
         Manufacturer            : Paroscientific
         Recording Interval      : PER PASS
         Accuracy      [% rel h]: 2
         Date Installed          : 2000-03-30
         Calibration Interval    : yearly
         Date Removed            : (yyyy-mm-dd hh:mm UT)
         Additional Information  : (multiple lines)




13.    Local Ties, Eccentricities, and Collocation Information

13.01 Collocated Permanent Geodetic Systems

      GPS                        : IGS
        Date Installed           : 1993-04-02
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : (multiple lines)
      GLONASS                    : NO
        Date Installed           : (yyyy-mm-dd)
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : (multiple lines)
      DORIS                      : IDS
        Date Installed           : 2000-06-29
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : (multiple lines)
      PRARE                      : YES
        Date Installed           : 1995-05-01
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : (multiple lines)
      VLBI                       : IVS
        Date Installed           : 1993-04-01
        Date Removed             : (yyyy-mm-dd)
        Additional Information   : (multiple lines)
      Gravimeter                 : NO
```

```
          Date Installed         : (yyyy-mm-dd)
          Date Removed           : (yyyy-mm-dd)
          Additional Information : (multiple lines)

13.02.xx Local Ties from the SRP to Other Monuments or Systems on Site

          Monument Name          :
          Instrumentation Type   : (GPS/GLONASS/DORIS/PRARE/SLR/VLBI/NONE)
          Instrumentation Status : (PERMANENT/MOBILE)
          DOMES Number           : (XXXXXXXXX)
          CDP Number             : (XXXX)
          Differential Components (ITRS)
            dx                [m]: (m +- m)
            dy                [m]: (m +- m)
            dz                [m]: (m +- m)
            Date Measured        : (yyyy-mm-dd)
            Determined by        :
          Date Installed         : (yyyy-mm-dd)
          Date Removed           : (yyyy-mm-dd)
          Additional Information : (multiple lines)

13.03.01 Eccentricities Between Other Monuments on Site

          From: Monument Name    : CDP Station 7105
                DOMES Number     : 40451M105
                CDP Number       : 7105
          To:   Monument Name    : North GEOS Pier
                DOMES Number     : 40451M110
                CDP Number       :
          Differential Components (ITRS)
            dx                [m]:  11.6967 +- 0.002
            dy                [m]:  27.9696 +- 0.002
            dz                [m]:  29.9564 +- 0.002
            Date Measured        : 1998-12-12
            Determined by        : HTSI
          Additional Information : For more information about
                                   contact Jim Long at
                                   jim.long@honeywell-tsi.com

13.03.02 Eccentricities Between Other Monuments on Site

          From: Monument Name    : CDP Station 7105
                DOMES Number     : 40451M105
                CDP Number       : 7105
          To:   Monument Name    : CDP Station 7125
                DOMES Number     : 40451M114
                CDP Number       : 7125
          Differential Components (ITRS)
            dx                [m]:  26.0377 +- 0.002
            dy                [m]: -17.4605 +- 0.002
            dz                [m]: -29.3887 +- 0.002
            Date Measured        : 1998-12-12
            Determined by        : HTSI
          Additional Information : For more information about
                                   contact Jim Long at
                                   jim.long@honeywell-tsi.com

13.03.03 Eccentricities Between Other Monuments on Site

          From: Monument Name    : CDP Station 7105
                DOMES Number     : 40451M105
                CDP Number       : 7105
          To:   Monument Name    : CDP Station 7920
```

```
        DOMES Number       : 40451M117
        CDP Number         : 7920
Differential Components (ITRS)
  dx                 [m]:  22.1812 +- 0.002
  dy                 [m]: -19.2155 +- 0.002
  dz                 [m]: -30.4096 +- 0.002
  Date Measured        : 1998-12-12
  Determined by        : HTSI
Additional Information : For more information about
                         contact Jim Long at
                         jim.long@honeywell-tsi.com
```

13.03.04 Eccentricities Between Other Monuments on Site

```
From: Monument Name    : CDP Station 7105
      DOMES Number     : 40451M105
      CDP Number       : 7105
To:   Monument Name    : CDP Station 7130
      DOMES Number     : 40451M116
      CDP Number       : 7130
Differential Components (ITRS)
  dx                 [m]:  15.5755 +- 0.002
  dy                 [m]:  25.9070 +- 0.002
  dz                 [m]:  25.8559 +- 0.002
  Date Measured        : 1998-12-12
  Determined by        : HTSI
Additional Information : For more information about
                         contact Jim Long at
                         jim.long@honeywell-tsi.com
```

13.03.05 Eccentricities Between Other Monuments on Site

```
From: Monument Name    : CDP Station 7105
      DOMES Number     : 40451M105
      CDP Number       : 7105
To:   Monument Name    : CDP Station 7918
      DOMES Number     : 40451M120
      CDP Number       : 7918
Differential Components (ITRS)
  dx                 [m]: -14.4196 +- 0.002
  dy                 [m]:   5.1378 +- 0.002
  dz                 [m]:   9.4549 +- 0.002
  Date Measured        : 1998-12-12
  Determined by        : HTSI
Additional Information : For more information about
                         contact Jim Long at
                         jim.long@honeywell-tsi.com
```

13.03.06 Eccentricities Between Other Monuments on Site

```
From: Monument Name    : CDP Station 7105
      DOMES Number     : 40451M105
      CDP Number       : 7105
To:   Monument Name    : JPL 4006 (GPS East)
      DOMES Number     : 40451M123
      CDP Number       : 4006
Differential Components (ITRS)
  dx                 [m]:  54.2314 +- 0.002
  dy                 [m]:  97.0090 +- 0.002
  dz                 [m]:  93.8623 +- 0.002
  Date Measured        : 1998-12-12
  Determined by        : HTSI
Additional Information : IGS site code is GODE.
```

                                        For more information about
                                        contact Jim Long at
                                        jim.long@honeywell-tsi.com

13.03.07 Eccentricities Between Other Monuments on Site

        From: Monument Name   : CDP Station 7105
              DOMES Number   : 40451M105
              CDP Number   : 7105
        To: Monument Name   : SGP 7108
              DOMES Number   : 40451M125
              CDP Number   : 7108
        Differential Components (ITRS)
         dx   [m]: 75.1266 +- 0.002
         dy   [m]: 116.7620 +- 0.002
         dz   [m]: 110.5077 +- 0.002
         Date Measured   : 1998-12-12
         Determined by   : HTSI
        Additional Information : 7108 is the Mobile VLBI (MV)-3 marker.
                                 For more information about
                                 contact Jim Long at
                                 jim.long@honeywell-tsi.com

13.03.08 Eccentricities Between Other Monuments on Site

        From: Monument Name   : CDP Station 7105
              DOMES Number   : 40451M105
              CDP Number   : 7105
        To: Monument Name   : JPL 4005 (GPS West)
              DOMES Number   : 40451M124
              CDP Number   : 4005
        Differential Components (ITRS)
         dx   [m]: 33.3058 +- 0.002
         dy   [m]: 88.3919 +- 0.002
         dz   [m]: 88.9674 +- 0.002
         Date Measured   : 1998-12-12
         Determined by   : HTSI
        Additional Information : IGS site code is GODW.
                                 For more information about
                                 contact Jim Long at
                                 jim.long@honeywell-tsi.com

13.03.09 Eccentricities Between Other Monuments on Site

        From: Monument Name   : CDP Station 7105
              DOMES Number   : 40451M105
              CDP Number   : 7105
        To: Monument Name   : MV-3 SRP (VLBI)
              DOMES Number   : 40451M125
              CDP Number   : 7108
        Differential Components (ITRS)
         dx   [m]: 75.9012 +- 0.002
         dy   [m]: 113.5125 +- 0.002
         dz   [m]: 113.2697 +- 0.002
         Date Measured   : 1998-12-12
         Determined by   : HTSI
        Additional Information : This is the system reference point
                                 for MV-3. For more information
                                 contact Jim Long at
                                 jim.long@honeywell-tsi.com .

13.03.10 Eccentricities Between Other Monuments on Site

```
       From: Monument Name     : CDP Station 7105
             DOMES Number      : 40451M105
             CDP Number        : 7105
       To:   Monument Name     : GREB (DORIS)
             DOMES Number      : 40451S176
             CDP Number        : N.A.
       Differential Components (ITRS)
         dx                [m]: -8.343 +- 0.002
         dy                [m]: -41.346 +- 0.002
         dz                [m]: -45.362 +- 0.002
       Date Measured         : 2000-01-01
       Determined by         : HTSI
       Additional Information : For more information
                                contact Jim Long at
                                jim.long@honeywell-tsi.com .



14.    Local Events Possibly Affecting Computed Position

14.01 Date                    : (yyyy-mm-dd hh:mm UT)
      Event                   : (EARTHQUAKE/CONSTRUCTION/etc)
      Additional Information   : (multiple lines)



15.    On-Site, Point of Contact Agency Information

       Agency                 : HTSI
       Mailing Address        : NASA SLR
                              : 7515 Mission Dr
                              : Lanham, Md 20706
       Primary Contact
         Contact Name         : Maceo Blount
         Telephone (primary)  : 301-286-5050
         Telephone (secondary):
         Fax                  : 301-286-1636
         E-mail               : maceo.blount@honeywell-tsi.com
       Secondary Contact
         Contact Name         : Scott Wetzel
         Telephone (primary)  : 301-805-3987
         Telephone (secondary):
         Fax                  : 301-805-3974
         E-mail               : Scott.Wetzel@honeywell-tsi.com
       Additional Information : (multiple lines)



16.    Responsible Agency (if different from 15.)

       Agency                 : NASA, Code 920.1
       Mailing Address        : Code 920.1
                              : NASA/GSFC
                              : Greenbelt, MD 20771 USA
       Primary Contact
         Contact Name         : David Carter
         Telephone (primary)  : 301-614-5966
         Telephone (secondary):
         Fax                  : 301-614-5970
         E-mail               : dlcarter@pop900.gsfc.nasa.gov
```

```
Secondary Contact
  Contact Name            :
  Telephone (primary)     :
  Telephone (secondary)   :
  Fax                     :
  E-mail                  :
Additional Information    : (multiple lines)
```


```
17.   More Information

  URL for More Information  : N.A.
  Hardcopy on File
    Site Map                : YES
    Site Diagram            : YES
    Horizon Mask            : YES
    Monument Description     : YES
    Site Pictures           : YES
  Additional Information    : contact Jim Long at HTSI for
                              more information at
                              jim.long@honeywell-tsi.com
```

Appendix C. VLBI MV3 IVS Site Log

```
Network Station Configuration File
International VLBI Service

Refer to the instructions in the file
ftp://ivscc.gsfc.nasa.gov/config/instructions.txt
for how to fill out and submit this form.
990624 nrv Form version 0.5
990702 nrv Form version 0.6
990713 nrv Form version 0.7
991020 nrv Form version 0.8

0. Form

   Prepared by (full name) : Charles (Chuck) Kodak
   Date prepared           : 2000-Apr-19
   Report type             : new
   Prepared by (full name) : Charles (Chuck) Kodak
   Date prepared           : 2001-Apr-09
   Report type             : update
   Updated sections        : 2.2,3, 4, 6.3, 7.5(new), 13, 14

1. Site identification

   Site name               : GREENBELT
   Site 8-letter code      : GGAO7108
   Site 2-letter code(s)   : Gg
   IERS DOMES number       : 40451M125
   CDP occupation code     : 71085301
   CDP monument number     : 7108
   Surveyed into national network? : yes
   IGS station code        : GODE
   ILRS station name       : GODL
   Additional information  :

2. Site information

2.1 Site location information

   City or Town            : Greenbelt
   State or Province        : Maryland
   Country                 : United States of America
   Tectonic plate          : North American
   Approximate position
     X coordinate (m)      : 1130794.76936
     Y coordinate (m)      : -4831233.80170
     Z coordinate (m)      : 3994217.03883
     Latitude (deg)        : 39.0219 N
     Longitude (deg)       : 76.8265 W
     Elevation (m)         : 15.0
     Source of position    : local survey
   Additional information  :

2.2 Site local survey network information

   Number of reference markers  :  3
   Type of marker          :  pillar with imbedded disk
   Frequency of surveying  :  Annual
```

```
     Surveying method         :   directions, distances, leveling, GPS, etc.
     Survey instruments used :   theodolite, GPS,EDMI
     Accuracy                 :   (+/- 2 mm)
     Survey performed by      :   Honeywell Techonlogy Solutions, Inc. formerly
                                        AlliedSignal Technical Services Corp.
     Survey documentation     :  Report of Survey and HAVAGO adjustment
     Most recent survey date : 1996-Jan-05
     Results provided to IERS:  yes
     Results provided to CDDIS: yes
     Person responsible       :  James L. Long, Honeywell-TSI,Inc
     Additional information   :
```

2.3 Site descriptive information

```
     Electronic file available at IVSCC:
     (Please upload these files to ftp://ivscc.gsfc.nasa.gov/incoming
      and send e-mail to ivscc@ivscc.gsfc.nasa.gov telling the names.)
        ns is for Network Stations (don't change)
        Xy is station 2-letter code
        sm, sd, hm, md, sp indicate the type of file (don't change)
        NN are numbers, 01 is the first such file, 02 the second, etc.
        .type is the file type, .ps for PostScript, .jpg for JPEG, etc.
      Site map                : nsGgsmNN.type
      Site diagram            : nsGgsmNN.type
      Horizon mask diagram    : nsGgsmNN.type
      Monument description     : nsGgsmNN.type
      Site photographs        : nsGgsmNN.type
     URLs for reference
      Site map                :
      Site diagram            :
      Horizon mask            :
      Monument description    :
      Site photographs        :
     Additional information   :
```

3. Antenna information

```
     Diameter (m)             :   5
     Axis type                :   AZEL
     Axis offset (m)          :   0.0
     Slew rate first axis      : 3o/s
     Slew rate second axis     : 3o/s
     Limit stops first axis   : -270o, +270o
     Limit stops second axis : 90o, 6.8o
     Horizon mask data        :
     Occupation dates         : (yyyy-mmm-dd to Present)
     Additional information   :
```

4. Receiver information

```
     Feed location            : S-Band prime focus, X-Band cassegrain focus
     Feed type                : dichroic
     X 1st-stage amplifier    : cooled HEMT
     X bandwidth (MHz)        : 800MHz, -2dB
     X Tsys at zenith (K)     : 55 K
     X SEFD (Jy)              : 24,000
     X aperture efficiency    : 45 %
     X LO frequencies (MHz)   : 8080MHz
     S 1st-stage amplifier    : uncooled HEMT
     S bandwidth (MHz)        : 240MHz, -2dB
     S Tsys at zenith (K)     : 45 K
     S SEFD (Jy)              : 26,500
     S aperture efficiency    : 42 %
```

```
    S LO frequencies (MHz)  : 2020MHz
    Phase calibrator type   : NASA/CDP with 5 MHz input and
                              temperature controller
    Additional information  :

5. Cables between receiver and back end

    Length of cable run     : 111 m
    X band cable type       : RG214
    X band freq. bandpass   : 900MHz
    S band cable type       : RG214
    S band freq. bandpass   : 300MHz
    LO ref signal cable type: RG214
    LO ref signal freq.     : 5MHz
    Phase cal ref signal cable type: RG214
    Phase cal ref signal freq. : 5MHz
    Cable meas. system type : MarkIII cable cal
    Additional information  :

6. Data acquisition system information

6.1 Video/baseband converter set (group each set of up to 16
     mixers with similar characteristics)
    Type of converters      : MarkIV
    Number of mixers        : MarkIII type has 1 mixer per converter
    Sidebands available     : U&L
    Number of mixers with
    the following filters in
    all sideband outputs:
     2 MHz                  : 15
     4 MHz                  : 15
     8 MHz                  : 15
    16 MHz                  : 15
    32 MHz                  : 0
    Additional information  :

6.1.x (add sections for each additional video/baseband converter set)

6.2 Formatter
    Formatter type          : MarkIV
    Serial number or rack ID: Formatter - Haystack 02
    Additional information  :

6.2.x (add sections for each additional formatter)

6.3 Decoder
    Decode type             : MarkIV
    Additional information  :

6.3.x (add sections for each additional decoder)

6.4 IF distribution
    IF distributor type     : MarkIII/IV+IF3
    Additional information  :

6.4.x (add sections for each additional IF distribution)

6.5 Up/down converters
    X up/down converter freq.:
    S up/down converter freq.:
    Additional information   :

6.5.x (add sections for each additional converter)
```

```
6.6 Other rack equipment   :

   Additional information  :

6.6.x (add lines or sections for other types of rack equipment)

6.7 Recorders

   Recorder type          : MarkIV
   Number of recorders    : 1
   Tape type              : thin
   Additional information :

6.7.x (add sections for each recorder type)

6.8 Data Acquisition System Configuration Types Supported
    (list only those that are actually usable)

   6.8.1 Configuration 1  : (list elements from section 6 that
                          :  make a usable configuration)
                          : Example:
                          : 6.1.1 MKIV VCs
                          : 6.2   MKIV formatter
                          : 6.3   MKIII Decoder
                          : 6.4   MKIII IFD+IF3 distribution
                          : 6.5   None
                          : 6.7   MKIV recorder

   6.8.x (list additional configurations)

7 Meteorological instrumentation

7.1 Humidity sensor
   Manufacturer           : WeatherMeasures
   Model                  : 5124D
   Accuracy                                  :   +/-0.5%  0-15%RH,  +/-3%  15-80%RH,
+/-6% 80-100%RH
   Effective dates        : 1982 to present
   Additional information :

7.2 Pressure sensor
   Manufacturer           : Setra
   Model                  : B245
   Accuracy               : 650 to 1100mbar
   Effective dates        : 1982 to present
   Height relative to VLBI : 3.8m
   Additional information :

7.3 Temperature sensor
   Manufacturer           : WeatherMeasure
   Model                  : HUP14U
   Accuracy               : +/- 1o
   Effective dates        : 1982 to present
   Additional information :

7.4 Meteorological instrumentation (Future / Under development)
   Manufacturer           : Paroscientific,Inc.
   Model                  : MET3A
   Accuracy               : +/-0.08 hPa FS, +/-0.1 deg C FS, +/-2% RH @25C
   Effective dates        : Current Production
   Height relative to VLBI : TDB
   Additional information :
```

```
8. Time and frequency standards

8.1
   Standard type          : H-maser
   Installed dates        : 1993 to present
   Manufacturer           : NASA / APL
   Model number or ID      : NR-12
   Additional information  :

8.x (add more sections for each standard)

9. Auxilliary equipment information

   Type of equipment       :
   Installed dates        :
   Manufacturer           :
   Model number or ID      :
   Additional information  :

9.x (add sections for additional auxilliary equipment)

10. Co-location information

10.1
   Instrument type        : Doris
   Instrument name        :
   Status                 : Permanent
   Effective dates        : NEW May, 2000
   Included in local survey: yes
   Additional information  :

10.2
   Instrument type        : Glonass
   Instrument name        : 3S Navigation (gone)
                                    Ashtech Z-18  (present)
   Status                 : Permanent
   Effective dates        : 1995 to present
   Included in local survey: yes
   Additional information  :

10.3
   Instrument type        : Prare
   Instrument name        : Dorier
   Status                 : Permanent
   Effective dates        : 1997 to present
   Included in local survey: yes
   Additional information  : INOPERATIVE

10.4
   Instrument type        : SLR
   Instrument name        : Moblas-7
   Status                 : Permanent
   Effective dates        : 1981 to present
   Included in local survey: yes
   Additional information  :

10.5
   Instrument type        : GPS
   Instrument name        : GODE (AO ACT) and GODZ (Ashtec Z-12)
   Status                 : Permanent
   Effective dates        : 1993 to present
   Included in local survey: yes
```

```
   Additional information  :

10.x (add sections for each type)

11. Field System computer information

   System vendor         : SWT
   CPU                   : PII
   CPU speed             : 200MHz
   Memory                : 64Mbytes
   Disk                  : 1.4Gb
   Linux release         : 6.x
   Internet connection   : direct
   Antenna interface type : serial
   Spare FS computer?    : no

12. Known RFI sources

12.1
   Center frequency      : (MHz)
   Approximate bandwidth  :
   Approximate az/el range : (give range affected by RFI)
   Additional informaiton : (multiple lines allowed, give estimate
                             of strength of interference)

12.x (add sections for multiple RFI sources and frequencies)

13. On-site contact information

   Agency                    : Honeywell-TSI, Inc.
   Shipping address          : 7515 Mission Drive
                                     SLR/VLBI
                                     Lanham, MD 20706
   Postal address            : (if different, multiple lines)
   URL of site web page      :
   On-site Friend of VLBI
     Name                    : Jay Redmond
     Telephone (primary)     : 301.805.3972
     Telephone (alternate)   : 301.805.3997
     Fax                     : 301.805.3974
     E-mail                  : jay.readmond@honeywell-tsi.com


   On-site VLBI operations room
     Telephone (primary)     : 301.286.3877
     Telephone (alternate)   : 301.286.0811
     Fax                     : 301.286.4075
     E-mail                  : mv3@cddis.gsfc.nasa.gov
   Other on-site contact
     Name                    : Charles A. Kodak
     Telephone (primary)     : 301.805.3968
     Telephone (alternate)   : 301.805.3997
     Fax                     : 301.805.3974
     E-mail                  : Charles.Kodak@honeywell-tsi.com

   Additional information  : (multiple lines allowed)

14. Responsible agency (if different from on-site information)

   Agency                    :  Goddard Space Flight Center
                                 Code 920.3
   Shipping address          : NASA/GSFC, Greenbelt MD 20771
   Postal address            :
```

```
    URL of agency web page  : Lupus.gsfc.nasa.gov
    Primary administrative agency contact
      Contact person        : Dr. Thomas Clark
      Telephone (primary)   : 301.614.5866
      Telephone (alternate) :
      Fax                   : 301.614.6015
      E-mail                : clark@tomcat.gsfc.nasa.gov
                              Thomas.A.Clark.1@gsfc.nasa.gov
    Alternate agency contact
      Contact person        : Bill Wildes
      Telephone (primary)   : 301.614.5967
      Telephone (alternate) :
      Fax                   : 301.614.5866
      E-mail                : wtw@gemini.gsfc.nasa.gov
    Additional information  : (multiple lines allowed)
```

15. More information

  Additional information : (multiple lines allowed)

Appendix D. DORIS GREB IDS Site Log

```
    GREENBELT DORIS site description form

0. Form

   Prepared by       : SIMB (DORIS installation and maintenance department)
   Date prepared     : 26/07/2007
   Report type       : UPDATE

1. Site location information

   Site name              : GREENBELT
   Site DOMES number      : 40451
   Host agency            : NASA/GSFC
   City                   : Greenbelt
   State or province      : Maryland
   Country                : U.S.A.
   Tectonic plate         : North America
   Geological information :

   Geographical coordinates (ITRF) :
          North Latitude  :   39 deg  1' 12''
          East Longitude  :  -76 deg 49' 41''
          Ellipsoid height :   20 m
   Approximate altitude    :   52 m

2. DORIS antenna and reference point information

2.1
   Four character ID      : GREB
   Antenna model          : Starec 52291 type
   Antenna serial number  : 71
   IERS DOMES number      : 40451S176
   CNES/IGN number        : 404511
   CTDP number            : 93
   Date installed (dd/mm/yy): 29/06/2000
   Date removed (dd/mm/yy) :
   Antenna support type   : Concrete pillar
   Installed on           :
   Height above ground mark : 0.518 m
   Ground mark type       :
   Ground mark DOMES number : 40451
   Notes                  :


3. DORIS beacons information

3.1
   Beacon serial number      : 99 04 123
   Beacon model              : 2.0
   USO serial number         : 3.182
   4 Char. ID of the REF point : GREB
   Date installed (dd/mm/yy) : 29/06/2000
   Date removed (dd/mm/yy)   : 11/09/2005

3.2
   Beacon serial number      : 28 19 025
   Beacon model              : 3.0
   USO serial number         : 3.340
```

```
   4 Char. ID of the REF point : GREB
   Date installed (dd/mm/yy)   : 17/01/2006
   Date removed (dd/mm/yy)      :
```

4. ITRF coordinates and velocities of the current DORIS ref. point (GREB)

```
   Solution : ITRF2000 (connection to CDP 7105)
   Epoch    : 1997.0

   X = 1130711.289 m     Y = -4831391.923 m     Z = 3994061.177 m
   Sig X = 0.001 m        Sig Y = 0.002 m        Sig Z = 0.002 m

   VX = -0.0148 m/y       VY = -0.0001 m/y       VZ = 0.0010 m/y
   Sig VX = 0.0001 m/y    Sig VY = 0.0003 m/y   Sig VZ = 0.0003 m/y
```

5. IERS co-location information

5.1
```
   Instrument type       : SLR
   Status                : Permanent
   DOMES number of the
   instrument ref. point : 40451M105
   Notes                 :
```

5.2
```
   Instrument type       : GPS
   Status                : Permanent
   DOMES number of the
   instrument ref. point : 40451M123
   Notes                 :
```

5.3
```
   Instrument type       : VLBI
   Status                : Mobile
   DOMES number of the
   instrument ref. point : 40451M125
   Notes                 :
```

6. Tide gauge co-location information

7. Local site ties

7.1
```
   Point description     : DORIS mark (concrete pillar: top of plate)
   DOMES number          :

   Differential components from the current DORIS ref. point (GREB)
   to the above point (in the ITRS) :
               dX (m) : -0.092
               dY (m) : 0.392
               dZ (m) : -0.326
   Accuracy (m)          : 0.001
   Date measured         : June 2000
   Additional information : Antenna height measurement by IGN-F
```

7.2
```
   Point description     : SLR mark (CDP 7105)
   DOMES number          : 40451M105

   Differential components from the current DORIS ref. point (GREB)
   to the above point (in the ITRS) :
               dX (m) : 8.343
```

```
                             dY (m) : 41.346
                             dZ (m) : 45.362
   Accuracy (m)            : 0.001
   Date measured           : January 2000
   Additional information : Survey by Honeywell TSI


7.3
   Point description       : Mark JPL 4006 (IGS station GODE)
   DOMES number            : 40451M123

   Differential components from the current DORIS ref. point (GREB)
   to the above point (in the ITRS) :
                             dX (m) : 62.573
                             dY (m) : 138.355
                             dZ (m) : 139.226
   Accuracy (m)            : 0.002
   Date measured           : January 2000
   Additional information : Survey by Honeywell TSI

7.4
   Point description       : MV-3 mark (CDP 7108)
   DOMES number            : 40451M125

   Differential components from the current DORIS ref. point (GREB)
   to the above point (in the ITRS) :
                             dX (m) : 83.468
                             dY (m) : 158.108
                             dZ (m) : 155.871
   Accuracy (m)            : 0.003
   Date measured           : January 2000
   Additional information : Survey by Honeywell TSI


8. Meteorological Instrumentation

8.1 Humidity sensor
   Model          : HMP45D
   Manufacturer   : VAISALA
   Accuracy       : +/- 3 percents
   Notes          :

8.2 Pressure sensor
   Model          : PTU200 class B
   Manufacturer   : VAISALA
   Accuracy       : +/- 0.25 mb
   Height         : 1.65 m above the current DORIS ref. point (GREB)
   Notes          : long term stability = +/- 0.1 mb/year

8.3 Temperature sensor
   Model          : HMP45D
   Manufacturer   : VAISALA
   Accuracy       : +/- 0.5 deg C
   Notes          :


9. DORIS network contacts

   Primary contact:

   Name                : Herve FAGARD
   Agency              : Institut Geographique National
   Mailing address     : Service de Geodesie et de Nivellement
                         : 2 Avenue PASTEUR
                         : 94165 SAINT-MANDE CEDEX    FRANCE
```

```
Telephone           : + 33 1 43 98 81 48
Fax                 : + 33 1 43 98 84 50
E-mail              : herve (.) fagard (@) ign.fr

Secondary contact:

Name                : Francois BOLDO
Agency              : Institut Geographique National
Mailing address     : CNES (DCT/PO/AL)
                    : 18 Avenue Edouard BELIN
                    : 31401 TOULOUSE Cedex    FRANCE
Telephone           : + 33 5 61 27 40 72
Fax                 : + 33 5 61 28 25 95
E-mail              : Simb.Doris@cnes.fr
```

Appendix E. SLR Conventional Reference Point Observations

Translation Stage with Survey Prism on SLR Telescope

Close View Translation Stage and Prism on Trivet Plate

The translation stage assembly with the prism target is placed on the SLR telescope mount. The fine adjustment of the translation stage allows the prism target to be accurately positioned on the vertical axis of rotation while observed with an electronic theodolite and EDM instrument.

Appendix F. VLBI Conventional Reference Point Analysis

Below is the HAVAGO output listings for the VLBI antenna conventional reference point survey and the output listings from the software to "best fit" a circle to the target points on the arc scribed by the rotation of the VLBI antenna. The circle fit output shows the coordinate changes from the preliminary (assumed) circle center.

F.1.1 North Quadrant (VLBI antenna azimuth at 000 degrees)

```
INPUT FILE IS mv3n_g1.txt
OUTPUT FILE IS mv3n_g1.hav



                  GGAO - GODDARD SPACE FLIGHT CENTER
                       GREENBELT, MARYLAND

GODDARD GEOPHYSICAL ASTRONOMICAL OBSERVATORY SURVEY CONTROL SCHEME/ADJUSTMENT

THIS ADJUSTMENT CONTAINS SELECTED UPDATED SURVEY OBSERVATIONS MADE AT THE
GODDARD GEOPHYSICAL ASTRONOMICAL OBSERVATORY (GGAO) FORMERLY (GORF) in
NOVEMBER 2007.

 NOTE: This a special survey data HAVAGO adjustment to provide
 updated vector and calibration data between the MOBLAS-7 and NG2000
 laser systems, their calibration piers, and the MV3 VLBI antenna.
 The field survey data was observed in November 2007.


The geodetic positions and heights of the constrained survey control
monuments for this adjustment were obtained from the final HAVAGO
adjustment of the November 2007 GGAO ground geodetic survey.
(GGAO07G3.HAV).

The astronomic position of survey control monument VLBI PIER A
has been set to equal the ITRF2000 geodetic position.

 *



FLAGS IN INPUT DATA:
  *  DELETED OBSERVATION
  #  DEWEIGHTED OBSERVATION
1INPUT                                          DATE: 08-12-**  TIME: 11:50:37  PAGE   1

 STATION DATA
```

STATION NUMBER	GEODETIC LAT. ASTRONOMIC LAT.	GEODETIC LON. ASTRONOMIC LON.	GEOD.HT. ELEV.	GEOD. ST. ERRORS (M) ASTR. ST. ERRORS			STATION NAME X	Y	CODES Z
42	39 1 18.93344	76 49 35.55262	13.752	.001	.001	.001	CDP 7108		1 1 1
42	0 0 .00	0 0 .00		10.00	15.00				
50	39 1 18.02142	76 49 37.51422	14.246	.001	.001	.001	JPL 4005		1 1 1
50	0 0 .00	0 0 .00		10.00	15.00				
94	39 1 19.91876	76 49 35.36268	13.771	.001	.001	.001	VLBI PIER-A		1 1 1
94	39 1 19.92	76 49 35.36		.01	.01				

```
  95   39  1 16.36233   76 49 38.36598   17.759   .001   .001   .001     VLBI PIER-B                              1 1 1
  95    0  0    .00       0  0    .00              10.00  15.00

  96   39  1 19.44905   76 49 37.49952   12.662   .001   .001   .001     VLBI PIER-C                              1 1 1
  96    0  0    .00       0  0    .00              10.00  15.00

  99   39  1 18.36794   76 49 34.47767   13.364   .001   .001   .001     7108 RM1                                 1 1 1
  99    0  0    .00       0  0    .00              10.00  15.00

1010   39  1 18.93310   76 49 35.55081   16.800   .000   .000   .000     NORTH QUAD 1                             0 0 0
1010    0  0    .00       0  0    .00              10.00  15.00

1025   39  1 18.93310   76 49 35.55081   16.800   .000   .000   .000     NORTH QUAD 2                             0 0 0
1025    0  0    .00       0  0    .00              10.00  15.00

1040   39  1 18.93310   76 49 35.55081   16.800   .000   .000   .000     NORTH QUAD 3                             0 0 0
1040    0  0    .00       0  0    .00              10.00  15.00

1055   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000     NORTH QUAD 4                             0 0 0
1055    0  0    .00       0  0    .00              10.00  15.00

1070   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000     NORTH QUAD 5                             0 0 0
1070    0  0    .00       0  0    .00              10.00  15.00

1085   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000     NORTH QUAD 6                             0 0 0
1085    0  0    .00       0  0    .00              10.00  15.00

1090   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000     NORTH QUAD 7                             0 0 0
1090    0  0    .00       0  0    .00              10.00  15.00

1105   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000     NORTH QUAD 8                             0 0 0
1105    0  0    .00       0  0    .00              10.00  15.00

1115   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000     NORTH QUAD 9                             0 0 0
1115    0  0    .00       0  0    .00              10.00  15.00

1130   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000     NORTH QUAD 10                            0 0 0
1130    0  0    .00       0  0    .00              10.00  15.00

1145   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000     NORTH QUAD 11                            0 0 0
1145    0  0    .00       0  0    .00              10.00  15.00
1INPUT                                                         DATE: 08-12-**  TIME: 11:50:37  PAGE    2

  STATION DATA

  STATION  GEODETIC LAT.   GEODETIC LON.   GEOD.HT.  GEOD. ST. ERRORS (M)   STATION NAME                        CODES
  NUMBER   ASTRONOMIC LAT. ASTRONOMIC LON. ELEV.     ASTR. ST. ERRORS            X              Y               Z

  1160   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000     NORTH QUAD 12                          0 0 0
  1160    0  0    .00       0  0    .00              10.00  15.00
```

```
 2006     39  1 18.93300    76 49 35.55200     16.800  .001   .001   .001     MV3 AXIS 07 (PRELIM)              1 1 1
 2006      0  0  .00        0  0   .00                 10.00  15.00
1INPUT                                                          DATE: 08-12-**  TIME: 11:50:37   PAGE    3

 DIRECTIONS


    FROM  TO  LIST     OBSERVED      MM   SEC.

   1  50   95   1      0  0   .00    1.0   1.0     JLL/TDC NOV 07
   2  50 1040   1    214 57 39.40    1.0   1.0
   3  50 1055   1    215 33  8.32    1.0   1.0
   4  50 1070   1    216 16 26.98    1.0   1.0
   5  50 1085   1    217  5 13.75    1.0   1.0
   6  50   95   2      0  0   .00    1.0   1.0
   7  50 1090   2    217 22  8.10    1.0   1.0
   8  50 1105   2    218 12 48.00    1.0   1.0
   9  50 1115   2    218 45 19.50    1.0   1.0
  10  50 1130   2    219 29 35.62    1.0   1.0
  11  50 1145   2    220  5 36.12    1.0   1.0
  12  50 1160   2    220 30 26.18    1.0   1.0
  13  94   95   1      0  0   .00    1.0   1.0     JLL/TDC NOV 07
  14  94 1010   1    336 16  6.78    1.0   1.0
  15  94 1025   1    336 10 23.68    1.0   1.0
  16  94 1040   1    336  0  1.92    1.0   1.0
  17  94 1055   1    335 46 26.78    1.0   1.0
  18  94 1070   1    335 31   .12    1.0   1.0
  19  94 1085   1    335 14 53.50    1.0   1.0
  20  94   95   2      0  0   .00    1.0   1.0
  21  94 1090   2    335  9 34.08    1.0   1.0
  22  94 1105   2    334 54 29.40    1.0   1.0
  23  96   95   1      0  0   .00    1.0   1.0
  24  96 1010   1    272 24 31.48    1.0   1.0
  25  96 1025   1    272 43 35.62    1.0   1.0
  26  96 1040   1    273 17 52.38    1.0   1.0
  27  96 1055   1    274  4 41.12    1.0   1.0
  28  96 1070   1    275  0 33.30    1.0   1.0
  29  96 1085   1    276  1 47.85    1.0   1.0
  30  96   95   2      0  0   .00    1.0   1.0
  31  96 1090   2    276 22 31.85    1.0   1.0
  32  96 1105   2    277 23 38.65    1.0   1.0
  33  96 1115   2    278  1 58.52    1.0   1.0
  34  96 1130   2    278 52 56.95    1.0   1.0
  35  96 1145   2    279 33 30.88    1.0   1.0
  36  96 1160   2    280  0 57.22    1.0   1.0
  37  99   94   1      0  0   .00    1.0   1.0
  38  99 1055   1    331  3 58.72    1.0   1.0
  39  99 1070   1    329 52 27.25    1.0   1.0
  40  99 1085   1    328 30 39.25    1.0   1.0
  41  99   94   2      0  0   .00    1.0   1.0
  42  99 1090   2    328  2  2.68    1.0   1.0
  43  99 1105   2    326 35 15.12    1.0   1.0
```

```
44   99 1115   2   325 38 45.88   1.0   1.0
45   99 1130   2   324 21  6.12   1.0   1.0
46   99 1145   2   323 17 10.28   1.0   1.0
47   99 1160   2   322 32 45.88   1.0   1.0
1INPUT                                              DATE: 08-12-**  TIME: 11:50:37   PAGE    4

  GROUPED VERTICAL ANGLES

     FROM  TO  LIST     OBSERVED     MM    SEC.    H.I.    H.T.    K1    K2

   48   50 1040  -1    86 34 21.70   3.0   1.0   1.499   .000   .00   .00
   49   50 1055  -1    85 53 55.30   3.0   1.0   1.499   .000   .00   .00
   50   50 1070  -1    85 25  5.62   3.0   1.0   1.499   .000   .00   .00
   51   50 1085  -1    85  9 47.95   3.0   1.0   1.499   .000   .00   .00
   52   50 1090  -1    85 16 22.68   3.0   1.0   1.631   .000   .00   .00
   53   50 1105  -1    85 21 24.30   3.0   1.0   1.631   .000   .00   .00
   54   50 1115  -1    85 33 22.60   3.0   1.0   1.631   .000   .00   .00
   55   50 1130  -1    86  3 30.25   3.0   1.0   1.631   .000   .00   .00
   56   50 1145  -1    86 46 36.42   3.0   1.0   1.631   .000   .00   .00
   57   50 1160  -1    87 39 35.15   3.0   1.0   1.631   .000   .00   .00
   58   94 1010  -1    82 49 52.85   3.0   1.0    .235   .000   .00   .00
   59   94 1025  -1    81  3 48.85   3.0   1.0    .235   .000   .00   .00
   60   94 1040  -1    79 37 57.30   3.0   1.0    .235   .000   .00   .00
   61   94 1055  -1    78 38 29.25   3.0   1.0    .235   .000   .00   .00
   62   94 1070  -1    78  7 57.02   3.0   1.0    .235   .000   .00   .00
   63   94 1085  -1    78  6  6.40   3.0   1.0    .235   .000   .00   .00
   64   94 1090  -1    78 12  5.55   3.0   1.0    .239   .000   .00   .00
   65   94 1105  -1    78 44 44.90   3.0   1.0    .239   .000   .00   .00
   66   96 1010  -1    84 39 42.08   3.0   1.0    .239   .000   .00   .00
   67   96 1025  -1    83 37  5.50   3.0   1.0    .239   .000   .00   .00
   68   96 1040  -1    82 42 37.12   3.0   1.0    .239   .000   .00   .00
   69   96 1055  -1    82  0  7.55   3.0   1.0    .239   .000   .00   .00
   70   96 1070  -1    81 32 25.08   3.0   1.0    .239   .000   .00   .00
   71   96 1085  -1    81 21  6.30   3.0   1.0    .239   .000   .00   .00
   72   96 1090  -1    81 20 48.52   3.0   1.0    .233   .000   .00   .00
   73   96 1105  -1    81 32  3.95   3.0   1.0    .233   .000   .00   .00
   74   96 1115  -1    81 48 28.60   3.0   1.0    .233   .000   .00   .00
   75   96 1130  -1    82 25   .98   3.0   1.0    .233   .000   .00   .00
   76   96 1145  -1    83 13 40.00   3.0   1.0    .233   .000   .00   .00
   77   96 1160  -1    84 10 57.05   3.0   1.0    .233   .000   .00   .00
   78   99 1055  -1    81 23 59.30   3.0   1.0   1.500   .000   .00   .00
   79   99 1070  -1    80 30  9.38   3.0   1.0   1.500   .000   .00   .00
   80   99 1085  -1    79 58 30.18   3.0   1.0   1.500   .000   .00   .00
   81   99 1090  -1    79 51  1.40   3.0   1.0   1.475   .000   .00   .00
   82   99 1105  -1    79 50  1.35   3.0   1.0   1.438   .000   .00   .00
   83   99 1115  -1    80  7 16.60   3.0   1.0   1.438   .000   .00   .00
   84   99 1130  -1    80 55 33.95   3.0   1.0   1.438   .000   .00   .00
   85   99 1145  -1    82  8 36.65   3.0   1.0   1.438   .000   .00   .00
   86   99 1160  -1    83 41 17.60   3.0   1.0   1.438   .000   .00   .00
1INPUT                                              DATE: 08-12-**  TIME: 11:50:37   PAGE    5
```

ASTRONOMIC POSITION DIFFERENCES TO BE THE SAME AS GEODETIC

```
      FROM   TO

   87   94    42
   88   94    50
   89   94    95
   90   94    96
   91   94    99
   92   94  1010
   93   94  1025
   94   94  1040
   95   94  1055
   96   94  1070
   97   94  1085
   98   94  1090
   99   94  1105
  100   94  1115
  101   94  1130
  102   94  1145
  103   94  1160
  104   94  2006
1INPUT                                                                DATE: 08-12-**  TIME: 11:50:37   PAGE    6
```

A PRIORI STANDARD ERRORS (UNLESS OVERRIDEN BY INPUT ON OBSERVATION CARD)

                              VECTOR SUM OF

```
DIRECTIONS                    1.0 MM    1.0 SEC.
AZIMUTHS                      2.0 MM    1.3 SEC.
RECIPROCAL VERTICAL ANGLES    7.0 MM    9.0 SEC.
GROUPED VERTICAL ANGLES       3.0 MM    5.0 SEC.
ABSOLUTE DISTANCES            5.0 MM    9.9 PPM
RELATIVE DISTANCES            5.0 MM    9.9 PPM
```

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 11:50:37   PAGE   7

JOB STATISTICS

ELLIPSOID: ITRF2000   A = 6378137.000   1/F = 298.2572221

                     GGAO - GODDARD SPACE FLIGHT CENTER

STANDARD ERROR OF UNIT WEIGHT =   .19, VARIANCE =   .04, 42 DEGREES OF FREEDOM.

```
146 OBSERVATIONS                              2 ITERATIONS
 47 DIRECTIONS                               19 STATIONS
  0 ASTR. AZIMUTHS                          104 UNKNOWNS
  0 REC. VERTICAL ANGLES                      8 LISTS OF DIRECTIONS
 39 GROUPED VERTICAL ANGLES                   1 REFRACTION UNKNOWNS
  0 ABSOLUTE DISTANCES                        0 SCALE UNKNOWNS
  0 RELATIVE DISTANCES
  0 ELEVATION DIFFERENCES
  0 LAT., LON., HEIGHT DIFFERENCES
  0 PLANE DISTANCES
  1 OBSERVED ASTR. LATITUDES
  1 OBSERVED ASTR. LONGITUDES
  7 CONSTRAINED GEOD. LATITUDES
  7 CONSTRAINED GEOD. LONGITUDES
  7 CONSTRAINED GEOD. HEIGHTS
 18 ASTR. POSITION DIFFERENCES


DK/DH ASSUMED AS   -.010/1000 IF K VALUES NOT INPUT.




SELECTED OPTIONS:


CC  FLAG   OPTION

31   9   ITERATIONS
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD       HAVAGO VERSION 90.07.18      DATE: 08-12-**  TIME: 11:50:37   PAGE    8

ADJUSTED DATA: STATIONS
```

STATION		LATITUDE	SIGMA	LONGITUDE	SIGMA	HEIGHT	SIGMA
42	CDP 7108	39 1 18.93344	.00001	76 49 35.55262	.00001	13.752	.000
50	JPL 4005	39 1 18.02142	.00001	76 49 37.51423	.00001	14.246	.000
94	VLBI PIER-A	39 1 19.91876	.00001	76 49 35.36268	.00001	13.771	.000
95	VLBI PIER-B	39 1 16.36233	.00001	76 49 38.36597	.00001	17.759	.000
96	VLBI PIER-C	39 1 19.44905	.00000	76 49 37.49952	.00001	12.662	.000
99	7108 RM1	39 1 18.36794	.00001	76 49 34.47767	.00001	13.364	.000
1010	NORTH QUAD 1	39 1 19.04883	.00001	76 49 35.55217	.00001	17.428	.000
1025	NORTH QUAD 2	39 1 19.03982	.00001	76 49 35.55220	.00001	18.327	.000
1040	NORTH QUAD 3	39 1 19.02352	.00001	76 49 35.55216	.00001	19.124	.000
1055	NORTH QUAD 4	39 1 19.00112	.00001	76 49 35.55213	.00001	19.763	.000
1070	NORTH QUAD 5	39 1 18.97415	.00001	76 49 35.55212	.00001	20.201	.000
1085	NORTH QUAD 6	39 1 18.94428	.00001	76 49 35.55212	.00001	20.409	.000
1090	NORTH QUAD 7	39 1 18.93407	.00001	76 49 35.55211	.00001	20.423	.000
1105	NORTH QUAD 8	39 1 18.90376	.00001	76 49 35.55210	.00001	20.303	.000
1115	NORTH QUAD 9	39 1 18.88457	.00001	76 49 35.55210	.00001	20.089	.000
1130	NORTH QUAD 10	39 1 18.85878	.00001	76 49 35.55209	.00001	19.585	.000
1145	NORTH QUAD 11	39 1 18.83807	.00001	76 49 35.55209	.00001	18.891	.000
1160	NORTH QUAD 12	39 1 18.82392	.00001	76 49 35.55207	.00001	18.056	.000

```
   2006    MV3 AXIS 07 (PRELIM)            39  1 18.93300    .00001    76 49 35.55200    .00001    16.800     .000
  1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD       HAVAGO VERSION 90.07.18    DATE: 08-12-** TIME: 11:50:37   PAGE    9

   ADJUSTED DATA: DIRECTIONS

        FROM   TO  LIST    OBSERVED      V     N.V    ADJUSTED       DIST.        AZ.           V.A.

     1   50   95   1    0  0   .00    -.27   -.07    0  0   .00     55.225   201 49 29.30   86 21 12.50    JLL/TDC NOV 07
     2   50 1040   1  214 57 39.40   -.07   -.02  214 57 39.60    56.626    56 47  8.91   85  3 30.22
     3   50 1055   1  215 33  8.32   -.18   -.05  215 33  8.41    56.311    57 22 37.71   84 22 39.68
     4   50 1070   1  216 16 26.98    .14    .04  216 16 27.39    55.915    58  5 56.69   83 53 12.86
     5   50 1085   1  217  5 13.75    .38    .10  217  5 14.39    55.459    58 54 43.70   83 37 11.78

     6   50   95   2    0  0   .00     .76    .20    0  0   .00     55.225   201 49 29.30   86 21 12.50
     7   50 1090   2  217 22  8.10    .00    .00  217 22  7.34    55.300    59 11 36.64   83 35 15.27
     8   50 1105   2  218 12 48.00   -.64   -.16  218 12 46.60    54.817    60  2 15.90   83 39 24.08
     9   50 1115   2  218 45 19.50   -.17   -.04  218 45 18.57    54.502    60 34 47.87   83 50 45.65
    10   50 1130   2  219 29 35.62   -.12   -.03  219 29 34.73    54.066    61 19  4.04   84 19 59.11
    11   50 1145   2  220  5 36.12    .09    .02  220  5 35.45    53.700    61 55  4.75   85  2 18.37
    12   50 1160   2  220 30 26.18    .07    .02  220 30 25.49    53.431    62 19 54.80   85 54 41.03

    13   94   95   1    0  0   .00     .01    .00    0  0   .00    131.391   213 22 29.65   88 15 40.01    JLL/TDC NOV 07
    14   94 1010   1  336 16  6.78   -.01    .00  336 16  6.76    27.456   189 38 36.41   82 20 42.74
    15   94 1025   1  336 10 23.68   -.02    .00  336 10 23.65    27.861   189 32 53.31   80 35 11.95
    16   94 1040   1  336  0  1.92   -.11   -.02  336  0  1.80    28.489   189 22 31.45   79 10  6.01
    17   94 1055   1  335 46 26.78   -.54   -.08  335 46 26.23    29.282   189  8 55.88   78 11 26.66
    18   94 1070   1  335 31   .12    .23    .03  335 31   .35    30.177   188 53 30.00   77 41 48.06
    19   94 1085   1  335 14 53.50    .31    .05  335 14 53.81    31.111   188 37 23.46   77 40 44.78

    20   94   95   2    0  0   .00     .05    .03    0  0   .00    131.391   213 22 29.65   88 15 40.01
    21   94 1090   2  335  9 34.08    .05    .01  335  9 34.09    31.418   188 32  3.74   77 46 35.23
    22   94 1105   2  334 54 29.40   -.63   -.10  334 54 28.73    32.298   188 16 58.38   78 19 52.13

    23   96   95   1    0  0   .00     .41    .18    0  0   .00    97.576   192 21  3.93   87  0 22.07
    24   96 1010   1  272 24 31.48   -.01    .00  272 24 31.06    48.677   104 45 34.99   84 22 52.83
    25   96 1025   1  272 43 35.62   -.02    .00  272 43 35.19    48.843   105  4 39.12   83 20 21.42
    26   96 1040   1  273 17 52.38    .03    .01  273 17 51.99    49.075   105 38 55.92   82 25 59.71
    27   96 1055   1  274  4 41.12   -.35   -.08  274  4 40.36    49.353   106 25 44.29   81 43 37.41
    28   96 1070   1  275  0 33.30   -.22   -.05  275  0 32.67    49.657   107 21 36.60   81 16  3.28
    29   96 1085   1  276  1 47.85   -.79   -.19  276  1 46.64    49.968   108 22 50.58   81  4 50.44

    30   96   95   2    0  0   .00    -.41   -.17    0  0   .00    97.576   192 21  3.93   87  0 22.07
    31   96 1090   2  276 22 31.85   -.01    .00  276 22 32.25    50.070   108 43 36.18   81  5   .30
    32   96 1105   2  277 23 38.65    .92    .22  277 23 39.97    50.356   109 44 43.90   81 16 20.09
    33   96 1115   2  278  1 58.52    .80    .19  278  1 59.73    50.525   110 23  3.66   81 32 48.61
    34   96 1130   2  278 52 56.95    .66    .16  278 52 58.02    50.733   111 14  1.95   82  9 24.05
    35   96 1145   2  279 33 30.88   -.57   -.14  279 33 30.72    50.876   111 54 34.65   82 58  3.21
    36   96 1160   2  280  0 57.22   -.48   -.11  280  0 57.15    50.945   112 22  1.08   83 55 19.47

    37   99   94   1    0  0   .00     .63    .15    0  0   .00    52.350   336  0 11.98   89 33 18.67
    38   99 1055   1  331  3 58.72   -.81   -.13  331  3 57.29    33.019   307  4  9.27   78 49 29.55
```

```
39   99 1070   1  329 52 27.25   -.07    -.01   329 52 26.55        32.623  305 52 38.54    77 54  9.31
40   99 1085   1  328 30 39.25   -.68    -.11   328 30 37.94        32.149  304 30 49.92    77 20 28.25

41   99   94   2    0  0   .00   -.57    -.14     0  0   .00        52.350  336  0 11.98    89 33 18.67
42   99 1090   2  328  2  2.68    .17     .03   328  2  3.43        31.979  304  2 15.41    77 14 53.04
43   99 1105   2  326 35 15.12    .73     .11   326 35 16.43        31.451  302 35 28.41    77 15 15.14
```
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 11:50:37   PAGE   10

ADJUSTED DATA: DIRECTIONS

```
     FROM   TO LIST   OBSERVED      V     N.V     ADJUSTED        DIST.       AZ.        V.A.

44   99 1115   2  325 38 45.88   1.10     .16   325 38 47.56        31.098  301 38 59.54    77 30 37.89
45   99 1130   2  324 21  6.12    .95     .14   324 21  7.64        30.591  300 21 19.62    78 15 57.13
46   99 1145   2  323 17 10.28   -.80    -.12   323 17 10.05        30.145  299 17 22.03    79 26  7.83
47   99 1160   2  322 32 45.88   -.70    -.10   322 32 45.76        29.795  298 32 57.74    80 56 21.20
```
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 11:50:37   PAGE   11

ADJUSTED DATA: GROUPED VERTICAL ANGLES

```
     FROM  TO LIST    OBSERVED   REF/KM    V     N.V     ADJUSTED      DIST.       AZ.

48   50 1040  -1   85  3 30.56     .00   -.34    -.03    85  3 30.22     56.626   56 47  8.91
49   50 1055  -1   84 22 37.97     .00   1.71     .15    84 22 39.68     56.311   57 22 37.71
50   50 1070  -1   83 53 12.93     .00   -.07    -.01    83 53 12.86     55.915   58  5 56.69
51   50 1085  -1   83 37 11.99     .00   -.21    -.02    83 37 11.78     55.459   58 54 43.70
52   50 1090  -1   83 35 18.97     .00  -3.71    -.33    83 35 15.27     55.300   59 11 36.64
53   50 1105  -1   83 39 26.42     .00  -2.34    -.21    83 39 24.08     54.817   60  2 15.90
54   50 1115  -1   83 50 47.66     .00  -2.02    -.18    83 50 45.65     54.502   60 34 47.87
55   50 1130  -1   84 20  1.73     .00  -2.63    -.23    84 19 59.11     54.066   61 19  4.04
56   50 1145  -1   85  2 20.57     .00  -2.20    -.19    85  2 18.37     53.700   61 55  4.75
57   50 1160  -1   85 54 43.13     .00  -2.10    -.18    85 54 41.03     53.431   62 19 54.80
58   94 1010  -1   82 20 41.16     .00   1.58     .07    82 20 42.74     27.456  189 38 36.41
59   94 1025  -1   80 35 10.13     .00   1.82     .08    80 35 11.95     27.861  189 32 53.31
60   94 1040  -1   79 10  3.59     .00   2.42     .11    79 10  6.01     28.489  189 22 31.45
61   94 1055  -1   78 11 26.32     .00    .34     .02    78 11 26.66     29.282  189  8 55.88
62   94 1070  -1   77 41 45.07     .00   2.99     .15    77 41 48.06     30.177  188 53 30.00
63   94 1085  -1   77 40 41.81     .00   2.97     .15    77 40 44.78     31.111  188 37 23.46
64   94 1090  -1   77 46 29.60     .00   5.63     .28    77 46 35.23     31.418  188 32  3.74
65   94 1105  -1   78 19 47.89     .00   4.23     .22    78 19 52.13     32.298  188 16 58.38
66   96 1010  -1   84 22 53.72     .00   -.89    -.07    84 22 52.83     48.677  104 45 34.99
67   96 1025  -1   83 20 22.46     .00  -1.04    -.08    83 20 21.42     48.843  105  4 39.12
68   96 1040  -1   82 26   .71     .00  -1.00    -.08    82 25 59.71     49.075  105 38 55.92
69   96 1055  -1   81 43 38.39     .00   -.99    -.08    81 43 37.41     49.353  106 25 44.29
70   96 1070  -1   81 16  3.12     .00    .15     .01    81 16  3.28     49.657  107 21 36.60
71   96 1085  -1   81  4 50.94     .00   -.51    -.04    81  4 50.44     49.968  108 22 50.58
72   96 1090  -1   81  4 59.59     .00    .71     .06    81  5   .30     50.070  108 43 36.18
73   96 1105  -1   81 16 19.94     .00    .14     .01    81 16 20.09     50.356  109 44 43.90
74   96 1115  -1   81 32 47.09     .00   1.52     .12    81 32 48.61     50.525  110 23  3.66
75   96 1130  -1   82  9 21.96     .00   2.09     .17    82  9 24.05     50.733  111 14  1.95
76   96 1145  -1   82 58  1.95     .00   1.26     .10    82 58  3.21     50.876  111 54 34.65
```

```
77   96 1160  -1    83 55 18.53    .00     .93    .08    83 55 19.47    50.945 112 22  1.08
78   99 1055  -1    78 49 31.32    .00   -1.76   -.09    78 49 29.55    33.019 307  4  9.27
79   99 1070  -1    77 54 12.19    .00   -2.87   -.15    77 54  9.31    32.623 305 52 38.54
80   99 1085  -1    77 20 29.95    .00   -1.71   -.09    77 20 28.25    32.149 304 30 49.92
81   99 1090  -1    77 14 53.20    .00    -.17   -.01    77 14 53.04    31.979 304  2 15.41
82   99 1105  -1    77 15 15.61    .00    -.46   -.02    77 15 15.14    31.451 302 35 28.41
83   99 1115  -1    77 30 36.80    .00    1.09    .05    77 30 37.89    31.098 301 38 59.54
84   99 1130  -1    78 15 55.93    .00    1.20    .06    78 15 57.13    30.591 300 21 19.62
85   99 1145  -1    79 26  6.02    .00    1.81    .09    79 26  7.83    30.145 299 17 22.03
86   99 1160  -1    80 56 19.02    .00    2.18    .10    80 56 21.20    29.795 298 32 57.74
```

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 11:50:37 PAGE 12

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

	STATION			OBSERVED	V	N.V	ADJUSTED	SIGMA
105	42	CDP 7108	LAT	39 1 18.93	.00	.00	39 1 18.93	.02 NOT OBS.
106	42	CDP 7108	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
107	50	JPL 4005	LAT	39 1 18.02	.00	.00	39 1 18.02	.02 NOT OBS.
108	50	JPL 4005	LON	76 49 37.51	.00	.00	76 49 37.51	.02 NOT OBS.
109	94	VLBI PIER-A	LAT	39 1 19.92	.00	.00	39 1 19.92	.00
110	94	VLBI PIER-A	LON	76 49 35.36	.00	.00	76 49 35.36	.00
111	95	VLBI PIER-B	LAT	39 1 16.36	.00	.00	39 1 16.36	.02 NOT OBS.
112	95	VLBI PIER-B	LON	76 49 38.37	.00	.00	76 49 38.36	.02 NOT OBS.
113	96	VLBI PIER-C	LAT	39 1 19.45	.00	.00	39 1 19.45	.02 NOT OBS.
114	96	VLBI PIER-C	LON	76 49 37.50	.00	.00	76 49 37.50	.02 NOT OBS.
115	99	7108 RM1	LAT	39 1 18.37	.00	.00	39 1 18.37	.02 NOT OBS.
116	99	7108 RM1	LON	76 49 34.48	.00	.00	76 49 34.47	.02 NOT OBS.
117	1010	NORTH QUAD 1	LAT	39 1 19.05	.00	.00	39 1 19.05	.02 NOT OBS.
118	1010	NORTH QUAD 1	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
119	1025	NORTH QUAD 2	LAT	39 1 19.04	.00	.00	39 1 19.04	.02 NOT OBS.
120	1025	NORTH QUAD 2	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
121	1040	NORTH QUAD 3	LAT	39 1 19.02	.00	.00	39 1 19.02	.02 NOT OBS.
122	1040	NORTH QUAD 3	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
123	1055	NORTH QUAD 4	LAT	39 1 19.00	.00	.00	39 1 19.00	.02 NOT OBS.
124	1055	NORTH QUAD 4	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
125	1070	NORTH QUAD 5	LAT	39 1 18.97	.00	.00	39 1 18.98	.02 NOT OBS.
126	1070	NORTH QUAD 5	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
127	1085	NORTH QUAD 6	LAT	39 1 18.94	.00	.00	39 1 18.95	.02 NOT OBS.
128	1085	NORTH QUAD 6	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.

```
129   1090     NORTH QUAD 7              LAT   39  1 18.93      .00      .00     39  1 18.94      .02 NOT OBS.
130   1090     NORTH QUAD 7              LON   76 49 35.55      .00      .00     76 49 35.55      .02 NOT OBS.

131   1105     NORTH QUAD 8              LAT   39  1 18.90      .00      .00     39  1 18.90      .02 NOT OBS.
132   1105     NORTH QUAD 8              LON   76 49 35.55      .00      .00     76 49 35.55      .02 NOT OBS.

133   1115     NORTH QUAD 9              LAT   39  1 18.88      .00      .00     39  1 18.89      .02 NOT OBS.
134   1115     NORTH QUAD 9              LON   76 49 35.55      .00      .00     76 49 35.55      .02 NOT OBS.

135   1130     NORTH QUAD 10             LAT   39  1 18.86      .00      .00     39  1 18.86      .02 NOT OBS.
136   1130     NORTH QUAD 10             LON   76 49 35.55      .00      .00     76 49 35.55      .02 NOT OBS.

137   1145     NORTH QUAD 11             LAT   39  1 18.84      .00      .00     39  1 18.84      .02 NOT OBS.
138   1145     NORTH QUAD 11             LON   76 49 35.55      .00      .00     76 49 35.55      .02 NOT OBS.
```

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 11:50:37   PAGE   13

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

```
          STATION                              OBSERVED        V       N.V      ADJUSTED       SIGMA

139   1160     NORTH QUAD 12             LAT   39  1 18.82      .00      .00     39  1 18.83      .02 NOT OBS.
140   1160     NORTH QUAD 12             LON   76 49 35.55      .00      .00     76 49 35.55      .02 NOT OBS.

141   2006     MV3 AXIS 07 (PRELIM)      LAT   39  1 18.93      .00      .00     39  1 18.93      .02 NOT OBS.
142   2006     MV3 AXIS 07 (PRELIM)      LON   76 49 35.55      .00      .00     76 49 35.55      .02 NOT OBS.
```

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 11:50:37   PAGE   14

GEODETIC LATITUDE CONSTRAINTS

```
       STATION      CONSTRAINED      V        N.V       ADJUSTED       SIGMA

143      42      39  1 18.93344   .00000    .00000    39  1 18.93344    .00001
144      50      39  1 18.02142   .00000    .14007    39  1 18.02142    .00001
145      94      39  1 19.91876   .00000   -.07600    39  1 19.91876    .00001
146      95      39  1 16.36233   .00000   -.05958    39  1 16.36233    .00001
147      96      39  1 19.44905   .00000    .00311    39  1 19.44905    .00000
148      99      39  1 18.36794   .00000   -.00758    39  1 18.36794    .00001
149    2006      39  1 18.93300   .00000    .00000    39  1 18.93300    .00001
```

GEODETIC LONGITUDE CONSTRAINTS

```
       STATION      CONSTRAINED      V        N.V       ADJUSTED       SIGMA

150      42      76 49 35.55262   .00000    .00000    76 49 35.55262    .00001
151      50      76 49 37.51422   .00001    .20157    76 49 37.51423    .00001
```

```
152      94      76 49 35.36268    .00000    -.06188    76 49 35.36268    .00001
153      95      76 49 38.36598   -.00001    -.13654    76 49 38.36597    .00001
154      96      76 49 37.49952    .00000    -.00197    76 49 37.49952    .00001
155      99      76 49 34.47767    .00000    -.00117    76 49 34.47767    .00001
156    2006      76 49 35.55200    .00000     .00000    76 49 35.55200    .00001
```

GEODETIC HEIGHT CONSTRAINTS

```
       STATION      CONSTRAINED      V      N.V    ADJUSTED      SIGMA

       157      42      13.7520     .0000     .0    13.7520      .000
       158      50      14.2460     .0004     .4    14.2464      .000
       159      94      13.7710    -.0004    -.4    13.7706      .000
       160      95      17.7590     .0000     .0    17.7590      .000
       161      96      12.6620    -.0001    -.1    12.6619      .000
       162      99      13.3640     .0000     .0    13.3640      .000
       163    2006      16.8000     .0000     .0    16.8000      .000
```
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 11:50:37   PAGE   15

ADJUSTED CARTESIAN COORDINATES

```
    DX        DY        DZ     EPSILON    PSI     OMEGA     SCALE

   .000      .000      .000      .000     .000     .000      .000
```

```
                                                                            TRANSFORMED COORDINATES
  STATION                                    X            Y            Z          X           Y           Z

     42    CDP 7108                    1130794.717  -4831233.824  3994217.058
     50    JPL 4005                    1130752.894  -4831262.194  3994195.520
     94    VLBI PIER-A                 1130794.810  -4831214.169  3994240.676
     95    VLBI PIER-B                 1130740.907  -4831300.885  3994157.982
     96    VLBI PIER-C                 1130746.642  -4831233.925  3994228.725
     99    7108 RM1                    1130822.329  -4831238.328  3994203.266
   1010    NORTH QUAD 1                1130794.868  -4831234.421  3994222.138
   1025    NORTH QUAD 2                1130795.066  -4831235.272  3994222.488
   1040    NORTH QUAD 3                1130795.281  -4831236.183  3994222.599
   1055    NORTH QUAD 4                1130795.494  -4831237.090  3994222.465
   1070    NORTH QUAD 5                1130795.691  -4831237.930  3994222.094
   1085    NORTH QUAD 6                1130795.860  -4831238.653  3994221.510
   1090    NORTH QUAD 7                1130795.908  -4831238.856  3994221.274
   1105    NORTH QUAD 8                1130796.021  -4831239.338  3994220.472
   1115    NORTH QUAD 9                1130796.068  -4831239.539  3994219.878
   1130    NORTH QUAD 10               1130796.093  -4831239.646  3994218.943
   1145    NORTH QUAD 11               1130796.062  -4831239.512  3994218.009
   1160    NORTH QUAD 12               1130795.977  -4831239.148  3994217.145
   2006    MV3 AXIS 07 (PRELIM)        1130795.273  -4831236.135  3994218.967
```
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   DATE: 08-12-** TIME: 11:50:37   PAGE   16

MISCELLANEOUS DATA FOR SELECTED LINES, PART 1

```
FROM   TO      STANDARD    CORRELATION COEFF.      STANDARD    CORRELATION COEFF.   DX,DY,DZ    AZ.,DIST.,V.A.    AZ.,DIST.,B.AZ.
               ERRORS      AZ.   DIST. V.A.         ERRORS      DX    DY    DZ                                     (GEODETIC)

2006   1010  AZ.   18.31   1.00  .03   .01      DX   .0003   1.00  -.13   .13     -.4053   359 56  6.49     359 56  6.49
             DIST.  .0003   .03 1.00   .11      DY   .0004   -.13  1.00  -.34     1.7139          3.6269            3.5721
             V.A.  26.71    .01  .11  1.00      DZ   .0004    .13  -.34  1.00     3.1705   80  1 48.24     179 56  6.49

2006   1025  AZ.   19.81   1.00  .03   .01      DX   .0003   1.00  -.14   .13     -.2070   359 54 52.23     359 54 52.23
             DIST.  .0003   .03 1.00   .27      DY   .0004   -.14  1.00  -.34      .8628          3.6310            3.2940
             V.A.  25.82    .01  .27  1.00      DZ   .0004    .13  -.34  1.00     3.5209   65  7 21.70     179 54 52.23

2006   1040  AZ.   22.69   1.00  .09  -.05      DX   .0003   1.00  -.04   .16      .0072   359 55 10.22     359 55 10.23
             DIST.  .0003   .09 1.00   .28      DY   .0004   -.04  1.00  -.26     -.0480          3.6324            2.7914
             V.A.  20.87   -.05  .28  1.00      DZ   .0003    .16  -.26  1.00     3.6321   50 12 56.35     179 55 10.23

2006   1055  AZ.   28.85   1.00  .01   .00      DX   .0003   1.00  -.06   .07      .2203   359 54 54.89     359 54 54.90
             DIST.  .0003   .01 1.00   .25      DY   .0003   -.06  1.00  -.25     -.9547          3.6325            2.1006
             V.A.  17.66    .00  .25  1.00      DZ   .0003    .07  -.25  1.00     3.4978   35 19 48.61     179 54 54.90

2006   1070  AZ.   47.83   1.00  .01   .00      DX   .0003   1.00  -.06   .07      .4172   359 51 54.09     359 51 54.09
             DIST.  .0004   .01 1.00   .19      DY   .0003   -.06  1.00  -.26    -1.7955          3.6301            1.2690
             V.A.  16.49    .00  .19  1.00      DZ   .0003    .07  -.26  1.00     3.1272   20 27 39.58     179 51 54.09

2006   1085  AZ.  174.88   1.00  .01   .01      DX   .0003   1.00  -.06   .07      .5863   359 30 50.12     359 30 50.14
             DIST.  .0004   .01 1.00   .06      DY   .0003   -.06  1.00  -.26    -2.5178          3.6261             .3478
             V.A.  15.78    .01  .06  1.00      DZ   .0003    .07  -.26  1.00     2.5427    5 30 12.87     179 30 50.14

2006   1090  AZ.1848.10    1.00  .01   .03      DX   .0003   1.00  -.07   .06      .6342   355 32 18.55     355 32 18.85
             DIST.  .0004   .01 1.00   .01      DY   .0003   -.07  1.00  -.26    -2.7209          3.6229             .0330
             V.A.  15.85    .03  .01  1.00      DZ   .0003    .06  -.26  1.00     2.3065    0 31 16.73     175 32 18.85

2006   1105  AZ.   67.89   1.00 -.01   .02      DX   .0003   1.00  -.07   .06      .7473   180  9 11.88     180  9 11.87
             DIST.  .0004  -.01 1.00   .13      DY   .0003   -.07  1.00  -.26    -3.2033          3.6173             .9017
             V.A.  16.11    .02  .13  1.00      DZ   .0003    .06  -.26  1.00     1.5051   14 26  2.18       0  9 11.87

2006   1115  AZ.   54.46   1.00 -.06   .14      DX   .0004   1.00  -.05  -.03      .7942   180  5 49.10     180  5 49.09
             DIST.  .0004  -.06 1.00   .26      DY   .0004   -.05  1.00  -.36    -3.4045          3.6125            1.4936
             V.A.  17.62    .14  .26  1.00      DZ   .0003   -.03  -.36  1.00      .9106   24 25 19.52       0  5 49.09

2006   1130  AZ.   36.05   1.00 -.10   .11      DX   .0004   1.00  -.04  -.04      .8196   180  3  4.95     180  3  4.95
             DIST.  .0004  -.10 1.00   .33      DY   .0004   -.04  1.00  -.36    -3.5106          3.6051            2.2887
             V.A.  19.32    .11  .33  1.00      DZ   .0003   -.04  -.36  1.00     -.0244   39 24 33.61       0  3  4.95

2006   1145  AZ.   28.54   1.00 -.13   .07      DX   .0004   1.00  -.03  -.04      .7882   180  2 31.76     180  2 31.76
             DIST.  .0003  -.13 1.00   .32      DY   .0004   -.03  1.00  -.36    -3.3770          3.5976            2.9276
             V.A.  21.05    .07  .32  1.00      DZ   .0003   -.04  -.36  1.00     -.9579   54 27 51.75       0  2 31.76

2006   1160  AZ.   25.07   1.00 -.16   .04      DX   .0004   1.00  -.03  -.04      .7035   180  1 37.31     180  1 37.31
             DIST.  .0003  -.16 1.00   .23      DY   .0004   -.03  1.00  -.36    -3.0127          3.5906            3.3636
             V.A.  22.39    .04  .23  1.00      DZ   .0003   -.04  -.36  1.00    -1.8223   69 31 15.92       0  1 37.31
```

 MISCELLANEOUS DATA FOR SELECTED LINES, PART 2

              E Q U A T O R I A L   S Y S T E M   HORIZON SYSTEM, ORIGIN AT THE STANDPOINT

FROM	TO	ALTITUDE	AZIMUTH	DISTANCE	DN	SIGMA	DE	SIGMA	DU	SIGMA
2006	1010	60 56 52.62	103 18 18.05	3.6269	3.5721	.0003	-.0040	.0003	.6279	.0005
2006	1025	75 51 18.70	103 29 27.02	3.6310	3.2940	.0003	-.0049	.0003	1.5275	.0005
2006	1040	89 14 6.17	278 32 6.74	3.6324	2.7914	.0003	-.0039	.0003	2.3244	.0004
2006	1055	74 21 7.17	282 59 30.31	3.6325	2.1006	.0003	-.0031	.0003	2.9635	.0004
2006	1070	59 28 58.21	283 4 49.95	3.6301	1.2690	.0003	-.0030	.0003	3.4011	.0004
2006	1085	44 31 31.03	283 6 29.05	3.6261	.3478	.0003	-.0030	.0003	3.6094	.0004
2006	1090	39 32 29.94	283 7 15.14	3.6229	.0329	.0003	-.0026	.0003	3.6228	.0004
2006	1105	24 35 16.92	283 7 53.17	3.6173	-.9017	.0003	-.0024	.0003	3.5031	.0004
2006	1115	14 35 59.51	283 7 55.30	3.6125	-1.4936	.0003	-.0025	.0004	3.2893	.0004
2006	1130	0 23 14.63	283 8 27.03	3.6051	-2.2887	.0003	-.0021	.0004	2.7854	.0004
2006	1145	15 26 32.78	283 8 16.33	3.5976	-2.9276	.0003	-.0022	.0004	2.0910	.0004
2006	1160	30 29 56.97	283 8 38.65	3.5906	-3.3636	.0003	-.0016	.0004	1.2562	.0004

F.1.2 Circle Fit Output for North Quadrant

```
Circle Radius: 3.6028679e+00
Circle Center: (2.1222164e-02, 2.0739097e-02)
```

ID	X-coord	Y-coord	Gamma-x	Gamma-y	Gamma
1	3.5721000	0.6279000	0.0004486	0.0000767	-0.0004552
2	3.2940000	1.5275000	-0.0000940	-0.0000433	0.0001035
3	2.7914000	2.3244000	-0.0000087	-0.0000072	0.0000113
4	2.1006000	2.9635000	-0.0002400	-0.0003396	0.0004158
5	1.2690000	3.4011000	-0.0001505	-0.0004077	0.0004346
6	0.3478000	3.6094000	-0.0000564	-0.0006195	0.0006221
7	0.0329000	3.6228000	0.0000026	0.0007881	-0.0007881
8	-0.9017000	3.5031000	-0.0000723	0.0002729	-0.0002824
9	-1.4936000	3.2893000	-0.0001448	0.0003124	-0.0003443
10	-2.2887000	2.7854000	-0.0001394	0.0001669	-0.0002175
11	-2.9276000	2.0910000	0.0000994	-0.0000698	0.0001214
12	-3.3636000	1.2562000	0.0003555	-0.0001298	0.0003785

```
     Radius = 3.6029 m
     DN = +0.02122 m
     Du = +0.0207 m
```

F.1.3 HAVAGO Output for East Quadrant (VLBI Antenna Azimuth 090 degrees)

```
INPUT FILE IS mv3e_g1.txt
 OUTPUT FILE IS mv3e_g1.hav



                    GGAO - GODDARD SPACE FLIGHT CENTER
                         GREENBELT, MARYLAND

GODDARD GEOPHYSICAL ASTRONOMICAL OBSERVATORY SURVEY CONTROL SCHEME/ADJUSTMENT

THIS ADJUSTMENT CONTAINS SELECTED UPDATED SURVEY OBSERVATIONS MADE AT THE
GODDARD GEOPHYSICAL ASTRONOMICAL OBSERVATORY (GGAO) FORMERLY (GORF) in
NOVEMBER 2007.

 NOTE: This a special survey data HAVAGO adjustment to provide
 updated vector and calibration data between the MOBLAS-7 and NG2000
 laser systems, their calibration piers, and the MV3 VLBI antenna.
 The field survey data was observed in November 2007.


The geodetic positions and heights of the constrained survey control
monuments for this adjustment were obtained from the final HAVAGO
adjustment of the November 2007 GGAO ground geodetic survey.
(GGAO07g.HAV).

The astronomic position of survey control monument VLBI PIER A
has been set to equal the ITRF2005 geodetic position.

 *



FLAGS IN INPUT DATA:
  *  DELETED OBSERVATION
  #  DEWEIGHTED OBSERVATION
1INPUT                                           DATE: 08-12-**  TIME: 13:42:14   PAGE    1

STATION DATA

STATION  GEODETIC LAT.   GEODETIC LON.   GEOD.HT.  GEOD. ST. ERRORS (M)   STATION NAME               CODES
NUMBER   ASTRONOMIC LAT. ASTRONOMIC LON. ELEV.     ASTR. ST. ERRORS          X            Y          Z

   42    39  1 18.93344  76 49 35.55262   13.752   .001   .001   .001   CDP 7108                  1 1 1
   42     0  0    .00     0  0    .00             10.00  15.00

   50    39  1 18.02142  76 49 37.51422   14.246   .001   .001   .001   JPL 4005                  1 1 1
   50     0  0    .00     0  0    .00             10.00  15.00

   94    39  1 19.91876  76 49 35.36268   13.771   .001   .001   .001   VLBI PIER-A               1 1 1
   94    39  1 19.92     76 49 35.36               .01    .01
```

```
   95   39  1 16.36233   76 49 38.36598   17.759   .001   .001   .001      VLBI PIER-B                              1 1 1
   95    0  0    .00      0  0    .00             10.00  15.00

   96   39  1 19.44905   76 49 37.49952   12.662   .001   .001   .001      VLBI PIER-C                              1 1 1
   96    0  0    .00      0  0    .00             10.00  15.00

   99   39  1 18.36794   76 49 34.47767   13.364   .001   .001   .001      7108 RM1                                 1 1 1
   99    0  0    .00      0  0    .00             10.00  15.00

 2015   39  1 18.93310   76 49 35.55081   16.800   .000   .000   .000      EAST QUAD 1                              0 0 0
 2015    0  0    .00      0  0    .00             10.00  15.00

 2030   39  1 18.93310   76 49 35.55081   16.800   .000   .000   .000      EAST QUAD 2                              0 0 0
 2030    0  0    .00      0  0    .00             10.00  15.00

 2045   39  1 18.93310   76 49 35.55081   16.800   .000   .000   .000      EAST QUAD 3                              0 0 0
 2045    0  0    .00      0  0    .00             10.00  15.00

 2060   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000      EAST QUAD 4                              0 0 0
 2060    0  0    .00      0  0    .00             10.00  15.00

 2075   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000      EAST QUAD 5                              0 0 0
 2075    0  0    .00      0  0    .00             10.00  15.00

 2090   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000      EAST QUAD 6                              0 0 0
 2090    0  0    .00      0  0    .00             10.00  15.00

 2105   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000      EAST QUAD 7                              0 0 0
 2105    0  0    .00      0  0    .00             10.00  15.00

 2120   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000      EAST QUAD 8                              0 0 0
 2120    0  0    .00      0  0    .00             10.00  15.00

 2135   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000      EAST QUAD 9                              0 0 0
 2135    0  0    .00      0  0    .00             10.00  15.00

 2150   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000      EAST QUAD 10                             0 0 0
 2150    0  0    .00      0  0    .00             10.00  15.00

 2165   39  1 18.93310   76 49 35.55070   16.800   .000   .000   .000      EAST QUAD 11                             0 0 0
 2165    0  0    .00      0  0    .00             10.00  15.00
1INPUT                                                              DATE: 08-12-**  TIME: 13:42:14   PAGE    2


 STATION DATA

 STATION   GEODETIC LAT.   GEODETIC LON.   GEOD.HT.  GEOD. ST. ERRORS (M)   STATION NAME                      CODES
 NUMBER    ASTRONOMIC LAT. ASTRONOMIC LON. ELEV.     ASTR. ST. ERRORS            X            Y            Z

 2006   39  1 18.93300   76 49 35.55200   16.800   .001   .001   .001      MV3 AXIS 07 (PRELIM)                     1 1 1
 2006    0  0    .00      0  0    .00             10.00  15.00
1INPUT                                                              DATE: 08-12-**  TIME: 13:42:14   PAGE    3
```

DIRECTIONS

```
      FROM  TO  LIST    OBSERVED     MM    SEC.

   1  50   95   1     0  0    .00    1.0   1.0    JLL/TDC NOV 07
   2  50 2060   1   218 19 37.18    1.0   1.0
   3  50 2075   1   217 52 57.20    1.0   1.0
   4  50 2090   1   217 23 29.65    1.0   1.0
   5  50 2105   1   216 53  7.72    1.0   1.0
   6  50 2120   1   216 23 58.60    1.0   1.0
   7  50 2135   1   215 58 14.42    1.0   1.0
   8  50 2150   2   215 38 11.08    1.0   1.0
   9  50 2165   2   215 25 13.70    1.0   1.0
  10  94   95   1     0  0    .00    1.0   1.0    JLL/TDC NOV 07
  11  94 2015   1   328 40   .15    1.0   1.0
  12  94 2030   1   329 20  1.92    1.0   1.0
  13  94 2045   1   330 24 21.78    1.0   1.0
  14  94 2060   1   331 48  1.28    1.0   1.0
  15  94 2075   1   333 25 12.05    1.0   1.0
  16  94 2090   1   335  8 57.52    1.0   1.0
  17  94 2105   1   336 51 49.68    1.0   1.0
  18  94 2120   2   338 26 50.75    1.0   1.0
  19  94 2135   2   339 47 29.82    1.0   1.0
  20  94 2150   2   340 48 57.35    1.0   1.0
  21  94 2165   2   341 27 22.35    1.0   1.0
  22  96   95   1     0  0    .00    1.0   1.0
  23  96 2075   1   276  3 34.08    1.0   1.0
  24  96 2090   1   276 24  3.62    1.0   1.0
  25  96 2105   1   276 45 21.38    1.0   1.0
  26  96 2120   1   277  5 54.62    1.0   1.0
  27  96 2135   1   277 24  2.35    1.0   1.0
  28  96 2150   1   277 38 27.68    1.0   1.0
  29  96 2165   1   277 47 36.50    1.0   1.0
  30  99   96   1     0  0    .00    1.0   1.0
  31  99 2015   1    13 17 21.92    1.0   1.0
  32  99 2030   1    12 51 13.95    1.0   1.0
  33  99 2045   1    12 10 14.92    1.0   1.0
  34  99 2060   1    11 18 31.55    1.0   1.0
  35  99   94   2     0  0    .00    1.0   1.0
  36  99 2075   2   328 59  2.15    1.0   1.0
  37  99 2090   2   327 59 56.18    1.0   1.0
  38  99 2105   2   327  3 45.40    1.0   1.0
```

1INPUT   DATE: 08-12-** TIME: 13:42:14   PAGE   4

GROUPED VERTICAL ANGLES

```
      FROM  TO  LIST    OBSERVED     MM    SEC.    H.I.    H.T.    K1     K2

  39  50 2060  -1    85 53 47.05    3.0   1.0    1.631    .000   .00    .00
  40  50 2075  -1    85 28  8.22    3.0   1.0    1.631    .000   .00    .00
```

```
41   50 2090   -1    85 16 19.30   3.0   1.0   1.631   .000   .00   .00
42   50 2105   -1    85 19 41.10   3.0   1.0   1.631   .000   .00   .00
43   50 2120   -1    85 38 43.60   3.0   1.0   1.631   .000   .00   .00
44   50 2135   -1    86 12 35.00   3.0   1.0   1.631   .000   .00   .00
45   50 2150   -1    86 59 24.22   3.0   1.0   1.631   .000   .00   .00
46   50 2165   -1    87 55 49.05   3.0   1.0   1.631   .000   .00   .00
47   94 2015   -1    83  0 43.18   3.0   1.0    .239   .000   .00   .00
48   94 2030   -1    81 24 36.48   3.0   1.0    .239   .000   .00   .00
49   94 2045   -1    80  2 33.40   3.0   1.0    .239   .000   .00   .00
50   94 2060   -1    79  0 51.12   3.0   1.0    .239   .000   .00   .00
51   94 2075   -1    78 23 25.42   3.0   1.0    .239   .000   .00   .00
52   94 2090   -1    78 12 34.60   3.0   1.0    .239   .000   .00   .00
53   94 2105   -1    78 28 45.45   3.0   1.0    .239   .000   .00   .00
54   94 2120   -1    79 10 33.02   3.0   1.0    .239   .000   .00   .00
55   94 2135   -1    80 14 43.70   3.0   1.0    .239   .000   .00   .00
56   94 2150   -1    81 37  7.12   3.0   1.0    .239   .000   .00   .00
57   94 2165   -1    83 12  1.72   3.0   1.0    .239   .000   .00   .00
58   96 2075   -1    81 38 20.52   3.0   1.0    .233   .000   .00   .00
59   96 2090   -1    81 20 53.88   3.0   1.0    .233   .000   .00   .00
60   96 2105   -1    81 19 52.35   3.0   1.0    .233   .000   .00   .00
61   96 2120   -1    81 36 14.55   3.0   1.0    .233   .000   .00   .00
62   96 2135   -1    82  9 39.28   3.0   1.0    .233   .000   .00   .00
63   96 2150   -1    82 58 32.35   3.0   1.0    .233   .000   .00   .00
64   96 2165   -1    83 59 22.15   3.0   1.0    .233   .000   .00   .00
65   99 2015   -1    84  5 37.50   3.0   1.0   1.438   .000   .00   .00
66   99 2030   -1    82 26 16.28   3.0   1.0   1.438   .000   .00   .00
67   99 2045   -1    81  6 20.52   3.0   1.0   1.438   .000   .00   .00
68   99 2060   -1    80 11 56.85   3.0   1.0   1.438   .000   .00   .00
69   99 2075   -1    79 45 22.45   3.0   1.0   1.438   .000   .00   .00
70   99 2090   -1    79 46 41.78   3.0   1.0   1.438   .000   .00   .00
71   99 2105   -1    80 13 48.12   3.0   1.0   1.438   .000   .00   .00
1INPUT                                              DATE: 08-12-**  TIME: 13:42:14   PAGE    5
```

ASTRONOMIC POSITION DIFFERENCES TO BE THE SAME AS GEODETIC

```
      FROM    TO

72    94    42
73    94    50
74    94    95
75    94    96
76    94    99
77    94  2015
78    94  2030
79    94  2045
80    94  2060
81    94  2075
82    94  2090
83    94  2105
```

```
   84   94 2120
   85   94 2135
   86   94 2150
   87   94 2165
   88   94 2006
1INPUT                                                    DATE: 08-12-**  TIME: 13:42:14   PAGE    6



 A PRIORI STANDARD ERRORS (UNLESS OVERRIDEN BY INPUT ON OBSERVATION CARD)

                                    VECTOR SUM OF

 DIRECTIONS                         1.0 MM     1.0 SEC.
 AZIMUTHS                           2.0 MM     1.3 SEC.
 RECIPROCAL VERTICAL ANGLES         7.0 MM     9.0 SEC.
 GROUPED VERTICAL ANGLES            3.0 MM     5.0 SEC.
 ABSOLUTE DISTANCES                 5.0 MM     9.9 PPM
 RELATIVE DISTANCES                 5.0 MM     9.9 PPM

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD      HAVAGO VERSION 90.07.18    DATE: 08-12-**  TIME: 13:42:14   PAGE    7

 JOB STATISTICS


 ELLIPSOID:  ITRF2005        A = 6378137.000   1/F = 298.2572221

                    GGAO - GODDARD SPACE FLIGHT CENTER

 STANDARD ERROR OF UNIT WEIGHT =   .28, VARIANCE =   .08,  31 DEGREES OF FREEDOM.


  129 OBSERVATIONS                           2 ITERATIONS
   38 DIRECTIONS                            18 STATIONS
    0 ASTR. AZIMUTHS                        98 UNKNOWNS
    0 REC. VERTICAL ANGLES                   7 LISTS OF DIRECTIONS
   33 GROUPED VERTICAL ANGLES                1 REFRACTION UNKNOWNS
    0 ABSOLUTE DISTANCES                     0 SCALE UNKNOWNS
    0 RELATIVE DISTANCES
    0 ELEVATION DIFFERENCES
    0 LAT., LON., HEIGHT DIFFERENCES
    0 PLANE DISTANCES
    1 OBSERVED ASTR. LATITUDES
    1 OBSERVED ASTR. LONGITUDES
    7 CONSTRAINED GEOD. LATITUDES
    7 CONSTRAINED GEOD. LONGITUDES
    7 CONSTRAINED GEOD. HEIGHTS
   17 ASTR. POSITION DIFFERENCES

DK/DH ASSUMED AS   -.010/1000 IF K VALUES NOT INPUT.
```

```
SELECTED OPTIONS:

CC  FLAG   OPTION

31   9   ITERATIONS
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD        HAVAGO VERSION 90.07.18     DATE: 08-12-** TIME: 13:42:14   PAGE    8

ADJUSTED DATA: STATIONS


STATION                                     LATITUDE        SIGMA       LONGITUDE       SIGMA      HEIGHT     SIGMA

    42     CDP 7108                     39  1 18.93344     .00001     76 49 35.55262    .00001     13.752     .000
    50     JPL 4005                     39  1 18.02142     .00001     76 49 37.51423    .00001     14.247     .000
    94     VLBI PIER-A                  39  1 19.91876     .00001     76 49 35.36268    .00001     13.770     .000
    95     VLBI PIER-B                  39  1 16.36233     .00001     76 49 38.36598    .00001     17.759     .000
    96     VLBI PIER-C                  39  1 19.44905     .00001     76 49 37.49952    .00001     12.662     .000
    99     7108 RM1                     39  1 18.36794     .00001     76 49 34.47767    .00001     13.364     .000
  2015     EAST QUAD 1                  39  1 18.93328     .00002     76 49 35.40771    .00001     17.736     .001
  2030     EAST QUAD 2                  39  1 18.93329     .00002     76 49 35.42245    .00001     18.605     .001
  2045     EAST QUAD 3                  39  1 18.93330     .00002     76 49 35.44617    .00001     19.356     .001
  2060     EAST QUAD 4                  39  1 18.93327     .00001     76 49 35.47711    .00001     19.932     .001
  2075     EAST QUAD 5                  39  1 18.93329     .00001     76 49 35.51320    .00001     20.297     .000
  2090     EAST QUAD 6                  39  1 18.93328     .00001     76 49 35.55203    .00001     20.423     .000
  2105     EAST QUAD 7                  39  1 18.93328     .00001     76 49 35.59087    .00001     20.304     .000
  2120     EAST QUAD 8                  39  1 18.93327     .00001     76 49 35.62714    .00002     19.945     .001
  2135     EAST QUAD 9                  39  1 18.93330     .00001     76 49 35.65823    .00002     19.374     .001
  2150     EAST QUAD 10                 39  1 18.93328     .00001     76 49 35.68216    .00002     18.627     .001
  2165     EAST QUAD 11                 39  1 18.93331     .00001     76 49 35.69721    .00002     17.757     .001
  2006     MV3 AXIS 07 (PRELIM)         39  1 18.93300     .00001     76 49 35.55200    .00001     16.800     .000
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD        HAVAGO VERSION 90.07.18     DATE: 08-12-** TIME: 13:42:14   PAGE    9

ADJUSTED DATA: DIRECTIONS


     FROM    TO  LIST    OBSERVED      V     N.V     ADJUSTED       DIST.        AZ.          V.A.

   1   50    95   1    0  0   .00    .44    .11    0  0   .00     55.225   201 49 29.59   86 21 13.70   JLL/TDC NOV 07
   2   50  2060   1  218 19 37.18    .36    .09  218 19 37.10     56.784    60  9  6.69   84 15 14.10
   3   50  2075   1  217 52 57.20   -.29   -.08  217 52 56.47     56.075    59 42 26.06   83 48 24.01
   4   50  2090   1  217 23 29.65   -.56   -.14  217 23 28.65     55.289    59 12 58.24   83 35 10.72
   5   50  2105   1  216 53  7.72    .07    .02  216 53  7.35     54.480    58 42 36.94   83 37  1.94
   6   50  2120   1  216 23 58.60   -.45   -.11  216 23 57.71     53.702    58 13 27.30   83 54 32.41
   7   50  2135   1  215 58 14.42    .44    .11  215 58 14.42     53.013    57 47 44.01   84 26 59.16

   8   50  2150   2    0  0   .00   -.26   -.07    0  0   .00     52.461    57 27 36.53   85 12 37.37
   9   50  2165   2  359 47  2.62    .27    .07  359 47  3.15     52.092    57 14 39.68   86  8 10.45

  10   94    95   1    0  0   .00    .03    .02    0  0   .00    131.391   213 22 29.73   88 15 39.58   JLL/TDC NOV 07
  11   94  2015   1  328 40   .15    .04    .01  328 40   .17     30.667   182  2 29.90   82 34  9.41
```

```
12    94 2030   1   329 20  1.92    .04   .01   329 20  1.93    30.805  182 42 31.67   80 58 15.52
13    94 2045   1   330 24 21.78    .04   .01   330 24 21.80    30.964  183 46 51.53   79 36 26.60
14    94 2060   1   331 48  1.28    .70   .10   331 48  1.95    31.131  185 10 31.69   78 35  2.02
15    94 2075   1   333 25 12.05   -.44  -.07   333 25 11.58    31.293  186 47 41.32   77 57 45.60
16    94 2090   1   335  8 57.52   -.39  -.06   335  8 57.10    31.441  188 31 26.83   77 47  4.10
17    94 2105   1   336 51 49.68   -.35  -.05   336 51 49.30    31.565  190 14 19.04   78  3 18.47

18    94 2120   2    0  0   .00    -.57  -.09    0  0   .00     31.657  191 49 23.74   78 45  8.79
19    94 2135   2    1 20 39.07    .56   .09    1 20 40.20     31.709  193 10  3.94   79 49 14.81
20    94 2150   2    2 22  6.60   -.35  -.05    2 22  6.82     31.721  194 11 30.56   81 11 33.44
21    94 2165   2    3  0 31.60    .35   .05    3  0 32.52     31.688  194 49 56.26   82 46 20.98

22    96   95   1    0  0   .00    -.10  -.04    0  0   .00     97.576  192 21  4.17   87  0 22.10
23    96 2075   1   276  3 34.08    .17   .04   276  3 34.35    50.935  108 24 38.52   81 22 46.99
24    96 2090   1   276 24  3.62   1.27   .30   276 24  4.99    50.079  108 45  9.16   81  5  5.05
25    96 2105   1   276 45 21.38   -.96  -.22   276 45 20.52    49.188  109  6 24.68   81  3 46.03
26    96 2120   1   277  5 54.62    .25   .06   277  5 54.97    48.319  109 26 59.14   81 19 51.30
27    96 2135   1   277 24  2.35   -.40  -.09   277 24  2.04    47.538  109 45  6.21   81 52 58.69
28    96 2150   1   277 38 27.68    .15   .03   277 38 27.92    46.902  109 59 32.09   82 41 34.99
29    96 2165   1   277 47 36.50   -.25  -.06   277 47 36.34    46.461  110  8 40.51   83 42 14.75

30    99   96   1    0  0   .00    -.14  -.05    0  0   .00     79.976  294 38 16.73   90 30 11.85
31    99 2015   1   13 17 21.92    .05   .01   13 17 22.11    28.698  307 55 38.85   81 14 10.80
32    99 2030   1   12 51 13.95    .04   .01   12 51 14.14    29.119  307 29 30.87   79 37 53.43
33    99 2045   1   12 10 14.92    .05   .01   12 10 15.11    29.709  306 48 31.84   78 21 51.76
34    99 2060   1   11 18 31.55    .76   .11   11 18 32.46    30.415  305 56 49.19   77 31 43.46

35    99   94   2    0  0   .00    -.01   .00    0  0   .00     52.350  336  0 11.48   89 33 19.47
36    99 2075   2   328 59  2.15   -.05  -.01   328 59  2.10    31.185  304 59 13.59   77  9 21.26
37    99 2090   2   327 59 56.18   1.43   .22   327 59 57.61    31.964  304  0  9.09   77 14 28.93
38    99 2105   2   327  3 45.40  -1.30  -.20   327  3 44.10    32.698  303  3 55.58   77 44 49.47
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD        HAVAGO VERSION 90.07.18     DATE: 08-12-** TIME: 13:42:14   PAGE   10

  ADJUSTED DATA: GROUPED VERTICAL ANGLES

        FROM  TO LIST    OBSERVED    REF/KM    V      N.V     ADJUSTED       DIST.        AZ.

   39    50 2060  -1   84 15 16.93    .00  -2.83  -.26   84 15 14.10    56.784   60  9  6.69
   40    50 2075  -1   83 48 26.69    .00  -2.68  -.24   83 48 24.01    56.075   59 42 26.06
   41    50 2090  -1   83 35 14.43    .00  -3.71  -.33   83 35 10.72    55.289   59 12 58.24
   42    50 2105  -1   83 37  5.65    .00  -3.71  -.32   83 37  1.94    54.480   58 42 36.94
   43    50 2120  -1   83 54 36.17    .00  -3.76  -.32   83 54 32.41    53.702   58 13 27.30
   44    50 2135  -1   84 27  1.97    .00  -2.81  -.24   84 26 59.16    53.013   57 47 44.01
   45    50 2150  -1   85 12 39.36    .00  -1.99  -.17   85 12 37.37    52.461   57 27 36.53
   46    50 2165  -1   86  8 14.09    .00  -3.64  -.30   86  8 10.45    52.092   57 14 39.68
   47    94 2015  -1   82 34  7.58    .00   1.83   .09   82 34  9.41    30.667  182  2 29.90
   48    94 2030  -1   80 58 14.13    .00   1.39   .07   80 58 15.52    30.805  182 42 31.67
   49    94 2045  -1   79 36 25.26    .00   1.35   .07   79 36 26.60    30.964  183 46 51.53
   50    94 2060  -1   78 34 56.55    .00   5.48   .27   78 35  2.02    31.131  185 10 31.69
   51    94 2075  -1   77 57 42.27    .00   3.33   .17   77 57 45.60    31.293  186 47 41.32
   52    94 2090  -1   77 46 59.74    .00   4.35   .22   77 47  4.10    31.441  188 31 26.83
```

```
53   94 2105  -1   78  3 15.14    .00    3.33   .17   78  3 18.47   31.565  190 14 19.04
54   94 2120  -1   78 45  3.48    .00    5.32   .27   78 45  8.79   31.657  191 49 23.74
55   94 2135  -1   79 49 11.48    .00    3.33   .17   79 49 14.81   31.709  193 10  3.94
56   94 2150  -1   81 11 29.60    .00    3.84   .20   81 11 33.44   31.721  194 11 30.56
57   94 2165  -1   82 46 16.95    .00    4.03   .21   82 46 20.98   31.688  194 49 56.26
58   96 2075  -1   81 22 46.99    .00     .00   .00   81 22 46.99   50.935  108 24 38.52
59   96 2090  -1   81  5  5.12    .00    -.08  -.01   81  5  5.05   50.079  108 45  9.16
60   96 2105  -1   81  3 46.44    .00    -.41  -.03   81  3 46.03   49.188  109  6 24.68
61   96 2120  -1   81 19 50.57    .00     .73   .06   81 19 51.30   48.319  109 26 59.14
62   96 2135  -1   81 52 57.75    .00     .93   .07   81 52 58.69   47.538  109 45  6.21
63   96 2150  -1   82 41 35.35    .00    -.36  -.03   82 41 34.99   46.902  109 59 32.09
64   96 2165  -1   83 42 13.41    .00    1.33   .10   83 42 14.75   46.461  110  8 40.51
65   99 2015  -1   81 14 12.75    .00   -1.96  -.09   81 14 10.80   28.698  307 55 38.85
66   99 2030  -1   79 37 54.91    .00   -1.48  -.07   79 37 53.43   29.119  307 29 30.87
67   99 2045  -1   78 21 53.17    .00   -1.41  -.07   78 21 51.76   29.709  306 48 31.84
68   99 2060  -1   77 31 43.74    .00    -.28  -.01   77 31 43.46   30.415  305 56 49.19
69   99 2075  -1   77  9 19.71    .00    1.55   .08   77  9 21.26   31.185  304 59 13.59
70   99 2090  -1   77 14 26.60    .00    2.33   .12   77 14 28.93   31.964  304  0  9.09
71   99 2105  -1   77 44 45.80    .00    3.66   .19   77 44 49.47   32.698  303  3 55.58
```

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 13:42:14   PAGE   11

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

	STATION			OBSERVED	V	N.V	ADJUSTED	SIGMA
89	42	CDP 7108	LAT	39 1 18.93	.00	.00	39 1 18.93	.03 NOT OBS.
90	42	CDP 7108	LON	76 49 35.55	.00	.00	76 49 35.55	.03 NOT OBS.
91	50	JPL 4005	LAT	39 1 18.02	.00	.00	39 1 18.02	.03 NOT OBS.
92	50	JPL 4005	LON	76 49 37.51	.00	.00	76 49 37.51	.03 NOT OBS.
93	94	VLBI PIER-A	LAT	39 1 19.92	.00	.00	39 1 19.92	.00
94	94	VLBI PIER-A	LON	76 49 35.36	.00	.00	76 49 35.36	.00
95	95	VLBI PIER-B	LAT	39 1 16.36	.00	.00	39 1 16.36	.03 NOT OBS.
96	95	VLBI PIER-B	LON	76 49 38.37	.00	.00	76 49 38.36	.03 NOT OBS.
97	96	VLBI PIER-C	LAT	39 1 19.45	.00	.00	39 1 19.45	.03 NOT OBS.
98	96	VLBI PIER-C	LON	76 49 37.50	.00	.00	76 49 37.50	.03 NOT OBS.
99	99	7108 RM1	LAT	39 1 18.37	.00	.00	39 1 18.37	.03 NOT OBS.
100	99	7108 RM1	LON	76 49 34.48	.00	.00	76 49 34.48	.03 NOT OBS.
101	2015	EAST QUAD 1	LAT	39 1 18.93	.00	.00	39 1 18.93	.03 NOT OBS.
102	2015	EAST QUAD 1	LON	76 49 35.41	.00	.00	76 49 35.41	.03 NOT OBS.
103	2030	EAST QUAD 2	LAT	39 1 18.93	.00	.00	39 1 18.93	.03 NOT OBS.
104	2030	EAST QUAD 2	LON	76 49 35.42	.00	.00	76 49 35.42	.03 NOT OBS.
105	2045	EAST QUAD 3	LAT	39 1 18.93	.00	.00	39 1 18.93	.03 NOT OBS.
106	2045	EAST QUAD 3	LON	76 49 35.45	.00	.00	76 49 35.44	.03 NOT OBS.

```
107   2060    EAST QUAD 4              LAT   39  1 18.93     .00      .00    39  1 18.93       .03 NOT OBS.
108   2060    EAST QUAD 4              LON   76 49 35.48     .00      .00    76 49 35.47       .03 NOT OBS.

109   2075    EAST QUAD 5              LAT   39  1 18.93     .00      .00    39  1 18.93       .03 NOT OBS.
110   2075    EAST QUAD 5              LON   76 49 35.51     .00      .00    76 49 35.51       .03 NOT OBS.

111   2090    EAST QUAD 6              LAT   39  1 18.93     .00      .00    39  1 18.93       .03 NOT OBS.
112   2090    EAST QUAD 6              LON   76 49 35.55     .00      .00    76 49 35.55       .03 NOT OBS.

113   2105    EAST QUAD 7              LAT   39  1 18.93     .00      .00    39  1 18.93       .03 NOT OBS.
114   2105    EAST QUAD 7              LON   76 49 35.59     .00      .00    76 49 35.59       .03 NOT OBS.

115   2120    EAST QUAD 8              LAT   39  1 18.93     .00      .00    39  1 18.93       .03 NOT OBS.
116   2120    EAST QUAD 8              LON   76 49 35.63     .00      .00    76 49 35.62       .03 NOT OBS.

117   2135    EAST QUAD 9              LAT   39  1 18.93     .00      .00    39  1 18.93       .03 NOT OBS.
118   2135    EAST QUAD 9              LON   76 49 35.66     .00      .00    76 49 35.66       .03 NOT OBS.

119   2150    EAST QUAD 10             LAT   39  1 18.93     .00      .00    39  1 18.93       .03 NOT OBS.
120   2150    EAST QUAD 10             LON   76 49 35.68     .00      .00    76 49 35.68       .03 NOT OBS.

121   2165    EAST QUAD 11             LAT   39  1 18.93     .00      .00    39  1 18.93       .03 NOT OBS.
122   2165    EAST QUAD 11             LON   76 49 35.70     .00      .00    76 49 35.69       .03 NOT OBS.
```

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ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

```
        STATION                              OBSERVED       V       N.V      ADJUSTED         SIGMA

123   2006    MV3 AXIS 07 (PRELIM)     LAT   39  1 18.93     .00      .00    39  1 18.93       .03 NOT OBS.
124   2006    MV3 AXIS 07 (PRELIM)     LON   76 49 35.55     .00      .00    76 49 35.55       .03 NOT OBS.
```

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 13:42:14 PAGE 13

GEODETIC LATITUDE CONSTRAINTS

```
     STATION      CONSTRAINED     V        N.V        ADJUSTED        SIGMA

     125    42    39  1 18.93344   .00000   .00000    39  1 18.93344   .00001
     126    50    39  1 18.02142   .00000   .10901    39  1 18.02142   .00001
     127    94    39  1 19.91876   .00000  -.11399    39  1 19.91876   .00001
     128    95    39  1 16.36233   .00000  -.03994    39  1 16.36233   .00001
     129    96    39  1 19.44905   .00000  -.02724    39  1 19.44905   .00001
     130    99    39  1 18.36794   .00000   .07216    39  1 18.36794   .00001
     131  2006    39  1 18.93300   .00000   .00000    39  1 18.93300   .00001
```

GEODETIC LONGITUDE CONSTRAINTS

```
        STATION        CONSTRAINED      V        N.V        ADJUSTED        SIGMA

        132    42     76 49 35.55262  .00000    .00000    76 49 35.55262    .00001
        133    50     76 49 37.51422  .00001    .20055    76 49 37.51423    .00001
        134    94     76 49 35.36268  .00000   -.02659    76 49 35.36268    .00001
        135    95     76 49 38.36598  .00000   -.07643    76 49 38.36598    .00001
        136    96     76 49 37.49952  .00000   -.04478    76 49 37.49952    .00001
        137    99     76 49 34.47767  .00000   -.05275    76 49 34.47767    .00001
        138  2006     76 49 35.55200  .00000    .00000    76 49 35.55200    .00001
```

GEODETIC HEIGHT CONSTRAINTS

```
        STATION      CONSTRAINED     V       N.V     ADJUSTED      SIGMA

        139    42      13.7520     .0000     .0     13.7520       .000
        140    50      14.2460     .0007     .7     14.2467       .000
        141    94      13.7710    -.0006    -.6     13.7704       .000
        142    95      17.7590     .0000     .0     17.7590       .000
        143    96      12.6620    -.0001    -.1     12.6619       .000
        144    99      13.3640     .0000     .0     13.3640       .000
        145  2006      16.8000     .0000     .0     16.8000       .000
```
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 13:42:14   PAGE   14

ADJUSTED CARTESIAN COORDINATES

```
    DX       DY       DZ     EPSILON    PSI     OMEGA    SCALE

   .000     .000     .000     .000     .000     .000     .000
```

						TRANSFORMED COORDINATES		
STATION		X	Y	Z		X	Y	Z
42	CDP 7108	1130794.717	-4831233.824	3994217.058				
50	JPL 4005	1130752.895	-4831262.194	3994195.520				
94	VLBI PIER-A	1130794.809	-4831214.169	3994240.676				
95	VLBI PIER-B	1130740.907	-4831300.885	3994157.982				
96	VLBI PIER-C	1130746.642	-4831233.925	3994228.725				
99	7108 RM1	1130822.329	-4831238.328	3994203.266				
2015	EAST QUAD 1	1130798.818	-4831236.047	3994219.563				
2030	EAST QUAD 2	1130798.626	-4831236.784	3994220.110				
2045	EAST QUAD 3	1130798.204	-4831237.482	3994220.584				
2060	EAST QUAD 4	1130797.581	-4831238.089	3994220.946				
2075	EAST QUAD 5	1130796.800	-4831238.562	3994221.175				
2090	EAST QUAD 6	1130795.913	-4831238.870	3994221.255				
2105	EAST QUAD 7	1130794.982	-4831238.993	3994221.180				
2120	EAST QUAD 8	1130794.069	-4831238.921	3994220.954				
2135	EAST QUAD 9	1130793.240	-4831238.659	3994220.595				
2150	EAST QUAD 10	1130792.547	-4831238.225	3994220.124				

```
2165      EAST QUAD 11                    1130792.040  -4831237.649   3994219.577
2006      MV3 AXIS 07 (PRELIM)            1130795.273  -4831236.135   3994218.967
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD                 DATE: 08-12-**  TIME: 13:42:14    PAGE   15

 MISCELLANEOUS DATA FOR SELECTED LINES, PART 1


  FROM    TO      STANDARD   CORRELATION COEFF.      STANDARD   CORRELATION COEFF.   DX,DY,DZ   AZ.,DIST.,V.A.    AZ.,DIST.,B.AZ.
                  ERRORS    AZ.   DIST.  V.A.        ERRORS     DX    DY    DZ                                     (GEODETIC)


  2006   2015   AZ.  35.00   1.00   .30  -.04     DX  .0005   1.00  -.31  -.16     3.5441   89 51 19.64     89 51 19.64
                DIST. .0005   .30  1.00   .21     DY  .0006  -.31   1.00  -.20      .0880            3.5950           3.4709
                V.A.  38.99  -.04   .21  1.00     DZ  .0006  -.16  -.20   1.00      .5964   74 54  1.63    269 51 19.73

  2006   2030   AZ.  38.37   1.00   .23  -.09     DX  .0005   1.00  -.30  -.15     3.3527   89 50  9.14     89 50  9.14
                DIST. .0005   .23  1.00   .36     DY  .0006  -.30   1.00  -.21     -.6496            3.6013           3.1164
                V.A.  36.89  -.09   .36  1.00     DZ  .0006  -.15  -.21   1.00     1.1433   59 55 21.35    269 50  9.22

  2006   2045   AZ.  45.94   1.00   .16  -.14     DX  .0005   1.00  -.29  -.13     2.9301   89 47 22.58     89 47 22.58
                DIST. .0006   .16  1.00   .41     DY  .0006  -.29   1.00  -.23    -1.3476            3.6076           2.5459
                V.A.  33.65  -.14   .41  1.00     DZ  .0006  -.13  -.23   1.00     1.6166   44 53 11.33    269 47 22.65

  2006   2060   AZ.  51.35   1.00   .03  -.04     DX  .0004   1.00  -.14   .03     2.3076   89 43 58.74     89 43 58.73
                DIST. .0006   .03  1.00   .30     DY  .0005  -.14   1.00  -.27    -1.9537            3.6134           1.8016
                V.A.  26.79  -.04   .30  1.00     DZ  .0005   .03  -.27   1.00     1.9786   29 54 26.66    269 43 58.78

  2006   2075   AZ.  90.36   1.00   .02  -.03     DX  .0004   1.00  -.08   .05     1.5265   89 27 16.86     89 27 16.85
                DIST. .0005   .02  1.00   .10     DY  .0005  -.08   1.00  -.26    -2.4268            3.6189            .9333
                V.A.  25.02  -.03   .10  1.00     DZ  .0005   .05  -.26   1.00     2.2084   14 56 42.35    269 27 16.87

  2006   2090   AZ.*******   1.00   .01   .03     DX  .0004   1.00  -.07   .05      .6396  355 35 53.77    355 35 54.73
                DIST. .0005   .01  1.00   .01     DY  .0005  -.07   1.00  -.26    -2.7356            3.6231            .0087
                V.A.  23.22   .03   .01  1.00     DZ  .0005   .05  -.26   1.00     2.2879    0  8 14.31    175 35 54.73

  2006   2105   AZ.  89.44   1.00  -.01  -.01     DX  .0004   1.00  -.06   .06     -.2913  270 31 23.35    270 31 23.35
                DIST. .0005  -.01  1.00   .11     DY  .0005  -.06   1.00  -.26    -2.8581            3.6262            .9350
                V.A.  25.15  -.01   .11  1.00     DZ  .0005   .06  -.26   1.00     2.2125   14 56 33.13     90 31 23.33

  2006   2120   AZ.  50.11   1.00  -.04   .03     DX  .0006   1.00   .02   .12    -1.2043  270 15 43.79    270 15 43.79
                DIST. .0006  -.04  1.00   .04     DY  .0005   .02   1.00  -.26    -2.7860            3.6275           1.8075
                V.A.  33.61   .03   .04  1.00     DZ  .0005   .12  -.26   1.00     1.9866   29 53 11.86     90 15 43.75

  2006   2135   AZ.  35.44   1.00  -.05   .02     DX  .0006   1.00   .03   .12    -2.0338  270 12 35.45    270 12 35.45
                DIST. .0006  -.05  1.00   .03     DY  .0005   .03   1.00  -.26    -2.5240            3.6273           2.5555
                V.A.  33.82   .02   .03  1.00     DZ  .0005   .12  -.26   1.00     1.6281   44 47 23.57     90 12 35.38

  2006   2150   AZ.  31.31   1.00   .12  -.10     DX  .0006   1.00  -.05  -.04    -2.7263  270  9 22.06    270  9 22.06
                DIST. .0006   .12  1.00  -.07     DY  .0005  -.05   1.00  -.23    -2.0906            3.6253           3.1310
                V.A.  34.81  -.10  -.07  1.00     DZ  .0005  -.04  -.23   1.00     1.1571   59 43 53.69     90  9 21.98

  2006   2165   AZ.  28.04   1.00   .14  -.06     DX  .0006   1.00  -.04  -.04    -3.2332  270  9 29.38    270  9 29.38
                DIST. .0006   .14  1.00  -.06     DY  .0005  -.04   1.00  -.23    -1.5142            3.6220           3.4932
```

```
          V.A. 34.10        -.06  -.06  1.00    DZ  .0005    -.04  -.23  1.00        .6101   74 40 37.99       90  9 29.29
```

MISCELLANEOUS DATA FOR SELECTED LINES, PART 2

E Q U A T O R I A L   S Y S T E M   HORIZON SYSTEM, ORIGIN AT THE STANDPOINT

FROM	TO	ALTITUDE	AZIMUTH	DISTANCE	DN	SIGMA	DE	SIGMA	DU	SIGMA
2006	2015	9 32 59.48	1 25 18.43	3.5950	.0088	.0006	3.4709	.0005	.9365	.0007
2006	2030	18 30 36.19	349 2 2.96	3.6013	.0089	.0006	3.1164	.0005	1.8049	.0007
2006	2045	26 37 18.98	335 18 6.69	3.6076	.0093	.0006	2.5459	.0004	2.5560	.0007
2006	2060	33 12 3.70	319 44 52.51	3.6134	.0084	.0004	1.8016	.0004	3.1322	.0006
2006	2075	37 36 21.26	302 10 12.85	3.6189	.0089	.0004	.9333	.0004	3.4965	.0005
2006	2090	39 9 31.79	283 9 35.52	3.6231	.0087	.0004	-.0007	.0004	3.6231	.0005
2006	2105	37 36 2.89	264 10 52.55	3.6262	.0085	.0004	-.9350	.0004	3.5035	.0005
2006	2120	33 12 23.39	246 37 23.25	3.6275	.0083	.0004	-1.8075	.0006	3.1451	.0006
2006	2135	26 40 9.72	231 8 21.17	3.6273	.0094	.0004	-2.5555	.0006	2.5743	.0006
2006	2150	18 36 49.83	217 28 55.47	3.6253	.0085	.0005	-3.1310	.0006	1.8273	.0006
2006	2165	9 41 51.54	205 5 43.23	3.6220	.0096	.0005	-3.4932	.0006	.9571	.0006

F.1.4 Circle Fit Output for East Quadrant

```
Circle Radius: 3.6033744e+00
Circle Center: (-1.3874873e-02, 1.9807470e-02)
```

ID	X-coord	Y-coord	Gamma-x	Gamma-y	Gamma
1	3.4709000	0.9365000	0.0000437	0.0000115	-0.0000452
2	3.1164000	1.8049000	-0.0001048	-0.0000598	0.0001206
3	2.5459000	2.5560000	-0.0000407	-0.0000404	0.0000573
4	1.8016000	3.1322000	0.0000958	0.0001643	-0.0001902
5	0.9333000	3.4965000	-0.0000082	-0.0000300	0.0000311
6	-0.0007000	3.6231000	0.0000002	0.0000577	-0.0000577
7	-0.9350000	3.5035000	0.0000099	-0.0000373	0.0000386
8	-1.8075000	3.1451000	0.0000164	-0.0000286	0.0000330
9	-2.5555000	2.5743000	0.0000963	-0.0000968	0.0001365
10	-3.1310000	1.8273000	-0.0000970	0.0000563	-0.0001122
11	-3.4932000	0.9571000	-0.0000115	0.0000031	-0.0000119

```
INPUT FILE IS mv3s_g1.txt
 OUTPUT FILE IS mv3s_g1.hav



                    GGAO - GODDARD SPACE FLIGHT CENTER
                         GREENBELT, MARYLAND

 GODDARD GEOPHYSICAL ASTRONOMICAL OBSERVATORY SURVEY CONTROL SCHEME/ADJUSTMENT

 THIS ADJUSTMENT CONTAINS SELECTED UPDATED SURVEY OBSERVATIONS MADE AT THE
 GODDARD GEOPHYSICAL ASTRONOMICAL OBSERVATORY (GGAO) FORMERLY (GORF) in
 NOVEMBER 2007.

  NOTE: This a special survey data HAVAGO adjustment to provide
  updated vector and calibration data between the MOBLAS-7 and NG2000
  laser systems, their calibration piers, and the MV3 VLBI antenna.
  The field survey data was observed in November 2007.

 The geodetic positions and heights of the constrained survey control
 monuments for this adjustment were obtained from the final HAVAGO
 adjustment of the November 2007 GGAO ground geodetic survey.
 (GGAO07G.HAV).

 The astronomic position of survey control monument VLBI PIER A
 has been set to equal the ITRF2005 geodetic position.

  *



 FLAGS IN INPUT DATA:
   *   DELETED OBSERVATION
   #   DEWEIGHTED OBSERVATION
1INPUT                                              DATE: 08-12-**  TIME: 14:46:14   PAGE    1

 STATION DATA

 STATION   GEODETIC LAT.   GEODETIC LON.   GEOD.HT.   GEOD. ST. ERRORS (M)   STATION NAME                    CODES
 NUMBER    ASTRONOMIC LAT. ASTRONOMIC LON. ELEV.      ASTR. ST. ERRORS          X            Y           Z

    42     39  1 18.93344  76 49 35.55262   13.752   .001   .001   .001     CDP 7108                        1 1 1
    42      0  0    .00     0  0    .00             10.00  15.00

    50     39  1 18.02142  76 49 37.51422   14.246   .001   .001   .001     JPL 4005                        1 1 1
```

```
  50      0  0   .00        0  0   .00                 10.00 15.00

  94     39  1 19.91876   76 49 35.36268   13.771  .001  .001    .001     VLBI PIER-A                    1 1 1
  94     39  1 19.92      76 49 35.36                     .01   .01

  95     39  1 16.36233   76 49 38.36598   17.759  .001  .001    .001     VLBI PIER-B                    1 1 1
  95      0  0   .00        0  0   .00                 10.00 15.00

  96     39  1 19.44905   76 49 37.49952   12.662  .001  .001    .001     VLBI PIER-C                    1 1 1
  96      0  0   .00        0  0   .00                 10.00 15.00

  99     39  1 18.36794   76 49 34.47767   13.364  .001  .001    .001     7108 RM1                       1 1 1
  99      0  0   .00        0  0   .00                 10.00 15.00

3015     39  1 18.93310   76 49 35.55081   16.800  .000  .000    .000     SOUTH QUAD 1                   0 0 0
3015      0  0   .00        0  0   .00                 10.00 15.00

3030     39  1 18.93310   76 49 35.55081   16.800  .000  .000    .000     SOUTH QUAD 2                   0 0 0
3030      0  0   .00        0  0   .00                 10.00 15.00

3045     39  1 18.93310   76 49 35.55081   16.800  .000  .000    .000     SOUTH QUAD 3                   0 0 0
3045      0  0   .00        0  0   .00                 10.00 15.00

3060     39  1 18.93310   76 49 35.55070   16.800  .000  .000    .000     SOUTH QUAD 4                   0 0 0
3060      0  0   .00        0  0   .00                 10.00 15.00

3075     39  1 18.93310   76 49 35.55070   16.800  .000  .000    .000     SOUTH QUAD 5                   0 0 0
3075      0  0   .00        0  0   .00                 10.00 15.00

3090     39  1 18.93310   76 49 35.55070   16.800  .000  .000    .000     SOUTH QUAD 6                   0 0 0
3090      0  0   .00        0  0   .00                 10.00 15.00

3105     39  1 18.93310   76 49 35.55070   16.800  .000  .000    .000     SOUTH QUAD 7                   0 0 0
3105      0  0   .00        0  0   .00                 10.00 15.00

3120     39  1 18.93310   76 49 35.55070   16.800  .000  .000    .000     SOUTH QUAD 8                   0 0 0
3120      0  0   .00        0  0   .00                 10.00 15.00

3135     39  1 18.93310   76 49 35.55070   16.800  .000  .000    .000     SOUTH QUAD 9                   0 0 0
3135      0  0   .00        0  0   .00                 10.00 15.00

3150     39  1 18.93310   76 49 35.55070   16.800  .000  .000    .000     SOUTH QUAD 10                  0 0 0
3150      0  0   .00        0  0   .00                 10.00 15.00

3165     39  1 18.93310   76 49 35.55070   16.800  .000  .000    .000     SOUTH QUAD 11                  0 0 0
3165      0  0   .00        0  0   .00                 10.00 15.00
1INPUT                                                        DATE: 08-12-**  TIME: 14:46:14  PAGE    2

  STATION DATA

 STATION  GEODETIC LAT.   GEODETIC LON.   GEOD.HT.  GEOD. ST. ERRORS (M)   STATION NAME                   CODES
```

```
NUMBER   ASTRONOMIC LAT. ASTRONOMIC LON.  ELEV.    ASTR. ST. ERRORS         X           Y           Z

2006   39  1 18.93300   76 49 35.55200   16.800   .001   .001   .001    MV3 AXIS 07 (PRELIM)           1 1 1
2006    0  0   .00        0  0   .00             10.00  15.00
1INPUT                                                          DATE: 08-12-**  TIME: 14:46:14   PAGE    3

DIRECTIONS


     FROM  TO  LIST    OBSERVED      MM   SEC.

   1   50   95    1      0  0   .00   1.0   1.0    JLL/TDC NOV 07
   2   50 3015    1    220 35 39.82   1.0   1.0
   3   50 3030    1    220 15 21.82   1.0   1.0
   4   50 3045    1    219 43  1.85   1.0   1.0
   5   50 3060    1    219  1 24.90   1.0   1.0
   6   50 3075    1    218 13 33.08   1.0   1.0
   7   50 3090    1    217 22 51.18   1.0   1.0
   8   50   95    2      0  0   .00   1.0   1.0
   9   50 3105    2    216 32 58.68   1.0   1.0
  10   50 3120    2    215 47 20.35   1.0   1.0
  11   50 3135    2    215  8 40.60   1.0   1.0
  12   50 3150    2    214 39 23.48   1.0   1.0
  13   94   95    1      0  0   .00   1.0   1.0    JLL/TDC NOV 07
  14   94 3075    1    334 56 28.82   1.0   1.0
  15   94 3090    1    335 11 35.80   1.0   1.0
  16   94   95    2      0  0   .00   1.0   1.0
  17   94 3105    2    335 27 40.50   1.0   1.0
  18   94 3120    2    335 43 36.40   1.0   1.0
  19   94 3135    2    335 58  5.40   1.0   1.0
  20   94 3150    2    336  9 43.62   1.0   1.0
  21   94 3165    2    336 17 19.10   1.0   1.0
  22   96   95    1      0  0   .00   1.0   1.0
  23   96 3015    1    280  7 58.45   1.0   1.0
  24   96 3030    1    279 45 38.62   1.0   1.0
  25   96 3045    1    279  9 32.08   1.0   1.0
  26   96 3060    1    278 21 58.70   1.0   1.0
  27   96 3075    1    277 25 54.30   1.0   1.0
  28   96 3090    1    276 24 46.88   1.0   1.0
  29   96   95    2      0  0   .00   1.0   1.0
  30   96 3105    2    275 22 57.35   1.0   1.0
  31   96 3120    2    274 24 34.72   1.0   1.0
  32   96 3135    2    273 33 58.45   1.0   1.0
  33   96 3150    2    272 54 48.20   1.0   1.0
  34   96 3165    2    272 29 59.75   1.0   1.0
  35   99   94    1      0  0   .00   1.0   1.0
  36   99 3015    1    322 20 59.98   1.0   1.0
  37   99 3030    1    322 57 21.62   1.0   1.0
  38   99 3045    1    323 54 50.38   1.0   1.0
  39   99 3060    1    325  8 11.88   1.0   1.0
  40   99 3075    1    326 31 27.08   1.0   1.0
  41   99 3090    1    327 58 14.72   1.0   1.0
```

```
      42   99   94    2      0  0    .00    1.0    1.0
      43   99 3105    2    329 22 14.62    1.0    1.0
      44   99 3120    2    330 37 58.22    1.0    1.0
 1INPUT                                                  DATE: 08-12-**  TIME: 14:46:14   PAGE    4

      GROUPED VERTICAL ANGLES


           FROM   TO  LIST     OBSERVED     MM    SEC.     H.I.     H.T.    K1     K2

      45   50 3015   -1    88  0 18.75   3.0    1.0    1.631    .000    .00    .00
      46   50 3030   -1    87  4 39.28   3.0    1.0    1.631    .000    .00    .00
      47   50 3045   -1    86 17 30.20   3.0    1.0    1.631    .000    .00    .00
      48   50 3060   -1    85 42 30.08   3.0    1.0    1.631    .000    .00    .00
      49   50 3075   -1    85 21 41.22   3.0    1.0    1.631    .000    .00    .00
      50   50 3090   -1    85 16 10.28   3.0    1.0    1.631    .000    .00    .00
      51   50 3105   -1    85 26  3.60   3.0    1.0    1.633    .000    .00    .00
      52   50 3120   -1    85 50 10.95   3.0    1.0    1.633    .000    .00    .00
      53   50 3135   -1    86 26 43.35   3.0    1.0    1.633    .000    .00    .00
      54   50 3150   -1    87 13  7.02   3.0    1.0    1.633    .000    .00    .00
      55   94 3075   -1    78 45 59.40   3.0    1.0     .239    .000    .00    .00
      56   94 3090   -1    78 12 41.50   3.0    1.0     .239    .000    .00    .00
      57   94 3105   -1    78  4 42.25   3.0    1.0     .239    .000    .00    .00
      58   94 3120   -1    78 24 43.88   3.0    1.0     .239    .000    .00    .00
      59   94 3135   -1    79 13 59.15   3.0    1.0     .239    .000    .00    .00
      60   94 3150   -1    80 30 51.78   3.0    1.0     .239    .000    .00    .00
      61   94 3165   -1    82 10 42.08   3.0    1.0     .239    .000    .00    .00
      62   96 3015   -1    84 32 50.85   3.0    1.0     .233    .000    .00    .00
      63   96 3030   -1    83 33 16.92   3.0    1.0     .233    .000    .00    .00
      64   96 3045   -1    82 41  3.60   3.0    1.0     .233    .000    .00    .00
      65   96 3060   -1    81 59 52.45   3.0    1.0     .233    .000    .00    .00
      66   96 3075   -1    81 32 23.25   3.0    1.0     .233    .000    .00    .00
      67   96 3090   -1    81 20 38.62   3.0    1.0     .233    .000    .00    .00
      68   96 3105   -1    81 26  9.38   3.0    1.0     .239    .000    .00    .00
      69   96 3120   -1    81 48  6.60   3.0    1.0     .239    .000    .00    .00
      70   96 3135   -1    82 25 34.72   3.0    1.0     .239    .000    .00    .00
      71   96 3150   -1    83 16  8.80   3.0    1.0     .239    .000    .00    .00
      72   96 3165   -1    84 16 26.68   3.0    1.0     .239    .000    .00    .00
      73   99 3015   -1    84 18 21.22   3.0    1.0    1.438    .000    .00    .00
      74   99 3030   -1    82 40 11.60   3.0    1.0    1.438    .000    .00    .00
      75   99 3045   -1    81 19 22.65   3.0    1.0    1.438    .000    .00    .00
      76   99 3060   -1    80 21 54.55   3.0    1.0    1.438    .000    .00    .00
      77   99 3075   -1    79 50 47.10   3.0    1.0    1.438    .000    .00    .00
      78   99 3090   -1    79 47  1.98   3.0    1.0    1.438    .000    .00    .00
      79   99 3105   -1    80  9 43.30   3.0    1.0    1.438    .000    .00    .00
      80   99 3120   -1    80 56  2.98   3.0    1.0    1.438    .000    .00    .00
 1INPUT                                                  DATE: 08-12-**  TIME: 14:46:14   PAGE    5
```

ASTRONOMIC POSITION DIFFERENCES TO BE THE SAME AS GEODETIC

```
         FROM    TO

    81    94    42
    82    94    50
    83    94    95
    84    94    96
    85    94    99
    86    94  3015
    87    94  3030
    88    94  3045
    89    94  3060
    90    94  3075
    91    94  3090
    92    94  3105
    93    94  3120
    94    94  3135
    95    94  3150
    96    94  3165
    97    94  2006
```

```
1INPUT                                                       DATE: 08-12-**  TIME: 14:46:14   PAGE    6
```

```
   A PRIORI STANDARD ERRORS (UNLESS OVERRIDEN BY INPUT ON OBSERVATION CARD)

                               VECTOR SUM OF

   DIRECTIONS                    1.0 MM    1.0 SEC.
   AZIMUTHS                      2.0 MM    1.3 SEC.
   RECIPROCAL VERTICAL ANGLES    7.0 MM    9.0 SEC.
   GROUPED VERTICAL ANGLES       3.0 MM    5.0 SEC.
   ABSOLUTE DISTANCES            5.0 MM    9.9 PPM
   RELATIVE DISTANCES            5.0 MM    9.9 PPM
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD       HAVAGO VERSION 90.07.18    DATE: 08-12-**  TIME: 14:46:14   PAGE    7

   JOB STATISTICS


   ELLIPSOID:  ITRF2000       A = 6378137.000   1/F = 298.2572221

                         GGAO - GODDARD SPACE FLIGHT CENTER

   STANDARD ERROR OF UNIT WEIGHT =   .23, VARIANCE =   .05,  39 DEGREES OF FREEDOM.


    138 OBSERVATIONS                              2 ITERATIONS
     44 DIRECTIONS                               18 STATIONS
      0 ASTR. AZIMUTHS                           99 UNKNOWNS
      0 REC. VERTICAL ANGLES                      8 LISTS OF DIRECTIONS
     36 GROUPED VERTICAL ANGLES                   1 REFRACTION UNKNOWNS
```

```
   0 ABSOLUTE DISTANCES                              0 SCALE UNKNOWNS
   0 RELATIVE DISTANCES
   0 ELEVATION DIFFERENCES
   0 LAT., LON., HEIGHT DIFFERENCES
   0 PLANE DISTANCES
   1 OBSERVED ASTR. LATITUDES
   1 OBSERVED ASTR. LONGITUDES
   7 CONSTRAINED GEOD. LATITUDES
   7 CONSTRAINED GEOD. LONGITUDES
   7 CONSTRAINED GEOD. HEIGHTS
  17 ASTR. POSITION DIFFERENCES

 DK/DH ASSUMED AS   -.010/1000 IF K VALUES NOT INPUT.




 SELECTED OPTIONS:

 CC  FLAG   OPTION

 31   9    ITERATIONS
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD        HAVAGO VERSION 90.07.18      DATE: 08-12-** TIME: 14:46:14   PAGE    8

 ADJUSTED DATA: STATIONS


 STATION                                  LATITUDE      SIGMA       LONGITUDE      SIGMA      HEIGHT     SIGMA

   42    CDP 7108                     39  1 18.93344   .00001    76 49 35.55262   .00001     13.752     .000
   50    JPL 4005                     39  1 18.02142   .00001    76 49 37.51423   .00001     14.246     .000
   94    VLBI PIER-A                  39  1 19.91876   .00001    76 49 35.36268   .00001     13.771     .000
   95    VLBI PIER-B                  39  1 16.36233   .00001    76 49 38.36597   .00001     17.759     .000
   96    VLBI PIER-C                  39  1 19.44905   .00001    76 49 37.49952   .00001     12.662     .000
   99    7108 RM1                     39  1 18.36794   .00001    76 49 34.47767   .00001     13.364     .000
 3015    SOUTH QUAD 1                 39  1 18.82059   .00001    76 49 35.55297   .00002     17.732     .000
 3030    SOUTH QUAD 2                 39  1 18.83212   .00001    76 49 35.55299   .00002     18.604     .000
 3045    SOUTH QUAD 3                 39  1 18.85063   .00001    76 49 35.55302   .00002     19.356     .000
 3060    SOUTH QUAD 4                 39  1 18.87476   .00001    76 49 35.55301   .00002     19.932     .000
 3075    SOUTH QUAD 5                 39  1 18.90290   .00001    76 49 35.55303   .00001     20.297     .000
 3090    SOUTH QUAD 6                 39  1 18.93320   .00001    76 49 35.55303   .00001     20.423     .000
 3105    SOUTH QUAD 7                 39  1 18.96351   .00001    76 49 35.55305   .00001     20.304     .000
 3120    SOUTH QUAD 8                 39  1 18.99176   .00001    76 49 35.55306   .00001     19.946     .000
 3135    SOUTH QUAD 9                 39  1 19.01604   .00001    76 49 35.55308   .00001     19.375     .000
 3150    SOUTH QUAD 10                39  1 19.03469   .00001    76 49 35.55308   .00001     18.629     .000
 3165    SOUTH QUAD 11                39  1 19.04644   .00001    76 49 35.55309   .00001     17.758     .001
 2006    MV3 AXIS 07 (PRELIM)         39  1 18.93300   .00001    76 49 35.55200   .00001     16.800     .000
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD        HAVAGO VERSION 90.07.18      DATE: 08-12-** TIME: 14:46:14   PAGE    9

 ADJUSTED DATA: DIRECTIONS

     FROM   TO LIST   OBSERVED      V    N.V    ADJUSTED     DIST.        AZ.        V.A.
```

```
 1   50   95  1    0  0    .00    1.18    .31    0  0    .00     55.225  201 49 29.47   86 21 12.75   JLL/TDC NOV 07
 2   50 3015  1  220 35 39.82    .07    .02  220 35 38.71     53.342   62 25  8.18   86 15 12.39
 3   50 3030  1  220 15 21.82    .09    .02  220 15 20.73     53.571   62  4 50.21   85 20  2.97
 4   50 3045  1  219 43  1.85    .04    .01  219 43   .71     53.905   61 32 30.19   84 33 39.20
 5   50 3060  1  219  1 24.90   -.12   -.03  219  1 23.60     54.319   60 50 53.07   83 59 30.66
 6   50 3075  1  218 13 33.08  -1.03   -.26  218 13 30.87     54.784   60  3   .35   83 39 35.08
 7   50 3090  1  217 22 51.18   -.24   -.06  217 22 49.76     55.267   59 12 19.24   83 34 59.29

 8   50   95  2    0  0    .00   -.83   -.21    0  0    .00     55.225  201 49 29.47   86 21 12.75
 9   50 3105  2  216 32 58.68    .93    .24  216 33   .44     55.735   58 22 29.92   83 45 39.03
10   50 3120  2  215 47 20.35   -.34   -.09  215 47 20.84     56.156   57 36 50.31   84 10 29.33
11   50 3135  2  215  8 40.60    .34    .09  215  8 41.77     56.504   56 58 11.24   84 47 33.90
12   50 3150  2  214 39 23.48   -.12   -.03  214 39 24.19     56.756   56 28 53.67   85 34 18.00

13   94   95  1    0  0    .00    .13    .07    0  0    .00    131.390  213 22 29.55   88 15 40.24   JLL/TDC NOV 07
14   94 3075  1  334 56 28.82  -1.45   -.23  334 56 27.23     32.325  188 18 56.79   78 21 11.49
15   94 3090  1  335 11 35.80   -.13   -.02  335 11 35.54     31.447  188 34  5.09   77 47 12.87

16   94   95  2    0  0    .00   -.07   -.04    0  0    .00    131.390  213 22 29.55   88 15 40.24
17   94 3105  2  335 27 40.50    .89    .13  335 27 41.46     30.519  188 50 11.02   77 38 21.75
18   94 3120  2  335 43 36.40   -.24   -.03  335 43 36.23     29.602  189  6  5.79   77 57 32.57
19   94 3135  2  335 58  5.40    .47    .07  335 58  5.94     28.763  189 20 35.50   78 45 53.73
20   94 3150  2  336  9 43.62   -.15   -.02  336  9 43.54     28.068  189 32 13.09   80  1 59.02
21   94 3165  2  336 17 19.10    .00    .00  336 17 19.17     27.577  189 39 48.72   81 41 11.42

22   96   95  1    0  0    .00   -.21   -.09    0  0    .00     97.576  192 21  3.84   87  0 21.96
23   96 3015  1  280  7 58.45   -.36   -.09  280  7 58.30     50.930  112 29  2.13   84 17 12.14
24   96 3030  1  279 45 38.62   -.47   -.11  279 45 38.36     50.890  112  6 42.20   83 17 40.06
25   96 3045  1  279  9 32.08   -.07   -.02  279  9 32.22     50.773  111 30 36.06   82 25 25.46
26   96 3060  1  278 21 58.70    .72    .17  278 21 59.63     50.587  110 43  3.47   81 44 13.05
27   96 3075  1  277 25 54.30    .32    .08  277 25 54.83     50.343  109 46 58.67   81 16 38.67
28   96 3090  1  276 24 46.88    .58    .14  276 24 47.67     50.057  108 45 51.51   81  4 49.24

29   96   95  2    0  0    .00    .35    .15    0  0    .00     97.576  192 21  3.84   87  0 21.96
30   96 3105  2  275 22 57.35  -1.58   -.37  275 22 55.42     49.750  107 43 59.26   81  9 50.44
31   96 3120  2  274 24 34.72    .58    .14  274 24 34.95     49.440  106 45 38.79   81 31 39.32
32   96 3135  2  273 33 58.45   -.26   -.06  273 33 57.84     49.150  105 55  1.68   82  9   .18
33   96 3150  2  272 54 48.20    .10    .02  272 54 47.95     48.900  105 15 51.79   82 59 28.38
34   96 3165  2  272 29 59.75    .00    .00  272 29 59.40     48.708  104 51  3.23   83 59 39.43

35   99   94  1    0  0    .00   -.01    .00    0  0    .00     52.350  336  0 11.96   89 33 17.48
36   99 3015  1  322 20 59.98   -.52   -.07  322 20 59.47     29.716  298 21 11.42   81 32 48.29
37   99 3030  1  322 57 21.62   -.64   -.09  322 57 20.99     30.025  298 57 32.94   79 56 53.70
38   99 3045  1  323 54 50.38   -.06   -.01  323 54 50.33     30.441  299 55  2.28   78 38 49.50
39   99 3060  1  325  8 11.88   1.02    .15  325  8 12.91     30.928  301  8 24.87   77 44 18.50
40   99 3075  1  326 31 27.08   -.69   -.10  326 31 26.40     31.455  302 31 38.36   77 16  2.21
41   99 3090  1  327 58 14.72    .79    .12  327 58 15.52     31.982  303 58 27.47   77 14 52.93

42   99   94  2    0  0    .00    .31    .08    0  0    .00     52.350  336  0 11.96   89 33 17.48
43   99 3105  2  329 22 14.62  -1.26   -.20  329 22 13.05     32.476  305 22 25.01   77 39 39.20
```

ADJUSTED DATA: DIRECTIONS

```
      FROM   TO LIST   OBSERVED      V     N.V     ADJUSTED      DIST.        AZ.         V.A.

   44   99 3120    2  330 37 58.22   .48    .08  330 37 58.39     32.903  306 38 10.35   78 27 36.16
```
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 14:46:14   PAGE 11

ADJUSTED DATA: GROUPED VERTICAL ANGLES

```
      FROM   TO LIST    OBSERVED    REF/KM    V     N.V     ADJUSTED      DIST.        AZ.

   45   50 3015   -1   86 15 14.79    .00   -2.40   -.21   86 15 12.39     53.342   62 25  8.18
   46   50 3030   -1   85 20  6.61    .00   -3.64   -.31   85 20  2.97     53.571   62  4 50.21
   47   50 3045   -1   84 33 41.38    .00   -2.18   -.19   84 33 39.20     53.905   61 32 30.19
   48   50 3060   -1   83 59 33.20    .00   -2.54   -.22   83 59 30.66     54.319   60 50 53.07
   49   50 3075   -1   83 39 39.61    .00   -4.53   -.40   83 39 35.08     54.784   60  3   .35
   50   50 3090   -1   83 35  3.03    .00   -3.74   -.33   83 34 59.29     55.267   59 12 19.24
   51   50 3105   -1   83 45 38.49    .00    .54    .05   83 45 39.03     55.735   58 22 29.92
   52   50 3120   -1   84 10 27.87    .00   1.46    .13   84 10 29.33     56.156   57 36 50.31
   53   50 3135   -1   84 47 32.80    .00   1.10    .10   84 47 33.90     56.504   56 58 11.24
   54   50 3150   -1   85 34 18.43    .00   -.44   -.04   85 34 18.00     56.756   56 28 53.67
   55   94 3075   -1   78 21  3.55    .00   7.94    .41   78 21 11.49     32.325  188 18 56.79
   56   94 3090   -1   77 47  6.92    .00   5.96    .30   77 47 12.87     31.447  188 34  5.09
   57   94 3105   -1   77 38 21.78    .00   -.04    .00   77 38 21.75     30.519  188 50 11.02
   58   94 3120   -1   77 57 32.49    .00    .08    .00   77 57 32.57     29.602  189  6  5.79
   59   94 3135   -1   78 45 55.41    .00   -1.68   -.08   78 45 53.73     28.763  189 20 35.50
   60   94 3150   -1   80  1 59.45    .00   -.43   -.02   80  1 59.02     28.068  189 32 13.09
   61   94 3165   -1   81 41 11.08    .00    .33    .01   81 41 11.42     27.577  189 39 48.72
   62   96 3015   -1   84 17 11.48    .00    .66    .05   84 17 12.14     50.930  112 29  2.13
   63   96 3030   -1   83 17 38.51    .00   1.55    .13   83 17 40.06     50.890  112  6 42.20
   64   96 3045   -1   82 25 24.74    .00    .72    .06   82 25 25.46     50.773  111 30 36.06
   65   96 3060   -1   81 44 11.65    .00   1.40    .11   81 44 13.05     50.587  110 43  3.47
   66   96 3075   -1   81 16 38.99    .00   -.32   -.03   81 16 38.67     50.343  109 46 58.67
   67   96 3090   -1   81  4 49.46    .00   -.22   -.02   81  4 49.24     50.057  108 45 51.51
   68   96 3105   -1   81  9 49.52    .00    .92    .07   81  9 50.44     49.750  107 43 59.26
   69   96 3120   -1   81 31 39.68    .00   -.36   -.03   81 31 39.32     49.440  106 45 38.79
   70   96 3135   -1   82  9   .47    .00   -.29   -.02   82  9   .18     49.150  105 55  1.68
   71   96 3150   -1   82 59 27.62    .00    .75    .06   82 59 28.38     48.900  105 15 51.79
   72   96 3165   -1   83 59 39.62    .00   -.19   -.01   83 59 39.43     48.708  104 51  3.23
   73   99 3015   -1   81 32 45.11    .00   3.18    .15   81 32 48.29     29.716  298 21 11.42
   74   99 3030   -1   79 56 49.80    .00   3.90    .19   79 56 53.70     30.025  298 57 32.94
   75   99 3045   -1   78 38 46.82    .00   2.68    .13   78 38 49.50     30.441  299 55  2.28
   76   99 3060   -1   77 44 16.28    .00   2.22    .11   77 44 18.50     30.928  301  8 24.87
   77   99 3075   -1   77 16  1.88    .00    .33    .02   77 16  2.21     31.455  302 31 38.36
   78   99 3090   -1   77 14 51.91    .00   1.03    .05   77 14 52.93     31.982  303 58 27.47
   79   99 3105   -1   77 39 41.53    .00   -2.32   -.12   77 39 39.20     32.476  305 22 25.01
   80   99 3120   -1   78 27 38.21    .00   -2.05   -.11   78 27 36.16     32.903  306 38 10.35
```
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 14:46:14   PAGE 12

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

	STATION			OBSERVED	V	N.V	ADJUSTED	SIGMA
98	42	CDP 7108	LAT	39 1 18.93	.00	.00	39 1 18.93	.02 NOT OBS.
99	42	CDP 7108	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
100	50	JPL 4005	LAT	39 1 18.02	.00	.00	39 1 18.02	.02 NOT OBS.
101	50	JPL 4005	LON	76 49 37.51	.00	.00	76 49 37.51	.02 NOT OBS.
102	94	VLBI PIER-A	LAT	39 1 19.92	.00	.00	39 1 19.92	.00
103	94	VLBI PIER-A	LON	76 49 35.36	.00	.00	76 49 35.36	.00
104	95	VLBI PIER-B	LAT	39 1 16.36	.00	.00	39 1 16.36	.02 NOT OBS.
105	95	VLBI PIER-B	LON	76 49 38.37	.00	.00	76 49 38.36	.02 NOT OBS.
106	96	VLBI PIER-C	LAT	39 1 19.45	.00	.00	39 1 19.45	.02 NOT OBS.
107	96	VLBI PIER-C	LON	76 49 37.50	.00	.00	76 49 37.50	.02 NOT OBS.
108	99	7108 RM1	LAT	39 1 18.37	.00	.00	39 1 18.37	.02 NOT OBS.
109	99	7108 RM1	LON	76 49 34.48	.00	.00	76 49 34.48	.02 NOT OBS.
110	3015	SOUTH QUAD 1	LAT	39 1 18.82	.00	.00	39 1 18.82	.02 NOT OBS.
111	3015	SOUTH QUAD 1	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
112	3030	SOUTH QUAD 2	LAT	39 1 18.83	.00	.00	39 1 18.83	.02 NOT OBS.
113	3030	SOUTH QUAD 2	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
114	3045	SOUTH QUAD 3	LAT	39 1 18.85	.00	.00	39 1 18.85	.02 NOT OBS.
115	3045	SOUTH QUAD 3	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
116	3060	SOUTH QUAD 4	LAT	39 1 18.87	.00	.00	39 1 18.88	.02 NOT OBS.
117	3060	SOUTH QUAD 4	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
118	3075	SOUTH QUAD 5	LAT	39 1 18.90	.00	.00	39 1 18.90	.02 NOT OBS.
119	3075	SOUTH QUAD 5	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
120	3090	SOUTH QUAD 6	LAT	39 1 18.93	.00	.00	39 1 18.93	.02 NOT OBS.
121	3090	SOUTH QUAD 6	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
122	3105	SOUTH QUAD 7	LAT	39 1 18.96	.00	.00	39 1 18.96	.02 NOT OBS.
123	3105	SOUTH QUAD 7	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
124	3120	SOUTH QUAD 8	LAT	39 1 18.99	.00	.00	39 1 18.99	.02 NOT OBS.
125	3120	SOUTH QUAD 8	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
126	3135	SOUTH QUAD 9	LAT	39 1 19.02	.00	.00	39 1 19.02	.02 NOT OBS.
127	3135	SOUTH QUAD 9	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
128	3150	SOUTH QUAD 10	LAT	39 1 19.03	.00	.00	39 1 19.04	.02 NOT OBS.
129	3150	SOUTH QUAD 10	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.

```
130   3165    SOUTH QUAD 11                LAT   39  1 19.05      .00      .00    39  1 19.05     .02 NOT OBS.
131   3165    SOUTH QUAD 11                LON   76 49 35.55      .00      .00    76 49 35.55     .02 NOT OBS.
```

```
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD        HAVAGO VERSION 90.07.18     DATE: 08-12-** TIME: 14:46:14  PAGE  13
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ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

```
         STATION                                      OBSERVED        V       N.V      ADJUSTED       SIGMA

    132   2006    MV3 AXIS 07 (PRELIM)         LAT   39  1 18.93      .00      .00    39  1 18.93     .02 NOT OBS.
    133   2006    MV3 AXIS 07 (PRELIM)         LON   76 49 35.55      .00      .00    76 49 35.55     .02 NOT OBS.
```

```
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD        HAVAGO VERSION 90.07.18     DATE: 08-12-** TIME: 14:46:14  PAGE  14
```

GEODETIC LATITUDE CONSTRAINTS

```
     STATION     CONSTRAINED      V        N.V       ADJUSTED       SIGMA

    134    42    39  1 18.93344   .00000    .00000   39  1 18.93344   .00001
    135    50    39  1 18.02142   .00000    .09825   39  1 18.02142   .00001
    136    94    39  1 19.91876   .00000   -.06969   39  1 19.91876   .00001
    137    95    39  1 16.36233   .00000   -.05889   39  1 16.36233   .00001
    138    96    39  1 19.44905   .00000    .10301   39  1 19.44905   .00001
    139    99    39  1 18.36794   .00000   -.07267   39  1 18.36794   .00001
    140  2006    39  1 18.93300   .00000    .00000   39  1 18.93300   .00001
```

GEODETIC LONGITUDE CONSTRAINTS

```
     STATION     CONSTRAINED      V        N.V       ADJUSTED       SIGMA

    141    42    76 49 35.55262   .00000    .00000   76 49 35.55262   .00001
    142    50    76 49 37.51422   .00001    .15063   76 49 37.51423   .00001
    143    94    76 49 35.36268   .00000   -.00918   76 49 35.36268   .00001
    144    95    76 49 38.36598  -.00001   -.15589   76 49 38.36597   .00001
    145    96    76 49 37.49952   .00000    .00238   76 49 37.49952   .00001
    146    99    76 49 34.47767   .00000    .01206   76 49 34.47767   .00001
    147  2006    76 49 35.55200   .00000    .00000   76 49 35.55200   .00001
```

GEODETIC HEIGHT CONSTRAINTS

```
     STATION     CONSTRAINED     V       N.V     ADJUSTED      SIGMA

    148    42      13.7520     .0000      .0     13.7520       .000
    149    50      14.2460     .0005      .5     14.2465       .000
    150    94      13.7710    -.0002     -.2     13.7708       .000
    151    95      17.7590     .0000      .0     17.7590       .000
    152    96      12.6620    -.0001     -.1     12.6619       .000
```

```
   153     99        13.3640    -.0001    -.1     13.3639       .000
   154    2006       16.8000     .0000     .0     16.8000       .000
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD       HAVAGO VERSION 90.07.18      DATE: 08-12-** TIME: 14:46:14  PAGE  15

   ADJUSTED CARTESIAN COORDINATES

     DX          DY          DZ      EPSILON     PSI      OMEGA     SCALE

    .000        .000        .000       .000     .000      .000      .000

                                                                            TRANSFORMED COORDINATES
   STATION                                 X            Y            Z          X          Y          Z

     42    CDP 7108              1130794.717  -4831233.824  3994217.058
     50    JPL 4005              1130752.895  -4831262.194  3994195.520
     94    VLBI PIER-A           1130794.810  -4831214.170  3994240.677
     95    VLBI PIER-B           1130740.907  -4831300.885  3994157.982
     96    VLBI PIER-C           1130746.642  -4831233.925  3994228.725
     99    7108 RM1              1130822.329  -4831238.328  3994203.266
   3015    SOUTH QUAD 1          1130795.913  -4831238.970  3994216.861
   3030    SOUTH QUAD 2          1130796.016  -4831239.412  3994217.686
   3045    SOUTH QUAD 3          1130796.067  -4831239.631  3994218.603
   3060    SOUTH QUAD 4          1130796.062  -4831239.611  3994219.544
   3075    SOUTH QUAD 5          1130796.002  -4831239.355  3994220.448
   3090    SOUTH QUAD 6          1130795.890  -4831238.878  3994221.253
   3105    SOUTH QUAD 7          1130795.734  -4831238.214  3994221.904
   3120    SOUTH QUAD 8          1130795.546  -4831237.410  3994222.356
   3135    SOUTH QUAD 9          1130795.337  -4831236.519  3994222.578
   3150    SOUTH QUAD 10         1130795.122  -4831235.602  3994222.555
   3165    SOUTH QUAD 11         1130794.915  -4831234.721  3994222.288
   2006    MV3 AXIS 07 (PRELIM)  1130795.273  -4831236.135  3994218.967
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD                        DATE: 08-12-** TIME: 14:46:14  PAGE  16

   MISCELLANEOUS DATA FOR SELECTED LINES, PART 1

   FROM    TO       STANDARD    CORRELATION COEFF.       STANDARD    CORRELATION COEFF.   DX,DY,DZ   AZ.,DIST.,V.A.    AZ.,DIST.,B.AZ.
                    ERRORS     AZ.   DIST.  V.A.         ERRORS      DX    DY    DZ                                    (GEODETIC)

   2006   3015   AZ.  29.22   1.00  -.17   .03      DX   .0005     1.00  -.03  -.04       .6397    180 23 10.73      180 23 10.72
                 DIST. .0004   -.17  1.00   .18      DY   .0004     -.03  1.00  -.36     -2.8356        3.5897            3.4665
                 V.A. 27.19    .03   .18  1.00       DZ   .0004     -.04  -.36  1.00     -2.1062    74 56 52.53       0 23 10.72

   2006   3030   AZ.  32.30   1.00  -.14   .06      DX   .0005     1.00  -.03  -.04       .7427    180 26 15.25      180 26 15.24
                 DIST. .0004   -.14  1.00   .30      DY   .0004     -.03  1.00  -.36     -3.2775        3.5964            3.1110
                 V.A. 25.84    .06   .30  1.00       DZ   .0004     -.04  -.36  1.00     -1.2808    59 53 12.06       0 26 15.24

   2006   3045   AZ.  39.12   1.00  -.11   .09      DX   .0005     1.00  -.04  -.04       .7932    180 33  9.47      180 33  9.46
                 DIST. .0004   -.11  1.00   .34      DY   .0004     -.04  1.00  -.36     -3.4965        3.6038            2.5403
                 V.A. 23.88    .09   .34  1.00       DZ   .0004     -.04  -.36  1.00      -.3640    44 49 13.84       0 33  9.46

   2006   3060   AZ.  54.58   1.00  -.07   .12      DX   .0005     1.00  -.04  -.04       .7888    180 46 18.92      180 46 18.91
```

```
          DIST.  .0005   -.07  1.00   .30    DY  .0004   -.04  1.00  -.36    -3.4761        3.6108          1.7963
          V.A. 21.75     .12   .30  1.00    DZ  .0004   -.04  -.36  1.00      .5767   29 49 58.63     0 46 18.91

2006 3075 AZ.  78.95    1.00  -.01   .01    DX  .0004   1.00  -.07   .06      .7282  181 31 24.31   181 31 24.28
          DIST.  .0004   -.01  1.00   .13    DY  .0004   -.07  1.00  -.26    -3.2197        3.6178           .9284
          V.A. 19.31     .01   .13  1.00    DZ  .0004    .06  -.26  1.00     1.4805   14 52 12.76     1 31 24.27

2006 3090 AZ.2673.03    1.00  -.01   .01    DX  .0004   1.00  -.07   .06      .6164  284  8 39.63   284  8 40.07
          DIST.  .0004   -.01  1.00   .01    DY  .0004   -.07  1.00  -.26    -2.7428        3.6235           .0257
          V.A. 20.16     .01   .01  1.00    DZ  .0004    .06  -.26  1.00     2.2863    0 24 21.33   104  8 40.07

2006 3105 AZ.  77.30    1.00   .00   .01    DX  .0004   1.00  -.06   .07      .4608  358 27 38.69   358 27 38.72
          DIST.  .0004    .00  1.00   .15    DY  .0004   -.06  1.00  -.26    -2.0796        3.6281           .9411
          V.A. 19.36     .01   .15  1.00    DZ  .0004    .07  -.26  1.00     2.9370   15  2  2.36   178 27 38.71

2006 3120 AZ.  40.08    1.00   .01   .01    DX  .0004   1.00  -.06   .07      .2723  359 11 43.26   359 11 43.28
          DIST.  .0004    .01  1.00   .24    DY  .0004   -.06  1.00  -.25    -1.2749        3.6308          1.8122
          V.A. 20.61     .01   .24  1.00    DZ  .0004    .07  -.25  1.00     3.3887   29 56 31.00   179 11 43.28

2006 3135 AZ.  29.60    1.00   .08  -.05    DX  .0004   1.00  -.04   .16      .0632  359 25  9.67   359 25  9.68
          DIST.  .0004    .08  1.00   .29    DY  .0004   -.04  1.00  -.25    -.3838        3.6317          2.5610
          V.A. 24.42    -.05   .29  1.00    DZ  .0004    .16  -.25  1.00     3.6108   44 50 41.96   179 25  9.68

2006 3150 AZ.  24.24    1.00   .10  -.04    DX  .0004   1.00  -.04   .16     -.1516  359 31 23.36   359 31 23.37
          DIST.  .0004    .10  1.00   .24    DY  .0004   -.04  1.00  -.25      .5330        3.6304          3.1360
          V.A. 26.02    -.04   .24  1.00    DZ  .0004    .16  -.25  1.00     3.5878   59 44 57.37   179 31 23.37

2006 3165 AZ.  22.38    1.00   .03   .01    DX  .0004   1.00  -.13   .13     -.3580  359 34  7.50   359 34  7.50
          DIST.  .0004    .03  1.00   .17    DY  .0005   -.13  1.00  -.33     1.4138        3.6273          3.4984
          V.A. 31.73     .01   .17  1.00    DZ  .0005    .13  -.33  1.00     3.3212   74 40 56.18   179 34  7.50
```

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   DATE: 08-12-** TIME: 14:46:14PAGE 17

MISCELLANEOUS DATA FOR SELECTED LINES, PART 2

```
            E Q U A T O R I A L    S Y S T E M              HORIZON SYSTEM, ORIGIN AT THE STANDPOINT

FROM   TO     ALTITUDE      AZIMUTH      DISTANCE     DN     SIGMA     DE     SIGMA     DU     SIGMA

2006 3015  35 55 29.25  282 42 45.97     3.5897   -3.4664  .0003   -.0234  .0005    .9322  .0005
2006 3030  20 51 48.80  282 46  6.19     3.5964   -3.1109  .0003   -.0238  .0005   1.8044  .0005
2006 3045   5 47 49.62  282 46 54.90     3.6038   -2.5401  .0003   -.0245  .0005   2.5562  .0005
2006 3060   9 11 27.64  282 47  4.06     3.6108   -1.7961  .0003   -.0242  .0005   3.1323  .0005
2006 3075  24  9 22.11  282 44 42.11     3.6178    -.9281  .0003   -.0247  .0004   3.4966  .0004
2006 3090  39  7 12.08  282 39 57.97     3.6235     .0063  .0003   -.0249  .0004   3.6234  .0004
2006 3105  54  2 55.75  282 29 36.41     3.6281     .9408  .0003   -.0253  .0004   3.5039  .0004
2006 3120  68 57 27.96  282  3 17.59     3.6308    1.8121  .0003   -.0254  .0004   3.1462  .0004
2006 3135  83 51  6.64  279 20 50.82     3.6317    2.5609  .0004   -.0260  .0004   2.5749  .0005
2006 3150  81 13 12.27  105 52 22.86     3.6304    3.1359  .0004   -.0261  .0004   1.8289  .0005
2006 3165  66 17 34.00  104 12 28.79     3.6273    3.4983  .0004   -.0263  .0004    .9582  .0006
```

F.1.6 Circle Fit Output for South Quadrant

```
Circle Radius: 3.6030966e+00
Circle Center: (1.9586481e-02, 2.0425363e-02)
```

ID	X-coord	Y-coord	Gamma-x	Gamma-y	Gamma
1	-3.4664000	0.9322000	0.0001517	-0.0000397	0.0001568
2	-3.1109000	1.8044000	0.0000249	-0.0000142	0.0000286
3	-2.5401000	2.5562000	-0.0000155	0.0000153	-0.0000218
4	-1.7961000	3.1323000	-0.0001275	0.0002186	-0.0002531
5	-0.9281000	3.4966000	-0.0000148	0.0000542	-0.0000562
6	0.0063000	3.6234000	-0.0000004	0.0000974	-0.0000974
7	0.9408000	3.5039000	-0.0000328	-0.0001241	0.0001284
8	1.8121000	3.1462000	-0.0000875	-0.0001525	0.0001758
9	2.5609000	2.5749000	-0.0001282	-0.0001289	0.0001818
10	3.1359000	1.8289000	0.0000377	0.0000219	-0.0000436
11	3.4983000	0.9582000	0.0001924	0.0000519	-0.0001993

```
Radius = 3.6031 m
DN = +0.01959 m
DU = +0.0204 m
```

F.1.7 HAVAGO Output for West Quadrant (VLBI Antenna Azimuth 270 degrees)

```
INPUT FILE IS mv3w_g1.txt
OUTPUT FILE IS mv3w_g1.hav



                  GGAO - GODDARD SPACE FLIGHT CENTER
                       GREENBELT, MARYLAND

GODDARD GEOPHYSICAL ASTRONOMICAL OBSERVATORY SURVEY CONTROL SCHEME/ADJUSTMENT

THIS ADJUSTMENT CONTAINS SELECTED UPDATED SURVEY OBSERVATIONS MADE AT THE
GODDARD GEOPHYSICAL ASTRONOMICAL OBSERVATORY (GGAO) FORMERLY (GORF) in
NOVEMBER 2007.

 NOTE: This a special survey data HAVAGO adjustment to provide
 updated vector and calibration data between the MOBLAS-7 and NG2000
 laser systems, their calibration piers, and the MV3 VLBI antenna.
 The field survey data was observed in November 2007.


The geodetic positions and heights of the constrained survey control
monuments for this adjustment were obtained from the final HAVAGO
adjustment of the November 2007 GGAO ground geodetic survey.
(GGAO07G.HAV).

The astronomic position of survey control monument VLBI PIER A
has been set to equal the ITRF2005 geodetic position.

*



FLAGS IN INPUT DATA:
   *  DELETED OBSERVATION
   #  DEWEIGHTED OBSERVATION
1INPUT                                        DATE: 08-12-**  TIME: 14:30:34  PAGE    1

STATION DATA

STATION  GEODETIC LAT.    GEODETIC LON.    GEOD.HT.  GEOD. ST. ERRORS (M)   STATION NAME                    CODES
NUMBER   ASTRONOMIC LAT.  ASTRONOMIC LON.  ELEV.      ASTR. ST. ERRORS         X           Y          Z

   42    39  1 18.93344   76 49 35.55262   13.752   .001   .001   .001     CDP 7108                        1 1 1
   42     0  0   .00        0  0   .00             10.00  15.00

   50    39  1 18.02142   76 49 37.51422   14.246   .001   .001   .001     JPL 4005                        1 1 1
   50     0  0   .00        0  0   .00             10.00  15.00
```

```
  94    39  1 19.91876    76 49 35.36268    13.771   .001   .001   .001      VLBI PIER-A                              1 1 1
  94    39  1 19.92       76 49 35.36                        .01    .01

  95    39  1 16.36233    76 49 38.36598    17.759   .001   .001   .001      VLBI PIER-B                              1 1 1
  95     0  0  .00         0  0  .00                 10.00  15.00

  96    39  1 19.44905    76 49 37.49952    12.662   .001   .001   .001      VLBI PIER-C                              1 1 1
  96     0  0  .00         0  0  .00                 10.00  15.00

  99    39  1 18.36794    76 49 34.47767    13.364   .001   .001   .001      7108 RM1                                 1 1 1
  99     0  0  .00         0  0  .00                 10.00  15.00

4015    39  1 18.93310    76 49 35.55081    16.800   .000   .000   .000      WEST QUAD 1                              0 0 0
4015     0  0  .00         0  0  .00                 10.00  15.00

4030    39  1 18.93310    76 49 35.55081    16.800   .000   .000   .000      WEST QUAD 2                              0 0 0
4030     0  0  .00         0  0  .00                 10.00  15.00

4045    39  1 18.93310    76 49 35.55081    16.800   .000   .000   .000      WEST QUAD 3                              0 0 0
4045     0  0  .00         0  0  .00                 10.00  15.00

4060    39  1 18.93310    76 49 35.55070    16.800   .000   .000   .000      WEST QUAD 4                              0 0 0
4060     0  0  .00         0  0  .00                 10.00  15.00

4075    39  1 18.93310    76 49 35.55070    16.800   .000   .000   .000      WEST QUAD 5                              0 0 0
4075     0  0  .00         0  0  .00                 10.00  15.00

4090    39  1 18.93310    76 49 35.55070    16.800   .000   .000   .000      WEST QUAD 6                              0 0 0
4090     0  0  .00         0  0  .00                 10.00  15.00

4105    39  1 18.93310    76 49 35.55070    16.800   .000   .000   .000      WEST QUAD 7                              0 0 0
4105     0  0  .00         0  0  .00                 10.00  15.00

4120    39  1 18.93310    76 49 35.55070    16.800   .000   .000   .000      WEST QUAD 8                              0 0 0
4120     0  0  .00         0  0  .00                 10.00  15.00

4135    39  1 18.93310    76 49 35.55070    16.800   .000   .000   .000      WEST QUAD 9                              0 0 0
4135     0  0  .00         0  0  .00                 10.00  15.00

4150    39  1 18.93310    76 49 35.55070    16.800   .000   .000   .000      WEST QUAD 10                             0 0 0
4150     0  0  .00         0  0  .00                 10.00  15.00

4165    39  1 18.93310    76 49 35.55070    16.800   .000   .000   .000      WEST QUAD 11                             0 0 0
4165     0  0  .00         0  0  .00                 10.00  15.00
1INPUT                                               DATE: 08-12-**  TIME: 14:30:34   PAGE    2

 STATION DATA

 STATION  GEODETIC LAT.   GEODETIC LON.   GEOD.HT.  GEOD. ST. ERRORS (M)   STATION NAME                       CODES
 NUMBER   ASTRONOMIC LAT. ASTRONOMIC LON. ELEV.     ASTR. ST. ERRORS            X             Y             Z
```

```
 2006     39  1 18.93300   76 49 35.55200    16.800  .001   .001   .001    MV3 AXIS 07 (PRELIM)            1 1 1
 2006      0  0  .00       0  0  .00                  10.00 15.00
1INPUT                                                           DATE: 08-12-**  TIME: 14:30:34   PAGE    3

  DIRECTIONS

      FROM  TO  LIST    OBSERVED      MM    SEC.

    1  50   95   1      0  0   .00    1.0   1.0    JLL/TDC NOV 07
    2  50 4015   1    215 23 45.08    1.0   1.0
    3  50 4030   1    215 36 25.15    1.0   1.0
    4  50 4045   1    215 56 27.20    1.0   1.0
    5  50 4060   1    216 21 56.02    1.0   1.0
    6  50 4075   1    216 51   .98    1.0   1.0
    7  50 4090   1    217 21 24.50    1.0   1.0
    8  50 4105   1    217 50 56.58    1.0   1.0
    9  50 4120   1    218 17 40.78    1.0   1.0
   10  94   95   1      0  0   .00    1.0   1.0    JLL/TDC NOV 07
   11  94 4015   1    341 28 45.45    1.0   1.0
   12  94 4030   1    340 51   .48    1.0   1.0
   13  94 4045   1    339 50  4.00    1.0   1.0
   14  94 4060   1    338 29 56.48    1.0   1.0
   15  94 4075   1    336 55 12.12    1.0   1.0
   16  94 4090   1    335 12 16.72    1.0   1.0
   17  94 4105   1    333 28 22.50    1.0   1.0
   18  94 4120   1    331 50 52.72    1.0   1.0
   19  94 4135   1    330 26 35.40    1.0   1.0
   20  94 4150   1    329 21 39.95    1.0   1.0
   21  94 4165   1    328 40 44.90    1.0   1.0
   22  96   95   1      0  0   .00    1.0   1.0
   23  96 4015   1    277 46 20.65    1.0   1.0
   24  96 4030   1    277 37 18.12    1.0   1.0
   25  96 4045   1    277 23  6.90    1.0   1.0
   26  96 4060   1    277  4 59.22    1.0   1.0
   27  96 4075   1    276 44 29.02    1.0   1.0
   28  96 4090   1    276 23 10.48    1.0   1.0
   29  96 4105   1    276  2 40.50    1.0   1.0
   30  99   94   1      0  0   .00    1.0   1.0
   31  99 4075   1    327  4 10.50    1.0   1.0
   32  99 4090   1    328  0 23.75    1.0   1.0
   33  99 4105   1    328 59 30.70    1.0   1.0
   34  99 4120   1    329 57 15.98    1.0   1.0
   35  99   96   2      0  0   .00    1.0   1.0
   36  99 4135   2     12 11 10.60    1.0   1.0
   37  99 4150   2     12 52 29.45    1.0   1.0
   38  99 4165   2     13 19 14.38    1.0   1.0
1INPUT                                                           DATE: 08-12-**  TIME: 14:30:34   PAGE    4

  GROUPED VERTICAL ANGLES

      FROM  TO  LIST    OBSERVED      MM    SEC.     H.I.    H.T.    K1     K2
```

```
39   50 4015  -1    87 57 27.85   3.0   1.0    1.633    .000    .00    .00
40   50 4030  -1    87  0 51.80   3.0   1.0    1.633    .000    .00    .00
41   50 4045  -1    86 13 42.70   3.0   1.0    1.633    .000    .00    .00
42   50 4060  -1    85 39 29.75   3.0   1.0    1.633    .000    .00    .00
43   50 4075  -1    85 20  2.25   3.0   1.0    1.633    .000    .00    .00
44   50 4090  -1    85 16 13.10   3.0   1.0    1.633    .000    .00    .00
45   50 4105  -1    85 27 37.80   3.0   1.0    1.633    .000    .00    .00
46   50 4120  -1    85 52 55.05   3.0   1.0    1.633    .000    .00    .00
47   94 4015  -1    83 14 25.90   3.0   1.0     .239    .000    .00    .00
48   94 4030  -1    81 39 13.48   3.0   1.0     .239    .000    .00    .00
49   94 4045  -1    80 16 19.60   3.0   1.0     .239    .000    .00    .00
50   94 4060  -1    79 11 35.75   3.0   1.0     .239    .000    .00    .00
51   94 4075  -1    78 29  5.32   3.0   1.0     .239    .000    .00    .00
52   94 4090  -1    78 12  5.50   3.0   1.0     .239    .000    .00    .00
53   94 4105  -1    78 22 10.82   3.0   1.0     .239    .000    .00    .00
54   94 4120  -1    78 58 55.32   3.0   1.0     .239    .000    .00    .00
55   94 4135  -1    80  0  9.15   3.0   1.0     .239    .000    .00    .00
56   94 4150  -1    81 21 40.92   3.0   1.0     .239    .000    .00    .00
57   94 4165  -1    82 58  6.00   3.0   1.0     .239    .000    .00    .00
58   96 4015  -1    84  1 27.30   3.0   1.0     .239    .000    .00    .00
59   96 4030  -1    83  0 19.42   3.0   1.0     .239    .000    .00    .00
60   96 4045  -1    82 11  3.48   3.0   1.0     .239    .000    .00    .00
61   96 4060  -1    81 37 14.35   3.0   1.0     .239    .000    .00    .00
62   96 4075  -1    81 20 21.00   3.0   1.0     .239    .000    .00    .00
63   96 4090  -1    81 20 53.30   3.0   1.0     .239    .000    .00    .00
64   96 4105  -1    81 37 52.48   3.0   1.0     .239    .000    .00    .00
65   99 4075  -1    80 15  6.45   3.0   1.0    1.437    .000    .00    .00
66   99 4090  -1    79 47 16.25   3.0   1.0    1.437    .000    .00    .00
67   99 4105  -1    79 45 11.88   3.0   1.0    1.437    .000    .00    .00
68   99 4120  -1    80 10 55.30   3.0   1.0    1.437    .000    .00    .00
69   99 4135  -1    81  4 39.70   3.0   1.0    1.437    .000    .00    .00
70   99 4150  -1    82 23 53.30   3.0   1.0    1.437    .000    .00    .00
71   99 4165  -1    84  3 17.20   3.0   1.0    1.437    .000    .00    .00
1INPUT                                    DATE: 08-12-**  TIME: 14:30:34   PAGE    5
```

```
  ASTRONOMIC POSITION DIFFERENCES TO BE THE SAME AS GEODETIC

      FROM   TO

   72   94    42
   73   94    50
   74   94    95
   75   94    96
   76   94    99
   77   94  4015
   78   94  4030
   79   94  4045
   80   94  4060
```

```
   81   94 4075
   82   94 4090
   83   94 4105
   84   94 4120
   85   94 4135
   86   94 4150
   87   94 4165
   88   94 2006
 1INPUT                                                      DATE: 08-12-**  TIME: 14:30:34   PAGE    6
```

 A PRIORI STANDARD ERRORS (UNLESS OVERRIDEN BY INPUT ON OBSERVATION CARD)

```
                                   VECTOR SUM OF

 DIRECTIONS                        1.0 MM     1.0 SEC.
 AZIMUTHS                          2.0 MM     1.3 SEC.
 RECIPROCAL VERTICAL ANGLES        7.0 MM     9.0 SEC.
 GROUPED VERTICAL ANGLES           3.0 MM     5.0 SEC.
 ABSOLUTE DISTANCES                5.0 MM     9.9 PPM
 RELATIVE DISTANCES                5.0 MM     9.9 PPM
```

```
 1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD        HAVAGO VERSION 90.07.18    DATE: 08-12-**  TIME: 14:30:34   PAGE    7

 JOB STATISTICS


 ELLIPSOID:  ITRF2000        A = 6378137.000   1/F = 298.2572221

                 GGAO - GODDARD SPACE FLIGHT CENTER

 STANDARD ERROR OF UNIT WEIGHT =   .17, VARIANCE =   .03,  33 DEGREES OF FREEDOM.


   129 OBSERVATIONS                              2 ITERATIONS
    38 DIRECTIONS                               18 STATIONS
     0 ASTR. AZIMUTHS                           96 UNKNOWNS
     0 REC. VERTICAL ANGLES                      5 LISTS OF DIRECTIONS
    33 GROUPED VERTICAL ANGLES                   1 REFRACTION UNKNOWNS
     0 ABSOLUTE DISTANCES                        0 SCALE UNKNOWNS
     0 RELATIVE DISTANCES
     0 ELEVATION DIFFERENCES
     0 LAT., LON., HEIGHT DIFFERENCES
     0 PLANE DISTANCES
     1 OBSERVED ASTR. LATITUDES
     1 OBSERVED ASTR. LONGITUDES
     7 CONSTRAINED GEOD. LATITUDES
```

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    7 CONSTRAINED GEOD. LONGITUDES
    7 CONSTRAINED GEOD. HEIGHTS
   17 ASTR. POSITION DIFFERENCES


  DK/DH ASSUMED AS   -.010/1000 IF K VALUES NOT INPUT.




  SELECTED OPTIONS:

  CC  FLAG   OPTION

  31   9   ITERATIONS
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD        HAVAGO VERSION 90.07.18        DATE: 08-12-** TIME: 14:30:34  PAGE    8

  ADJUSTED DATA: STATIONS


  STATION                                   LATITUDE      SIGMA       LONGITUDE      SIGMA      HEIGHT     SIGMA

    42     CDP 7108                      39  1 18.93344   .00001   76 49 35.55262   .00001     13.752      .000
    50     JPL 4005                      39  1 18.02142   .00000   76 49 37.51422   .00001     14.246      .000
    94     VLBI PIER-A                   39  1 19.91876   .00001   76 49 35.36268   .00001     13.771      .000
    95     VLBI PIER-B                   39  1 16.36233   .00001   76 49 38.36598   .00001     17.759      .000
    96     VLBI PIER-C                   39  1 19.44905   .00000   76 49 37.49952   .00001     12.662      .000
    99     7108 RM1                      39  1 18.36794   .00001   76 49 34.47767   .00001     13.364      .000
  4015     WEST QUAD 1                   39  1 18.93399   .00001   76 49 35.69751   .00001     17.733      .000
  4030     WEST QUAD 2                   39  1 18.93398   .00001   76 49 35.68271   .00001     18.606      .000
  4045     WEST QUAD 3                   39  1 18.93396   .00001   76 49 35.65901   .00001     19.357      .000
  4060     WEST QUAD 4                   39  1 18.93399   .00001   76 49 35.62812   .00001     19.933      .000
  4075     WEST QUAD 5                   39  1 18.93400   .00001   76 49 35.59199   .00001     20.297      .000
  4090     WEST QUAD 6                   39  1 18.93402   .00001   76 49 35.55313   .00001     20.424      .000
  4105     WEST QUAD 7                   39  1 18.93402   .00001   76 49 35.51427   .00001     20.305      .000
  4120     WEST QUAD 8                   39  1 18.93403   .00001   76 49 35.47807   .00001     19.947      .000
  4135     WEST QUAD 9                   39  1 18.93406   .00001   76 49 35.44693   .00001     19.374      .000
  4150     WEST QUAD 10                  39  1 18.93405   .00001   76 49 35.42301   .00001     18.628      .000
  4165     WEST QUAD 11                  39  1 18.93406   .00001   76 49 35.40796   .00001     17.757      .000
  2006     MV3 AXIS 07 (PRELIM)          39  1 18.93300   .00001   76 49 35.55200   .00001     16.800      .000
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD         HAVAGO VERSION 90.07.18        DATE: 08-12-** TIME: 14:30:34  PAGE    9

  ADJUSTED DATA: DIRECTIONS


     FROM   TO  LIST   OBSERVED       V      N.V      ADJUSTED       DIST.        AZ.          V.A.

     1   50   95   1    0  0   .00     .30     .08    0  0    .00     55.225   201 49 29.94   86 21 11.40   JLL/TDC NOV 07
     2   50 4015   1  215 23 45.08     .11     .03   215 23 44.90    52.096    57 13 14.84   86  9 43.30
     3   50 4030   1  215 36 25.15     .39     .10   215 36 25.24    52.460    57 25 55.18   85 13 58.38
     4   50 4045   1  215 56 27.20     .59     .15   215 56 27.49    53.007    57 45 57.44   84 28   .18
     5   50 4060   1  216 21 56.02     .40     .10   216 21 56.12    53.692    58 11 26.06   83 55 13.11
     6   50 4075   1  216 51   .98     .11     .03   216 51   .80    54.468    58 40 30.74   83 37 17.81
     7   50 4090   1  217 21 24.50    -.69    -.18   217 21 23.51    55.278    59 10 53.45   83 34 59.52
     8   50 4105   1  217 50 56.58    -.76    -.20   217 50 55.53    56.065    59 40 25.47   83 47 48.08
```

```
 9   50 4120  1  218 17 40.78   -.31   -.08   218 17 40.17    56.777   60  7 10.11   84 14 16.72

10   94   95  1    0  0   .00   -.01    .00     0  0   .00   131.390  213 22 29.55   88 15 40.05   JLL/TDC NOV 07
11   94 4015  1  341 28 45.45    .16    .02   341 28 45.61    31.667  194 51 15.16   82 48 41.52
12   94 4030  1  340 51   .48    .50    .08   340 51   .99    31.700  194 13 30.53   81 13 34.30
13   94 4045  1  339 50  4.00    .75    .11   339 50  4.76    31.691  193 12 34.30   79 50 46.93
14   94 4060  1  338 29 56.48    .49    .07   338 29 56.97    31.638  191 52 26.52   78 46  7.02
15   94 4075  1  336 55 12.12    .31    .05   336 55 12.43    31.547  190 17 41.98   78  3 36.41
16   94 4090  1  335 12 16.72   -.54   -.08   335 12 16.18    31.423  188 34 45.73   77 46 33.13
17   94 4105  1  333 28 22.50  -1.32   -.20   333 28 21.18    31.275  186 50 50.73   77 56 29.08
18   94 4120  1  331 50 52.72   -.48   -.07   331 50 52.24    31.113  185 13 21.79   78 33  2.70
19   94 4135  1  330 26 35.40    .04    .01   330 26 35.44    30.945  183 49  4.99   79 34  1.36
20   94 4150  1  329 21 39.95    .08    .01   329 21 40.04    30.787  182 44  9.59   80 55 20.65
21   94 4165  1  328 40 44.90    .05    .01   328 40 44.95    30.646  182  3 14.50   82 31 31.33

22   96   95  1    0  0   .00    .08    .04     0  0   .00    97.576  192 21  4.00   87  0 22.04
23   96 4015  1  277 46 20.65   -.11   -.02   277 46 20.46    46.444  110  7 24.46   83 43 52.84
24   96 4030  1  277 37 18.12   -.29   -.06   277 37 17.74    46.879  109 58 21.75   82 42 56.45
25   96 4045  1  277 23  6.90   -.47   -.11   277 23  6.35    47.512  109 44 10.35   81 53 56.06
26   96 4060  1  277  4 59.22   -.35   -.08   277  4 58.79    48.288  109 26  2.79   81 20 23.51
27   96 4075  1  276 44 29.02    .09    .02   276 44 29.02    49.154  109  5 33.03   81  3 49.97
28   96 4090  1  276 23 10.48   1.10    .26   276 23 11.49    50.047  108 44 15.50   81  4 39.57
29   96 4105  1  276  2 40.50   -.34   -.08   276  2 40.08    50.905  108 23 44.08   81 21 55.58

30   99   94  1    0  0   .00    .24    .06     0  0   .00    52.350  336  0 11.58   89 33 19.69
31   99 4075  1  327  4 10.50    .35    .06   327  4 10.61    32.731  303  4 22.19   77 46 15.88
32   99 4090  1  328  0 23.75    .94    .14   328  0 24.45    31.998  304  0 36.03   77 15 13.67
33   99 4105  1  328 59 30.70  -1.63   -.24   328 59 28.83    31.220  304 59 40.41   77  9 21.88
34   99 4120  1  329 57 15.98   -.42   -.06   329 57 15.32    30.450  305 57 26.90   77 30 58.28

35   99   96  2    0  0   .00   -.03   -.01     0  0   .00    79.976  294 38 17.32   90 30 12.85
36   99 4135  2   12 11 10.60    .04    .01    12 11 10.67    29.741  306 49 27.98   78 20 29.37
37   99 4150  2   12 52 29.45    .09    .01    12 52 29.57    29.148  307 30 46.88   79 35 46.83
38   99 4165  2   13 19 14.38    .05    .01    13 19 14.46    28.721  307 57 31.77   81 12  6.35
```
1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 14:30:34   PAGE   10

ADJUSTED DATA: GROUPED VERTICAL ANGLES

```
       FROM  TO LIST   OBSERVED   REF/KM    V     N.V     ADJUSTED      DIST.       AZ.

35   50 4015  -1   86  9 45.32    .00  -2.01   -.17   86  9 43.30    52.096   57 13 14.84
40   50 4030  -1   85 13 58.78    .00   -.40   -.03   85 13 58.38    52.460   57 25 55.18
41   50 4045  -1   84 28   .97    .00   -.80   -.07   84 28   .18    53.007   57 45 57.44
42   50 4060  -1   83 55 13.43    .00   -.32   -.03   83 55 13.11    53.692   58 11 26.06
43   50 4075  -1   83 37 17.83    .00   -.02    .00   83 37 17.81    54.468   58 40 30.74
44   50 4090  -1   83 34 59.58    .00   -.06   -.01   83 34 59.52    55.278   59 10 53.45
45   50 4105  -1   83 47 47.95    .00    .13    .01   83 47 48.08    56.065   59 40 25.47
46   50 4120  -1   84 14 17.05    .00   -.33   -.03   84 14 16.72    56.777   60  7 10.11
47   94 4015  -1   82 48 39.97    .00   1.55    .08   82 48 41.52    31.667  194 51 15.16
48   94 4030  -1   81 13 34.81    .00   -.51   -.03   81 13 34.30    31.700  194 13 30.53
49   94 4045  -1   79 50 46.37    .00    .55    .03   79 50 46.93    31.691  193 12 34.30
```

```
50   94 4060  -1   78 46  5.20    .00    1.82    .09   78 46  7.02   31.638  191 52 26.52
51   94 4075  -1   78  3 34.11    .00    2.31    .12   78  3 36.41   31.547  190 17 41.98
52   94 4090  -1   77 46 29.82    .00    3.31    .17   77 46 33.13   31.423  188 34 45.73
53   94 4105  -1   77 56 26.93    .00    2.15    .11   77 56 29.08   31.275  186 50 50.73
54   94 4120  -1   78 33   .03    .00    2.67    .13   78 33  2.70   31.113  185 13 21.79
55   94 4135  -1   79 34   .26    .00    1.10    .05   79 34  1.36   30.945  183 49  4.99
56   94 4150  -1   80 55 17.80    .00    2.85    .14   80 55 20.65   30.787  182 44  9.59
57   94 4165  -1   82 31 29.47    .00    1.87    .09   82 31 31.33   30.646  182  3 14.50
58   96 4015  -1   83 43 51.64    .00    1.21    .09   83 43 52.84   46.444  110  7 24.46
59   96 4030  -1   82 42 55.66    .00     .79    .06   82 42 56.45   46.879  109 58 21.75
60   96 4045  -1   81 53 55.53    .00     .52    .04   81 53 56.06   47.512  109 44 10.35
61   96 4060  -1   81 20 24.34    .00    -.83   -.06   81 20 23.51   48.288  109 26  2.79
62   96 4075  -1   81  3 49.53    .00     .44    .03   81  3 49.97   49.154  109  5 33.03
63   96 4090  -1   81  4 39.49    .00     .08    .01   81  4 39.57   50.047  108 44 15.50
64   96 4105  -1   81 21 54.37    .00    1.21    .10   81 21 55.58   50.905  108 23 44.08
65   99 4075  -1   77 46 18.74    .00   -2.86   -.15   77 46 15.88   32.731  303  4 22.19
66   99 4090  -1   77 15 16.95    .00   -3.28   -.17   77 15 13.67   31.998  304  0 36.03
67   99 4105  -1   77  9 26.27    .00   -4.39   -.22   77  9 21.88   31.220  304 59 40.41
68   99 4120  -1   77 31   .40    .00   -2.11   -.10   77 30 58.28   30.450  305 57 26.90
69   99 4135  -1   78 20 30.52    .00   -1.15   -.05   78 20 29.37   29.741  306 49 27.98
70   99 4150  -1   79 35 49.85    .00   -3.02   -.14   79 35 46.83   29.148  307 30 46.88
71   99 4165  -1   81 12  8.35    .00   -2.00   -.09   81 12  6.35   28.721  307 57 31.77
```

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 14:30:34   PAGE   11

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

	STATION			OBSERVED	V	N.V	ADJUSTED	SIGMA
89	42	CDP 7108	LAT	39 1 18.93	.00	.00	39 1 18.93	.02 NOT OBS.
90	42	CDP 7108	LON	76 49 35.55	.00	.00	76 49 35.55	.02 NOT OBS.
91	50	JPL 4005	LAT	39 1 18.02	.00	.00	39 1 18.02	.02 NOT OBS.
92	50	JPL 4005	LON	76 49 37.51	.00	.00	76 49 37.51	.02 NOT OBS.
93	94	VLBI PIER-A	LAT	39 1 19.92	.00	.00	39 1 19.92	.00
94	94	VLBI PIER-A	LON	76 49 35.36	.00	.00	76 49 35.36	.00
95	95	VLBI PIER-B	LAT	39 1 16.36	.00	.00	39 1 16.36	.02 NOT OBS.
96	95	VLBI PIER-B	LON	76 49 38.37	.00	.00	76 49 38.36	.02 NOT OBS.
97	96	VLBI PIER-C	LAT	39 1 19.45	.00	.00	39 1 19.45	.02 NOT OBS.
98	96	VLBI PIER-C	LON	76 49 37.50	.00	.00	76 49 37.50	.02 NOT OBS.
99	99	7108 RM1	LAT	39 1 18.37	.00	.00	39 1 18.37	.02 NOT OBS.
100	99	7108 RM1	LON	76 49 34.48	.00	.00	76 49 34.47	.02 NOT OBS.
101	4015	WEST QUAD 1	LAT	39 1 18.93	.00	.00	39 1 18.94	.02 NOT OBS.
102	4015	WEST QUAD 1	LON	76 49 35.70	.00	.00	76 49 35.69	.02 NOT OBS.
103	4030	WEST QUAD 2	LAT	39 1 18.93	.00	.00	39 1 18.94	.02 NOT OBS.
104	4030	WEST QUAD 2	LON	76 49 35.68	.00	.00	76 49 35.68	.02 NOT OBS.

```
105   4045    WEST QUAD 3              LAT   39  1 18.93    .00      .00    39  1 18.94      .02 NOT OBS.
106   4045    WEST QUAD 3              LON   76 49 35.66    .00      .00    76 49 35.66      .02 NOT OBS.

107   4060    WEST QUAD 4              LAT   39  1 18.93    .00      .00    39  1 18.94      .02 NOT OBS.
108   4060    WEST QUAD 4              LON   76 49 35.63    .00      .00    76 49 35.63      .02 NOT OBS.

109   4075    WEST QUAD 5              LAT   39  1 18.93    .00      .00    39  1 18.94      .02 NOT OBS.
110   4075    WEST QUAD 5              LON   76 49 35.59    .00      .00    76 49 35.59      .02 NOT OBS.

111   4090    WEST QUAD 6              LAT   39  1 18.93    .00      .00    39  1 18.94      .02 NOT OBS.
112   4090    WEST QUAD 6              LON   76 49 35.55    .00      .00    76 49 35.55      .02 NOT OBS.

113   4105    WEST QUAD 7              LAT   39  1 18.93    .00      .00    39  1 18.94      .02 NOT OBS.
114   4105    WEST QUAD 7              LON   76 49 35.51    .00      .00    76 49 35.51      .02 NOT OBS.

115   4120    WEST QUAD 8              LAT   39  1 18.93    .00      .00    39  1 18.94      .02 NOT OBS.
116   4120    WEST QUAD 8              LON   76 49 35.48    .00      .00    76 49 35.48      .02 NOT OBS.

117   4135    WEST QUAD 9              LAT   39  1 18.93    .00      .00    39  1 18.94      .02 NOT OBS.
118   4135    WEST QUAD 9              LON   76 49 35.45    .00      .00    76 49 35.44      .02 NOT OBS.

119   4150    WEST QUAD 10             LAT   39  1 18.93    .00      .00    39  1 18.94      .02 NOT OBS.
120   4150    WEST QUAD 10             LON   76 49 35.42    .00      .00    76 49 35.42      .02 NOT OBS.

121   4165    WEST QUAD 11             LAT   39  1 18.93    .00      .00    39  1 18.94      .02 NOT OBS.
122   4165    WEST QUAD 11             LON   76 49 35.41    .00      .00    76 49 35.41      .02 NOT OBS.
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1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD        HAVAGO VERSION 90.07.18    DATE: 08-12-**  TIME: 14:30:34   PAGE   12

ADJUSTED ASTRONOMIC LATITUDES AND LONGITUDES

        STATION                                  OBSERVED        V      N.V      ADJUSTED        SIGMA

123   2006    MV3 AXIS 07 (PRELIM)     LAT   39  1 18.93    .00      .00    39  1 18.93      .02 NOT OBS.
124   2006    MV3 AXIS 07 (PRELIM)     LON   76 49 35.55    .00      .00    76 49 35.55      .02 NOT OBS.

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD        HAVAGO VERSION 90.07.18    DATE: 08-12-**  TIME: 14:30:34   PAGE   13
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GEODETIC LATITUDE CONSTRAINTS

        STATION      CONSTRAINED      V       N.V       ADJUSTED       SIGMA

125     42      39  1 18.93344    .00000    .00000    39  1 18.93344    .00001
126     50      39  1 18.02142    .00000    .07842    39  1 18.02142    .00000
127     94      39  1 19.91876    .00000   -.04910    39  1 19.91876    .00001
128     95      39  1 16.36233    .00000   -.03324    39  1 16.36233    .00001
129     96      39  1 19.44905    .00000    .08127    39  1 19.44905    .00000
130     99      39  1 18.36794    .00000   -.07735    39  1 18.36794    .00001
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  131   2006      39  1 18.93300    .00000    .00000    39  1 18.93300    .00001
```

GEODETIC LONGITUDE CONSTRAINTS

```
        STATION      CONSTRAINED      V        N.V       ADJUSTED       SIGMA

  132     42      76 49 35.55262   .00000    .00000   76 49 35.55262   .00001
  133     50      76 49 37.51422   .00000    .09148   76 49 37.51422   .00001
  134     94      76 49 35.36268   .00000    .05666   76 49 35.36268   .00001
  135     95      76 49 38.36598   .00000   -.09870   76 49 38.36598   .00001
  136     96      76 49 37.49952   .00000   -.01064   76 49 37.49952   .00001
  137     99      76 49 34.47767   .00000   -.03879   76 49 34.47767   .00001
  138   2006      76 49 35.55200   .00000    .00000   76 49 35.55200   .00001
```

GEODETIC HEIGHT CONSTRAINTS

```
        STATION      CONSTRAINED      V       N.V    ADJUSTED      SIGMA

  139     42        13.7520     .0000      .0    13.7520      .000
  140     50        14.2460     .0001      .1    14.2461      .000
  141     94        13.7710    -.0003     -.3    13.7707      .000
  142     95        17.7590     .0000      .0    17.7590      .000
  143     96        12.6620    -.0001     -.1    12.6619      .000
  144     99        13.3640     .0003      .3    13.3643      .000
  145   2006        16.8000     .0000      .0    16.8000      .000
```

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   HAVAGO VERSION 90.07.18   DATE: 08-12-** TIME: 14:30:34   PAGE   14

ADJUSTED CARTESIAN COORDINATES

```
    DX        DY        DZ     EPSILON    PSI     OMEGA    SCALE

   .000      .000      .000      .000      .000     .000     .000
```

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                                                                          TRANSFORMED COORDINATES
   STATION                                   X            Y            Z          X          Y          Z

    42     CDP 7108                    1130794.717  -4831233.824  3994217.058
    50     JPL 4005                    1130752.895  -4831262.194  3994195.519
    94     VLBI PIER-A                 1130794.809  -4831214.170  3994240.677
    95     VLBI PIER-B                 1130740.907  -4831300.885  3994157.982
    96     VLBI PIER-C                 1130746.642  -4831233.925  3994228.725
    99     7108 RM1                    1130822.329  -4831238.329  3994203.266
  4015     WEST QUAD 1                 1130792.026  -4831237.620  3994219.578
  4030     WEST QUAD 2                 1130792.527  -4831238.199  3994220.128
  4045     WEST QUAD 3                 1130793.216  -4831238.638  3994220.600
  4060     WEST QUAD 4                 1130794.041  -4831238.903  3994220.963
  4075     WEST QUAD 5                 1130794.952  -4831238.981  3994221.193
  4090     WEST QUAD 6                 1130795.884  -4831238.863  3994221.273
  4105     WEST QUAD 7                 1130796.773  -4831238.560  3994221.198
```

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4120      WEST QUAD 8                    1130797.558  -4831238.090   3994220.973
4135      WEST QUAD 9                    1130798.186  -4831237.486   3994220.613
4150      WEST QUAD 10                   1130798.614  -4831236.791   3994220.143
4165      WEST QUAD 11                   1130798.812  -4831236.049   3994219.595
2006      MV3 AXIS 07 (PRELIM)           1130795.273  -4831236.135   3994218.967
```

```
 MISCELLANEOUS DATA FOR SELECTED LINES, PART 1

   FROM    TO      STANDARD    CORRELATION COEFF.      STANDARD    CORRELATION COEFF.   DX,DY,DZ    AZ.,DIST.,V.A.    AZ.,DIST.,B.AZ.
                    ERRORS     AZ.   DIST. V.A.         ERRORS     DX    DY    DZ                                       (GEODETIC)

   2006   4015   AZ.   15.73   1.00  -.12   .01    DX  .0003   1.00  -.03   .17    -3.2472  270 29 54.08    270 29 54.08
                 DIST.  .0003  -.12  1.00   .13    DY  .0003   -.03  1.00  -.26    -1.4851         3.6227          3.5004
                 V.A.  20.20    .01   .13  1.00    DZ  .0003    .17  -.26  1.00      .6113   75  4 10.58     90 29 53.99

   2006   4030   AZ.   17.51   1.00  -.11   .04    DX  .0003   1.00  -.03   .17    -2.7462  270 33 12.01    270 33 12.00
                 DIST.  .0003  -.11  1.00   .23    DY  .0003   -.03  1.00  -.26    -2.0642         3.6263          3.1445
                 V.A.  19.44    .04   .23  1.00    DZ  .0003    .17  -.26  1.00     1.1607   60  7 45.45     90 33 11.92

   2006   4045   AZ.   21.40   1.00  -.08   .06    DX  .0003   1.00  -.04   .17    -2.0579  270 39 39.97    270 39 39.97
                 DIST.  .0003  -.08  1.00   .27    DY  .0003   -.04  1.00  -.26    -2.5030         3.6287          2.5743
                 V.A.  18.30    .06   .27  1.00    DZ  .0003    .17  -.26  1.00     1.6333   45 11 19.19     90 39 39.90

   2006   4060   AZ.   30.10   1.00  -.06   .08    DX  .0003   1.00  -.05   .16    -1.2325  270 57 16.28    270 57 16.28
                 DIST.  .0003  -.06  1.00   .25    DY  .0003   -.05  1.00  -.26    -2.7686         3.6289          1.8313
                 V.A.  17.02    .08   .25  1.00    DZ  .0003    .16  -.26  1.00     1.9963   30 18 27.88     90 57 16.23

   2006   4075   AZ.   52.82   1.00  -.01   .01    DX  .0003   1.00  -.06   .08     -.3218  271 50  9.32    271 50  9.32
                 DIST.  .0003  -.01  1.00   .11    DY  .0003   -.06  1.00  -.26    -2.8460         3.6274           .9624
                 V.A.  15.29    .01   .11  1.00    DZ  .0003    .08  -.26  1.00     2.2260   15 23  7.25     91 50  9.30

   2006   4090   AZ.1266.54   1.00   .00   .06    DX  .0003   1.00  -.06   .07      .6106  318 58 42.50    318 58 43.12
                 DIST.  .0003   .00  1.00   .02    DY  .0003   -.06  1.00  -.26    -2.7286         3.6245           .0416
                 V.A.  14.52    .06   .02  1.00    DZ  .0003    .07  -.26  1.00     2.3063    0 39 26.98    138 58 43.12

   2006   4105   AZ.   56.39   1.00   .01  -.02    DX  .0003   1.00  -.07   .06     1.4997   88  0 38.02     88  0 38.01
                 DIST.  .0003   .01  1.00   .10    DY  .0003   -.07  1.00  -.26    -2.4249         3.6203           .9081
                 V.A.  15.18   -.02   .10  1.00    DZ  .0003    .06  -.26  1.00     2.2310   14 31 38.66    268  0 38.03

   2006   4120   AZ.   30.62   1.00   .01   .01    DX  .0003   1.00  -.09   .08     2.2842   88 58 33.50     88 58 33.50
                 DIST.  .0003   .01  1.00   .27    DY  .0003   -.09  1.00  -.29    -1.9555         3.6145          1.7787
                 V.A.  16.64    .01   .27  1.00    DZ  .0003    .08  -.29  1.00     2.0058   29 28 41.55    268 58 33.54

   2006   4135   AZ.   28.66   1.00   .16  -.14    DX  .0003   1.00  -.30  -.14     2.9122   89 15 26.39     89 15 26.38
                 DIST.  .0004   .16  1.00   .41    DY  .0004   -.30  1.00  -.22    -1.3513         3.6080          2.5278
                 V.A.  20.40   -.14   .41  1.00    DZ  .0004   -.14  -.22  1.00     1.6464   44 28 36.69    269 15 26.45

   2006   4150   AZ.   23.87   1.00   .24  -.10    DX  .0003   1.00  -.31  -.16     3.3403   89 24  7.64     89 24  7.64
                 DIST.  .0003   .24  1.00   .36    DY  .0004   -.31  1.00  -.20     -.6558         3.6015          3.1031
                 V.A.  22.38   -.10   .36  1.00    DZ  .0004   -.16  -.20  1.00     1.1761   59 29 54.86    269 24  7.72
```

```
2006  4165    AZ.  21.73        1.00    .30  -.05    DX  .0003   1.00  -.32  -.18      3.5387   89 27 26.58      89 27 26.58
              DIST. .0003        .30   1.00   .21    DY  .0004   -.32  1.00  -.18      .0856         3.5950           3.4652
              V.A. 23.69        -.05    .21  1.00    DZ  .0004   -.18  -.18  1.00      .6283   74 33 20.21     269 27 26.67
```

1AlliedSignal TECHNICAL SERVICES, COLUMBIA, MD   DATE: 08-12-** TIME: 14:30:34PAGE 16

MISCELLANEOUS DATA FOR SELECTED LINES, PART 2

              E Q U A T O R I A L   S Y S T E M   HORIZON SYSTEM, ORIGIN AT THE STANDPOINT

FROM	TO	ALTITUDE	AZIMUTH	DISTANCE	DN	SIGMA	DE	SIGMA	DU	SIGMA
2006	4015	9 42 53.99	204 34 35.51	3.6227	.0304	.0003	-3.5002	.0003	.9334	.0004
2006	4030	18 40 4.77	216 55 48.89	3.6263	.0304	.0003	-3.1444	.0003	1.8061	.0004
2006	4045	26 44 59.89	230 34 28.88	3.6287	.0297	.0003	-2.5742	.0003	2.5574	.0004
2006	4060	33 22 25.32	246 0 5.74	3.6289	.0305	.0003	-1.8311	.0003	3.1330	.0004
2006	4075	37 51 16.07	263 32 58.43	3.6274	.0308	.0002	-.9619	.0003	3.4974	.0003
2006	4090	39 30 59.94	282 36 50.63	3.6245	.0314	.0002	-.0273	.0003	3.6242	.0003
2006	4105	38 2 34.83	301 44 5.18	3.6203	.0315	.0002	.9076	.0003	3.5046	.0003
2006	4120	33 42 24.14	319 25 58.22	3.6145	.0318	.0003	1.7784	.0003	3.1466	.0004
2006	4135	27 8 56.99	335 6 28.66	3.6080	.0328	.0004	2.5276	.0003	2.5744	.0004
2006	4150	19 3 35.02	348 53 33.77	3.6015	.0324	.0004	3.1030	.0003	1.8280	.0004
2006	4165	10 3 53.08	1 23 8.18	3.5950	.0328	.0004	3.4651	.0003	.9574	.0004

F.1.8 Circle Fit Output for West Quadrant

```
Circle Radius: 3.6032241e+00
Circle Center: (-1.4474918e-02, 2.1115747e-02)

  ID     X-coord      Y-coord      Gamma-x       Gamma-y       Gamma
   1    -3.5002000   0.9334000   -0.0000915    0.0000240    -0.0000946
   2    -3.1444000   1.8061000   -0.0000752    0.0000429    -0.0000866
   3    -2.5742000   2.5574000    0.0001682   -0.0001667     0.0002368
   4    -1.8311000   3.1330000    0.0000508   -0.0000871     0.0001008
   5    -0.9619000   3.4974000   -0.0000386    0.0001416    -0.0001467
   6    -0.0273000   3.6242000   -0.0000004    0.0001170    -0.0001170
   7     0.9076000   3.5046000   -0.0000590   -0.0002228     0.0002305
   8     1.7784000   3.1466000    0.0000118    0.0000206    -0.0000238
   9     2.5276000   2.5744000    0.0001780    0.0001788    -0.0002523
  10     3.1030000   1.8280000   -0.0000308   -0.0000179     0.0000356
  11     3.4651000   0.9574000   -0.0001134   -0.0000305     0.0001174


     Radius = 3.6032 m
     DE = -0.0145 m
     DU = +0.0211 m
```

Appendix G. Global Results Listing from GeoLab Adjustment

```
================================================================================
                         GGAO SITE SURVEY 2007
GeoLab V3.72               GRS 80            UNITS: m,DMS          Page 0001
================================================================================
11:01:27, Tue Jun 17, 2008

Input file:  D:\glab32v3\GGAO_08c\gps2+conv6.iob
Output file: D:\glab32v3\GGAO_08c\gps2+conv6.lst
Options file: D:\glab32v3\default_jl.cfg

Geoid File:  D:\glab32v3\geoid_USGG2003\S2003u08.gsp
 ------------------------------------------------------------------------------
|         PARAMETERS            |            OBSERVATIONS                       |
|-------------------------------|----------------------------------------------|
|   Description    |   Number   |    Description     |       Number            |
|-------------------------------|----------------------------------------------|
| No. of Stations  |     22     | Directions         |        168              |
| Coord Parameters |     60     | Distances          |        271              |
| Free Latitudes   |     20     | Azimuths           |          0              |
| Free Longitudes  |     20     | Vertical Angles    |          0              |
| Free Heights     |     20     | Zenithal Angles    |          0              |
| Fixed Coordinates|      6     | Angles             |          0              |
| Astro. Latitudes |      0     | Heights            |          0              |
| Astro. Longitudes|      0     | Height Differences |         99              |
| Geoid Records    |      0     | Auxiliary Params.  |          0              |
| All Aux. Pars.   |     53     | 2-D Coords.        |          0              |
| Direction Pars.  |     53     | 2-D Coord. Diffs.  |          0              |
| Scale Parameters |      0     | 3-D Coords.        |          0              |
| Constant Pars.   |      0     | 3-D Coord. Diffs.  |         69              |
| Rotation Pars.   |      0     |                    |                         |
| Translation Pars.|      0     |                    |                         |
|                  |            |                    |                         |
|                  |  --------  |                    |       --------          |
| Total Parameters |    113     | Total Observations |        607              |
|-------------------------------|----------------------------------------------|
|              Degrees of Freedom =      494                                    |
 ------------------------------------------------------------------------------


 ------------------------------------------------------------------------------
                       SUMMARY OF SELECTED OPTIONS
 ------------------------------------------------------------------------------
     OPTION                          | SELECTION
 ------------------------------------------------------------------------------
     Computation Mode                | Adjustment
     Maximum Iterations              | 10
     Convergence Criterion           | 0.00100
     Angular Misclosure Limit Factor | 2.00
     Linear Misclosure Limit Factor  | 2.00
     Residual Rejection Criterion    | Tau Max
     Confidence Region Types         | 1D 2D Station Relative
     Relative Confidence Regions     | Connected Only
     Variance Factor (VF) Known      | Yes
     Scale Covariance Matrix With VF | Yes
     Scale Residual Variances With VF| No
     Force Convergence in Max Iters  | No
     Distances Contribute To Heights | Yes
     Compute Full Inverse            | Yes
     Optimize Band Width             | Yes
     Generate Initial Coordinates    | Yes
     Re-Transform Obs After 1st Pass | Yes
     Geoid Interpolation Method      | Bi-Quadratic
 ------------------------------------------------------------------------------
```

```
================================================================================
                              GGAO SITE SURVEY 2007
GeoLab V3.72                    GRS 80            UNITS: m,DMS      Page 0002
================================================================================
Input Station Data:
FFF STATION       ELIP-LATITUDE    ELIP-LONGITUDE    ELIP-HEIGHT
                  ASTRO-LATITUDE   ASTRO-LONGITUDE   ORTHO-HEIGHT
                  N/S DEFLECTION   N/S DEFLECTION    GEOID-HEIGHT
--- -----------   ---------------- ----------------  ------------
000 4005W         N 39  1 17.99247 W 76 49 37.50358    15.5300
                  N 39  1 16.19247 W 76 49 29.30441    48.8501
                  -  0  0     1.80    0  0     6.37    -33.3201
000 7105          N 39  1 14.17743 W 76 49 39.69784    19.1940
                  N 39  1 12.37743 W 76 49 31.49879    52.5135
                  -  0  0     1.80    0  0     6.37    -33.3195
000 7108(93)      N 39  1 18.90453 W 76 49 35.54202    15.0360
                  N 39  1 17.10453 W 76 49 27.32995    48.3574
                  -  0  0     1.80    0  0     6.38    -33.3214
000 7108RM1       N 39  1 18.33901 W 76 49 34.46714    14.6480
                  N 39  1 16.53901 W 76 49 26.25509    47.9701
                  -  0  0     1.80    0  0     6.38    -33.3221
000 7125          N 39  1 12.96876 W 76 49 38.80926    18.5060
                  N 39  1 11.16876 W 76 49 30.59738    51.8268
                  -  0  0     1.80    0  0     6.38    -33.3208
000 CAL(A)01      N 39  1 15.61136 W 76 49 35.68088    17.7200
                  N 39  1 13.81136 W 76 49 27.46892    51.0422
                  -  0  0     1.80    0  0     6.38    -33.3222
000 CAL(D)98      N 39  1 12.11265 W 76 49 40.63726    21.1750
                  N 39  1 10.31265 W 76 49 32.43828    54.4943
                  -  0  0     1.80    0  0     6.37    -33.3193
000 CALB          N 39  1 13.63413 W 76 49 32.47643    16.9587
                  N 39  1 11.82413 W 76 49 24.23879    50.2837
                  -  0  0     1.81    0  0     6.40    -33.3250
000 CALC          N 39  1 12.74706 W 76 49 32.86330    17.3033
                  N 39  1 10.93706 W 76 49 24.62569    50.6286
                  -  0  0     1.81    0  0     6.40    -33.3253
000 DORIS(07)ANT  N 39  1 12.25143 W 76 49 40.42715    20.4310
                  N 39  1 10.45143 W 76 49 32.22816    53.7503
                  -  0  0     1.80    0  0     6.37    -33.3193
000 DORIS(07)MK   N 39  1 12.25143 W 76 49 40.42715    19.9140
                  N 39  1 10.45143 W 76 49 32.22816    53.2333
                  -  0  0     1.80    0  0     6.37    -33.3193
111 GODE          N 39  1 18.21864 W 76 49 36.58553    14.5160
                  N 39  1 16.41864 W 76 49 28.38635    47.8366
                  -  0  0     1.80    0  0     6.37    -33.3206
000 GORF          N 39  1 12.78830 W 76 49 39.69118    18.3410
                  N 39  1 10.98830 W 76 49 31.47931    51.6610
                  -  0  0     1.80    0  0     6.38    -33.3200
000 MOB7(07)      N 39  1 14.14962 W 76 49 39.69049    23.6230
                  N 39  1 12.34962 W 76 49 31.49144    56.9425
                  -  0  0     1.80    0  0     6.37    -33.3195
000 MV3(07)       N 39  1 18.90463 W 76 49 35.54212    19.3880
                  N 39  1 17.10463 W 76 49 27.33005    52.7094
                  -  0  0     1.80    0  0     6.38    -33.3214
111 MV3(07PRE)    N 39  1 18.93300 W 76 49 35.55200    16.8000
                  N 39  1 17.13300 W 76 49 27.33993    50.1214
                  -  0  0     1.80    0  0     6.38    -33.3214
000 NG2000(07)    N 39  1 12.93765 W 76 49 38.91766    23.4910
                  N 39  1 11.13765 W 76 49 30.70578    56.8118
                  -  0  0     1.80    0  0     6.38    -33.3208
000 NGEO          N 39  1 15.43514 W 76 49 38.96613    18.9535
                  N 39  1 13.63514 W 76 49 30.76704    52.2734
                  -  0  0     1.80    0  0     6.37    -33.3199
000 PIER(B)95     N 39  1 16.33345 W 76 49 38.35535    19.0430
                  N 39  1 14.53345 W 76 49 30.15623    52.3627
                  -  0  0     1.80    0  0     6.37    -33.3197
000 PIER(C)95     N 39  1 19.42009 W 76 49 37.48891    13.9460
                  N 39  1 17.62009 W 76 49 29.28969    47.2656
                  -  0  0     1.80    0  0     6.37    -33.3196
```

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```
================================================================================
                           GGAO SITE SURVEY 2007
GeoLab V3.72                  GRS 80              UNITS: m,DMS        Page 0003
================================================================================
Input Station Data:
FFF STATION      ELIP-LATITUDE      ELIP-LONGITUDE     ELIP-HEIGHT
                 ASTRO-LATITUDE     ASTRO-LONGITUDE    ORTHO-HEIGHT
                 N/S DEFLECTION     N/S DEFLECTION     GEOID-HEIGHT
--- -----------  ----------------   ----------------   ------------
000 SGEOS        N 39  1  12.60829 W 76 49  38.93259       20.1580
                 N 39  1  10.80829 W 76 49  30.72072       53.4788
                 -  0  0      1.80    0  0      6.38      -33.3208
000 VLBA         N 39  1  19.91964 W 76 49  35.36780       13.7831
                 N 39  1  18.11964 W 76 49  27.15570       47.1042
                 -  0  0      1.80    0  0      6.38      -33.3211
```

```
================================================================================
```

```
================================================================================
                            GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80            UNITS: m,DMS        Page 0004
================================================================================
Misclosures (pass 1):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT          FROM          TO              OBSERVATION STD.DEV.   MISC
---- -----------  ------------  ------------  ----------------- --------  --------
GROUP: 00000923.SSF,obs#:   8 day  31  OPT                31 2  18:
DXCT         CALC          VLBA             -91.0270  0.0015   0.0031
DYCT         CALC          VLBA             124.5426  0.0055  -0.0145
DZCT         CALC          VLBA             169.6195  0.0047   0.0070
GROUP: 00000863.SSF,obs#:   9 day  10  OPT                10    13:
DXCT         GODE          CALB             117.0881  0.0006  -0.1231
DYCT         GODE          CALB             -65.9967  0.0019   0.0078
DZCT         GODE          CALB            -108.3131  0.0016   0.0138
GROUP: 00000847.SSF,obs#:  10 day   8  OPT                 8    14:3
DXCT         GODE          CALB             117.0875  0.0008  -0.1225
DYCT         GODE          CALB             -65.9979  0.0027   0.0090
DZCT         GODE          CALB            -108.3134  0.0021   0.0141
GROUP: 00000895.SSF,obs#:  11 day  31  OPT                31    13:
DXCT         GODE          CALC             112.0129  0.0010  -0.1232
DYCT         GODE          CALC             -85.1478  0.0032   0.0076
DZCT         GODE          CALC            -129.3490  0.0025   0.0137
GROUP: 00000911.SSF,obs#:  12 day  31  OPT                31    18:
DXCT         GODE          GORF             -47.9177  0.0008  -0.1213
DYCT         GODE          GORF            -122.5830  0.0032   0.0049
DZCT         GODE          GORF            -127.7099  0.0027   0.0160
GROUP: 00000859.SSF,obs#:  13 day   8  OPT                 8    15:2
DXCT         GODE          GORF             -47.9172  0.0010  -0.1218
DYCT         GODE          GORF            -122.5854  0.0034   0.0073
DZCT         GODE          GORF            -127.7098  0.0027   0.0159
GROUP: 00000879.SSF,obs#:  14 day  30  OPT                30    14
DXCT         GODE          NGEO             -42.5348  0.0006  -0.1237
DYCT         GODE          NGEO             -69.0389  0.0020   0.0097
DZCT         GODE          NGEO             -63.9046  0.0017   0.0107
GROUP: 00000851.SSF,obs#:  15 day   8  OPT                 8    14:2
DXCT         GODE          NGEO             -42.5355  0.0007  -0.1230
DYCT         GODE          NGEO             -69.0388  0.0022   0.0096
DZCT         GODE          NGEO             -63.9074  0.0018   0.0135
GROUP: 00000855.SSF,obs#:  16 day   8  OPT                 8    14:5
DXCT         GODE          VLBA              20.9866  0.0016  -0.1208
DYCT         GODE          VLBA              39.3953  0.0054  -0.0074
DZCT         GODE          VLBA              40.2685  0.0042   0.0227
GROUP: 00000887.SSF,obs#:  19 day  30  OPT                30 1  14:
DXCT         NGEO          GORF              -5.3828  0.0009   0.0023
DYCT         NGEO          GORF             -53.5438  0.0032  -0.0051
DZCT         NGEO          GORF             -63.8054  0.0027   0.0054
GROUP: 00000883.SSF,obs#:  20 day  30  OPT                30 1  14:
DXCT         NGEO          VLBA              63.5206  0.0014   0.0037
DYCT         NGEO          VLBA             108.4320  0.0055  -0.0149
DZCT         NGEO          VLBA             104.1764  0.0044   0.0087
GROUP: DISTANCES
DIST         NGEO          7105              42.6201  0.0010  -0.0270
DIST         NGEO          7105              42.6214  0.0031  -0.0283
DIST         7105          NGEO              42.6204  0.0010  -0.0273
DIST         7105          NGEO              42.6199  0.0031  -0.0269
DIST         SGEOS         7105              50.8962  0.0010   0.8850
DIST         SGEOS         7105              50.8962  0.0031   0.8851
DIST         7105          SGEOS             50.8995  0.0010   0.8818
DIST         7105          SGEOS             50.8982  0.0031   0.8830
DIST         CAL(A)01      7105             106.4981  0.0010  -0.2193
DIST         CAL(A)01      7105             106.4979  0.0031  -0.2190
DIST         7105          CAL(A)01         106.5024  0.0010  -0.2236
DIST         7105          CAL(A)01         106.5035  0.0031  -0.2247
DIST         NGEO          7108(93)         135.6271  0.0011  -0.5472
DIST         NGEO          7108(93)         135.6263  0.0031  -0.5464
DIST         7108(93)      NGEO             135.6254  0.0011  -0.5455
DIST         7108(93)      NGEO             135.6255  0.0031  -0.5456
```

```
================================================================================
                           GGAO SITE SURVEY 2007
GeoLab V3.72                 GRS 80          UNITS: m,DMS        Page 0005
================================================================================
Misclosures (pass 1):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT          FROM          TO               OBSERVATION STD.DEV.    MISC
---- -----------  ------------  ------------    ----------------- -------- --------
DIST             NGEO          7108(93)            135.6375  0.0011  -0.5576
DIST             NGEO          7108(93)            135.6378  0.0011  -0.5579
DIST             CALB          MOB7(07)            174.8005  0.0011  -0.4051
DIST             CALB          MOB7(07)            174.8001  0.0011  -0.4047
DIST             CALB          NG2000(07)          156.7595  0.0011  -0.1910
DIST             CALB          NG2000(07)          156.7588  0.0011  -0.1903
DIST             CALB          SGEOS               158.6847  0.0011  -0.1535
DIST             CALB          SGEOS               158.6836  0.0011  -0.1524
DIST             CALB          CAL(A)01             99.1567  0.0010  -0.8684
DIST             CALB          CAL(A)01             99.1560  0.0010  -0.8677
DIST             CALB          7125                153.8828  0.0011  -0.1565
DIST             CALB          7125                153.8814  0.0011  -0.1551
DIST             CALB          CAL(D)98            202.0195  0.0011  -0.1288
DIST             CALB          CAL(D)98            202.0188  0.0011  -0.1281
DIST             CALB          PIER(B)95           164.8972  0.0011  -0.7819
DIST             CALB          PIER(B)95           164.8966  0.0011  -0.7813
DIST             CALB          GORF                175.5155  0.0011  -0.0025
DIST             NG2000(07)    CALB                156.7582  0.0011  -0.1897
DIST             NG2000(07)    CALB                156.7575  0.0011  -0.1890
DIST             NG2000(07)    CALC                146.2482  0.0011  -0.3541
DIST             NG2000(07)    CALC                146.2475  0.0011  -0.3534
DIST             NG2000(07)    SGEOS                10.6986  0.0010  -0.0029
DIST             NG2000(07)    SGEOS                10.6978  0.0010  -0.0021
DIST             NG2000(07)    MOB7(07)             41.7195  0.0010   0.0238
DIST             NG2000(07)    MOB7(07)             41.7184  0.0010   0.0249
DIST             NG2000(07)    GORF                 19.4960  0.0010   0.3531
DIST             NG2000(07)    GORF                 19.4954  0.0010   0.3537
DIST             NG2000(07)    NGEO                 76.1720  0.0010   0.9876
DIST             NG2000(07)    NGEO                 76.1709  0.0010   0.9887
DIST             NG2000(07)    CAL(A)01            113.5555  0.0011  -0.0022
DIST             NG2000(07)    CAL(D)98             48.6229  0.0010  -0.0035
DIST             NG2000(07)    CAL(D)98             48.6225  0.0010  -0.0031
DIST             CALC          MOB7(07)            170.4926  0.0011  -0.5400
DIST             CALC          MOB7(07)            170.4922  0.0011  -0.5396
DIST             CALC          NG2000(07)          146.2505  0.0011  -0.3563
DIST             CALC          NG2000(07)          146.2498  0.0011  -0.3556
DIST             CALC          SGEOS               146.4120  0.0011  -0.3179
DIST             CALC          SGEOS               146.4111  0.0011  -0.3170
DIST             CALC          7125                143.3700  0.0011  -0.1651
DIST             CALC          7125                143.3691  0.0011  -0.1642
DIST             CALC          CAL(A)01            112.3024  0.0011  -0.9640
DIST             CALC          CAL(A)01            112.3012  0.0011  -0.9628
DIST             CALC          PIER(B)95           173.1776  0.0011  -0.8715
DIST             CALC          PIER(B)95           173.1764  0.0011  -0.8703
DIST             CALC          CAL(D)98            188.3275  0.0011  -0.2556
DIST             CALC          CAL(D)98            188.3266  0.0011  -0.2547
DIST             CALC          GORF                164.2626  0.0011  -0.0022
DIST             SGEOS         MOB7(07)             51.0015  0.0010   0.0243
DIST             SGEOS         MOB7(07)             51.0005  0.0010   0.0253
DIST             SGEOS         CALC                146.4107  0.0011  -0.3166
DIST             SGEOS         CALC                146.4104  0.0011  -0.3163
DIST             SGEOS         CALB                158.6840  0.0011  -0.1528
DIST             SGEOS         CALB                158.6833  0.0011  -0.1521
DIST             SGEOS         7125                 10.7724  0.0010   0.8509
DIST             SGEOS         7125                 10.7727  0.0010   0.8506
DIST             SGEOS         GORF                 18.5109  0.0010   0.6498
DIST             SGEOS         GORF                 18.5102  0.0010   0.6505
DIST             SGEOS         CAL(D)98             43.7792  0.0010  -0.0038
DIST             SGEOS         CAL(D)98             43.7788  0.0010  -0.0034
DIST             MOB7(07)      CALB                174.7978  0.0011  -0.4023
DIST             MOB7(07)      CALB                174.7974  0.0011  -0.4019
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                            GGAO SITE SURVEY 2007
GeoLab V3.72                 GRS 80          UNITS: m,DMS        Page 0006
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Misclosures (pass 1):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT          FROM          TO            OBSERVATION STD.DEV.    MISC
---- -----------  ------------  ------------  ----------------- -------- --------
DIST             MOB7(07)      CALC             170.4909   0.0011  -0.5383
DIST             MOB7(07)      CALC             170.4908   0.0011  -0.5382
DIST             MOB7(07)      SGEOS             51.0016   0.0010   0.0242
DIST             MOB7(07)      SGEOS             50.9996   0.0010   0.0262
DIST             MOB7(07)      NGEO              42.7731   0.0010   0.7812
DIST             MOB7(07)      NGEO              42.7724   0.0010   0.7819
DIST             MOB7(07)      CAL(A)01         106.6462   0.0010  -0.0146
DIST             MOB7(07)      CAL(A)01         106.6450   0.0010  -0.0134
DIST             MOB7(07)      CALB             174.7992   0.0011  -0.4038
DIST             MOB7(07)      CALB             174.7986   0.0011  -0.4032
DIST             MOB7(07)      CALC             170.4908   0.0011  -0.5382
DIST             MOB7(07)      CALC             170.4902   0.0011  -0.5376
DIST             MOB7(07)      NG2000(07)        41.7191   0.0010   0.0243
DIST             MOB7(07)      NG2000(07)        41.7181   0.0010   0.0253
DIST             MOB7(07)      CAL(A)01         106.6461   0.0010  -0.0144
DIST             MOB7(07)      CAL(A)01         106.6439   0.0010  -0.0122
DIST             MOB7(07)      CAL(A)01         106.6444   0.0010  -0.0127
DIST             7125          CALB             153.8837   0.0011  -0.1574
DIST             7125          CALB             153.8826   0.0011  -0.1563
DIST             7125          CAL(A)01         111.4723   0.0010  -0.5441
DIST             7125          CAL(A)01         111.4718   0.0010  -0.5436
DIST             7125          SGEOS             10.7952   0.0010   0.8280
DIST             7125          SGEOS             10.7955   0.0010   0.8277
DIST             7125          VLBA             229.8559   0.0011  -0.0257
DIST             7125          VLBA             229.8552   0.0011  -0.0250
DIST             7125          NGEO              76.1009   0.0010   0.0518
DIST             7125          NGEO              76.1007   0.0010   0.0520
DIST             CAL(A)01      7125             111.4694   0.0010  -0.5412
DIST             CAL(A)01      7125             111.4686   0.0010  -0.5404
DIST             CAL(A)01      GORF             130.3221   0.0011  -0.3756
DIST             CAL(A)01      GORF             130.3215   0.0011  -0.3750
DIST             CAL(A)01      MOB7(07)         106.6456   0.0010  -0.0139
DIST             CAL(A)01      MOB7(07)         106.6447   0.0010  -0.0130
DIST             CAL(A)01      VLBA             132.2025   0.0011   0.9270
DIST             CAL(A)01      VLBA             132.2018   0.0011   0.9277
DIST             CAL(A)01      NG2000(07)       113.5559   0.0011  -0.0026
DIST             GORF          CALB             175.5161   0.0011  -0.0031
DIST             GORF          CALB             175.5165   0.0011  -0.0035
DIST             GORF          CAL(A)01         130.3241   0.0011  -0.3776
DIST             GORF          CAL(A)01         130.3235   0.0011  -0.3770
DIST             GORF          NG2000(07)        19.5062   0.0010   0.3429
DIST             GORF          NG2000(07)        19.5056   0.0010   0.3435
DIST             GORF          CAL(D)98          30.6271   0.0010   0.3588
DIST             GORF          CAL(D)98          30.6271   0.0010   0.3588
DIST             GORF          SGEOS             18.5223   0.0010   0.6384
DIST             GORF          SGEOS             18.5217   0.0010   0.6390
DIST             GORF          NG2000(07)        19.5069   0.0010   0.3422
DIST             GORF          NG2000(07)        19.5064   0.0010   0.3427
DIST             NGEO          MOB7(07)          42.7803   0.0010   0.7740
DIST             NGEO          MOB7(07)          42.7792   0.0010   0.7751
DIST             NGEO          NG2000(07)        76.1757   0.0010   0.9838
DIST             NGEO          NG2000(07)        76.1749   0.0010   0.9846
DIST             NGEO          MOB7(07)          42.7792   0.0010   0.7752
DIST             NGEO          MOB7(07)          42.7782   0.0010   0.7762
DIST             NGEO          PIER(C)95        128.8714   0.0011  -0.8515
DIST             NGEO          PIER(C)95        128.8705   0.0011  -0.8506
DIST             NGEO          VLBA             163.2399   0.0011  -0.0096
DIST             NGEO          VLBA             163.2395   0.0011  -0.0092
DIST             NGEO          PIER(B)95         32.0680   0.0010  -0.7107
DIST             NGEO          PIER(B)95         32.0674   0.0010  -0.7101
DIST             NGEO          CALB             165.7154   0.0011  -0.0026
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                        GGAO SITE SURVEY 2007
GeoLab V3.72             GRS 80          UNITS: m,DMS        Page 0007
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Misclosures (pass 1):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT          FROM          TO             OBSERVATION STD.DEV.    MISC
---- -----------  ------------  ------------  ----------------- --------  --------
DIST             NGEO          7125               76.1014  0.0010   0.0513
DIST             NGEO          7125               76.1005  0.0010   0.0522
DIST             CAL(D)98      GORF               30.6163  0.0010   0.3697
DIST             CAL(D)98      GORF               30.6163  0.0010   0.3697
DIST             CAL(D)98      SGEOS              43.7788  0.0010  -0.0033
DIST             CAL(D)98      SGEOS              43.7787  0.0010  -0.0032
DIST             CAL(D)98      CALC              188.3247  0.0011  -0.2528
DIST             CAL(D)98      CALC              188.3247  0.0011  -0.2528
DIST             CAL(D)98      CALB              202.0175  0.0011  -0.1268
DIST             CAL(D)98      CALB              202.0173  0.0011  -0.1266
DIST             CAL(D)98      NG2000(07)         48.6229  0.0010  -0.0035
DIST             CAL(D)98      NG2000(07)         48.6225  0.0010  -0.0031
DIST             PIER(B)95     NGEO               32.0611  0.0010  -0.7038
DIST             PIER(B)95     NGEO               32.0602  0.0010  -0.7029
DIST             PIER(B)95     PIER(C)95          97.5765  0.0010  -0.0028
DIST             PIER(B)95     7108RM1           112.2214  0.0011  -0.0033
DIST             PIER(B)95     7108RM1           112.2206  0.0011  -0.0025
DIST             PIER(B)95     VLBA              131.3902  0.0011   0.6052
DIST             PIER(B)95     VLBA              131.3895  0.0011   0.6059
DIST             PIER(B)95     4005W              55.2253  0.0010  -0.0023
DIST             PIER(B)95     CALC              173.1750  0.0011  -0.8690
DIST             PIER(B)95     CALC              173.1743  0.0011  -0.8683
DIST             PIER(B)95     CALB              164.8952  0.0011  -0.7799
DIST             PIER(B)95     CALB              164.8949  0.0011  -0.7796
DIST             PIER(C)95     NGEO              128.8699  0.0011  -0.8500
DIST             PIER(C)95     NGEO              128.8686  0.0011  -0.8487
DIST             PIER(C)95     VLBA               53.4127  0.0010  -0.1134
DIST             PIER(C)95     VLBA               53.4118  0.0010  -0.1125
DIST             PIER(C)95     7108RM1            79.9762  0.0010  -0.0025
DIST             PIER(C)95     PIER(B)95          97.5760  0.0010  -0.0022
DIST             VLBA          CAL(A)01          132.2047  0.0011   0.9248
DIST             VLBA          CAL(A)01          132.2042  0.0011   0.9253
DIST             VLBA          7125              229.8562  0.0011  -0.0261
DIST             VLBA          7125              229.8552  0.0011  -0.0251
DIST             VLBA          NGEO              163.2389  0.0011  -0.0086
DIST             VLBA          NGEO              163.2386  0.0011  -0.0083
DIST             VLBA          PIER(B)95         131.3924  0.0011   0.6031
DIST             VLBA          PIER(B)95         131.3921  0.0011   0.6034
DIST             VLBA          7108RM1            52.3229  0.0010   1.0256
DIST             VLBA          7108RM1            52.3225  0.0010   1.0260
DIST             VLBA          PIER(C)95          53.4203  0.0010  -0.1210
DIST             VLBA          PIER(C)95          53.4197  0.0010  -0.1204
DIST             7108RM1       PIER(B)95         112.2212  0.0011  -0.0032
DIST             7108RM1       PIER(B)95         112.2205  0.0011  -0.0025
DIST             7108RM1       VLBA               52.3176  0.0010   1.0308
DIST             7108RM1       VLBA               52.3167  0.0010   1.0317
DIST             7108RM1       4005W              73.8290  0.0010  -0.0028
DIST             7108RM1       4005W              73.8286  0.0010  -0.0024
DIST             4005W         7108RM1            73.8291  0.0010  -0.0029
DIST             4005W         7108RM1            73.8288  0.0010  -0.0026
DIST             CAL(A)01      NGEO               78.9681  0.0010   0.2576
DIST             CAL(A)01      NGEO               78.9671  0.0010   0.2586
DIST             NGEO          VLBA              163.2393  0.0011  -0.0090
DIST             NGEO          VLBA              163.2377  0.0011  -0.0074
DIST             NGEO          CAL(A)01           78.9734  0.0010   0.2523
DIST             NGEO          CAL(A)01           78.9727  0.0010   0.2530
DIST             CALC          VLBA              229.2781  0.0011  -0.0059
DIST             CALC          VLBA              229.2773  0.0011  -0.0051
DIST             VLBA          CALC              229.2788  0.0011  -0.0065
DIST             VLBA          CALC              229.2778  0.0011  -0.0055
DIST             VLBA          NGEO              163.2391  0.0011  -0.0088
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                         GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80           UNITS: m,DMS        Page 0008
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Misclosures (pass 1):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT            FROM          TO               OBSERVATION STD.DEV.    MISC
---- ------------  ------------  ------------ ----------------- -------- --------
DIST               VLBA          NGEO                  163.2380  0.0011  -0.0077
DIST               CAL(D)98      DORIS(07)MK             6.2761  0.0010   0.4658
DIST               CAL(D)98      DORIS(07)MK             6.2757  0.0010   0.4662
DIST               GORF          DORIS(07)MK            24.3788  0.0010  -0.0884
DIST               GORF          DORIS(07)MK            24.3788  0.0010  -0.0884
DIST               SGEOS         DORIS(07)MK            37.6566  0.0010  -0.0559
DIST               SGEOS         DORIS(07)MK            37.6557  0.0010  -0.0550
DIST               DORIS(07)MK   CAL(D)98                6.3271  0.0010   0.4147
DIST               DORIS(07)MK   CAL(D)98                6.3270  0.0010   0.4148
DIST               DORIS(07)MK   GORF                   24.3797  0.0010  -0.0892
DIST               DORIS(07)MK   GORF                   24.3801  0.0010  -0.0896
DIST               DORIS(07)MK   SGEOS                  37.6648  0.0010  -0.0642
DIST               DORIS(07)MK   SGEOS                  37.6643  0.0010  -0.0637
GROUP: DIRECTIONS
DIR                GORF          DORIS(07)ANT 122 44   11.30 6.18    -9846.91
DIR                GORF          NG2000(07)   328 37   28.78 4.44     1993.94
DIR                GORF          CAL(A)01      35 27   46.05 0.84     1481.49
DIR                GORF          CALC          78 22   48.99 0.73        2.98
DIR                GORF          SGEOS         92 27   17.78 4.59     8648.72
DIR                GORF          CAL(D)98     217 12   18.02 2.87    -6265.32
DIR                NGEO          MOB7(07)      95  5    3.16 2.07    -3378.88
DIR                NGEO          MOB7(07)      12 36   16.65 2.07    -3377.72
DIR                NGEO          PIER(C)95    183 47   30.25 0.85      988.34
DIR                NGEO          NG2000(07)   347 20   16.36 1.24     -961.85
DIR                NGEO          CALB          83  0   17.49 0.73    -4906.89
DIR                NGEO          CALC          92 52   18.14 0.72    -4904.58
DIR                NGEO          7125         150 42    7.65 1.25    -5340.73
DIR                NGEO          GORF         165 29    2.94 1.16    -4906.98
DIR                NGEO          PIER(B)95    181 56   55.31 2.84     5695.32
DIR                NGEO          VLBA         187 24   52.99 0.73      785.37
DIR                NGEO          7108(93)     205  9   57.43 0.82     1310.63
DIR                NGEO          7108(93)     205  9   57.46 0.82     1310.60
DIR                NGEO          7108(93)     205  9   54.26 0.82     1313.80
DIR                SGEOS         CALC           9 50   43.82 0.78      -41.03
DIR                SGEOS         CAL(D)98     170 43    6.31 2.06     1273.56
DIR                SGEOS         GORF         205 40   44.50 4.59     9913.93
DIR                SGEOS         7125         298 22   43.21 7.55    -6916.59
DIR                SGEOS         DORIS(07)ANT   2  3   20.42 5.54     4921.89
DIR                SGEOS         MOB7(07)      89 26   35.76 1.79       43.73
DIR                7105          CAL(A)01      40 18    2.71 0.96     2518.81
DIR                7105          SGEOS         94  6   25.23 1.76    -1246.32
DIR                7125          CAL(A)01      45  3   18.05 0.93     1825.16
DIR                7125          CALB          85  4   21.12 0.76      347.54
DIR                7125          CALC          95 28    8.30 0.79      386.79
DIR                7125          SGEOS        199 55   56.10 7.55    -7732.38
DIR                7125          VLBA          23 52   45.72 0.63      282.67
DIR                7108(93)      NGEO          35 20   49.88 0.82     1301.36
DIR                7108(93)      CAL(A)01      57 53   18.93 1.00       -9.41
DIR                7108(93)      PIER(B)95     96 29   17.90 0.98      -10.70
DIR                7108(93)      PIER(C)95    164 45   29.20 1.84      -17.64
DIR                4005W         PIER(B)95    201 21   52.28 1.66        9.17
DIR                CAL(A)01      VLBA          74 20   25.32 0.83     -674.99
DIR                CAL(A)01      CALB         199 32   23.42 1.02    -1038.47
DIR                CAL(A)01      CALC         213 32   44.72 0.93     -499.22
DIR                CAL(A)01      7125           2  9    4.89 0.93     1381.51
DIR                CAL(A)01      GORF           7 20   28.40 0.84     1471.36
DIR                CAL(A)01      MOB7(07)      17 24   38.50 0.96    -1424.27
DIR                CAL(A)01      NG2000(07)   355 50    0.98 0.92    -1473.44
DIR                CAL(A)01      7105         102 17   49.27 0.96     2215.77
DIR                CALC          SGEOS          4 22    4.08 0.78     -268.75
DIR                CALC          GORF           6  7   32.86 0.73     1043.58
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                         GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80            UNITS: m,DMS         Page 0009
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Misclosures (pass 1):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT           FROM         TO                OBSERVATION STD.DEV.    MISC
---- ------------ ------------ ------------ ----------------- -------- --------
DIR               CALC         7125           8 25    58.64 0.79      991.90
DIR               CALC         NGEO          35  7    58.48 0.72     1043.60
DIR               CALC         NG2000(07)   333 12    52.89 0.78    -1276.56
DIR               CALC         MOB7(07)     345 33    43.61 0.72     -931.72
DIR               CALC         PIER(B)95     10 38    14.85 0.71     -558.57
DIR               CALC         CAL(A)01      23 11     6.59 0.93     -494.31
DIR               CALC         CALB          79 20    25.38 3.07      -10.35
DIR               CAL(D)98     DORIS(07)ANT   7 50    18.77 19.94  -20231.6
DIR               CAL(D)98     SGEOS         20 17    21.82 2.06     6273.42
DIR               CAL(D)98     CALB          27 34     7.06 0.66     5266.66
DIR               CAL(D)98     CALC          35  2    57.35 0.68     5225.47
DIR               VLBA         7125          17 43    51.12 0.63      513.51
DIR               VLBA         NGEO          28 36    52.19 0.73      664.86
DIR               VLBA         PIER(B)95     57 22    18.51 0.83    -1400.00
DIR               VLBA         PIER(C)95     98 15    32.88 1.72    -3938.96
DIR               PIER(B)95    NGEO          97 29    21.34 2.84     4898.31
DIR               PIER(B)95    4005W          9 28    25.08 1.66        5.24
DIR               PIER(B)95    VLBA          21  1    24.61 0.83    -1285.04
DIR               PIER(B)95    CALB         108 20    30.15 0.73     -764.60
DIR               PIER(B)95    CALC         117 44    16.04 0.71     -562.57
DIR               PIER(B)95    7108(93)     193 54    18.48 0.98    -4908.03
DIR               PIER(C)95    7108RM1       40 22    29.49 1.20     3825.78
DIR               PIER(C)95    4005W        106 11    51.08 2.05     3822.81
DIR               PIER(C)95    PIER(B)95    118  5    18.62 1.03     3826.39
DIR               PIER(C)95    NGEO         121 35    34.68 0.85     4808.50
DIR               PIER(C)95    7108(93)     276 24     5.51 1.84       -7.08
DIR               7108RM1      VLBA          99 28    36.22 1.71      115.90
DIR               7108RM1      7108(93)      67 28     9.00 2.85        8.93
DIR               MOB7(07)     NG2000(07)   354 32     0.64 2.16       19.03
DIR               CALB         SGEOS          2  0     8.78 0.74     -267.13
DIR               CALB         GORF           4 36    58.64 0.71     1001.17
DIR               CALB         7125           5 30    58.70 0.76      914.51
DIR               CALB         NGEO          32 44    46.79 0.73     1001.44
DIR               CALB         PIER(B)95     11  6    31.42 0.73     -760.10
DIR               CALB         CAL(A)01      19  2    46.92 1.02    -1032.23
DIR               CALB         CALC         269 12    28.58 3.07      -10.59
DIR               CALB         NG2000(07)   332 52    38.70 0.75    -1268.30
DIR               CALB         MOB7(07)     345 55    51.51 0.71    -1009.78
DIR               PIER(C)95    GODE          35 16    18.98 2.10    -1089.81
DIR               VLBA         GODE          53 17    30.29 1.54     -526.09
DIR               VLBA         PIER(C)95     98 15    32.01 1.72    -3938.09
DIR               7108RM1      GODE           3  8     2.25 1.78     3684.01
DIR               7108RM1      PIER(C)95     32 57    37.74 1.20        2.93
DIR               4005W        GODE          74 18    47.63 3.81    -8278.64
DIR               PIER(B)95    GODE           3 25    44.05 1.31     -828.55
DIR               PIER(B)95    7108RM1       23  9     2.79 0.93     1286.58
DIR               CAL(A)01     NGEO         122 44    34.28 1.21     2970.53
DIR               CALC         VLBA          45 18    50.00 0.63       -6.40
DIR               VLBA         NGEO          47 16    48.39 0.73        2.17
DIR               NGEO         CAL(A)01      53 20     1.60 1.21     2481.34
DIR               DORIS(07)MK  SGEOS         24 21    26.42 2.38     6133.02
DIR               DORIS(07)MK  CAL(D)98     189 51     4.18 12.99  -25294.7
DIR               GORF         DORIS(07)MK  122 44    15.71 3.64    -9851.45
DIR               CAL(D)98     DORIS(07)MK    7 50     4.91 12.99  -20217.3
DIR               SGEOS        GORF          32 54    13.35 4.59     3722.95
GROUP: ORTHOMETRIC HEIGHT DIFFERENCES
EHDF              VLBA         GODE                      0.7457   0.0005  -0.0133
EHDF              GODE         VLBA                     -0.7453   0.0005   0.0129
EHDF              VLBA         GODE                      0.7452   0.0005  -0.0128
EHDF              GODE         VLBA                     -0.7455   0.0005   0.0131
EHDF              PIER(C)95    GODE                      1.8546   0.0005  -1.2836
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                        GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80         UNITS: m,DMS         Page 0010
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Misclosures (pass 1):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT          FROM         TO               OBSERVATION STD.DEV.   MISC
---- ----------- ------------ ------------ ----------------- -------- --------
EHDF             GODE         PIER(C)95          -1.8546      0.0005   1.2836
EHDF             PIER(C)95    GODE                1.8531      0.0005  -1.2821
EHDF             GODE         PIER(C)95          -1.8530      0.0005   1.2820
EHDF             4005W        GODE                0.2701      0.0005  -1.2836
EHDF             GODE         4005W              -0.2700      0.0005   1.2835
EHDF             4005W        GODE                0.2686      0.0005  -1.2821
EHDF             GODE         4005W              -0.2686      0.0005   1.2821
EHDF             7108RM1      GODE                1.1513      0.0005  -1.2848
EHDF             GODE         7108RM1            -1.1512      0.0005   1.2847
EHDF             NGEO         GODE               -4.4569      0.0005   0.0201
EHDF             GODE         NGEO                4.4574      0.0005  -0.0206
EHDF             4005W        GODE                0.2703      0.0005  -1.2838
EHDF             GODE         4005W              -0.2700      0.0005   1.2835
EHDF             VLBA         GODE                0.7434      0.0005  -0.0110
EHDF             GODE         VLBA               -0.7436      0.0005   0.0112
EHDF             VLBA         7108(93)           -0.0183      0.0005   1.2715
EHDF             7108(93)     VLBA                0.0184      0.0005  -1.2716
EHDF             PIER(C)95    7108(93)            1.0906      0.0005   0.0012
EHDF             GORF         NGEO                0.6172      0.0005  -0.0048
EHDF             NGEO         GORF               -0.6175      0.0005   0.0051
EHDF             GORF         SGEOS               0.5173      0.0005   1.3005
EHDF             SGEOS        GORF               -0.5175      0.0005  -1.3003
EHDF             GORF         7125                0.1575      0.0005   0.0083
EHDF             7125         GORF               -0.1575      0.0005  -0.0083
EHDF             SGEOS        NGEO                0.1000      0.0005  -1.3054
EHDF             NGEO         SGEOS              -0.1000      0.0005   1.3054
EHDF             NGEO         7105                0.2283      0.0010   0.0118
EHDF             7105         NGEO               -0.2289      0.0010  -0.0112
EHDF             NGEO         7125               -0.4599      0.0005   0.0133
EHDF             7125         NGEO                0.4599      0.0005  -0.0133
EHDF             NGEO         CAL(A)01           -2.5376      0.0005   1.3064
EHDF             CAL(A)01     NGEO                2.5381      0.0005  -1.3069
EHDF             SGEOS        NG2000(07)          3.3364      0.0005  -0.0034
EHDF             NG2000(07)   SGEOS              -3.3360      0.0005   0.0030
EHDF             GORF         NG2000(07)          3.8545      0.0005   1.2963
EHDF             NG2000(07)   GORF               -3.8534      0.0005  -1.2974
EHDF             SGEOS        CALC               -1.5534      0.0005  -1.2968
EHDF             CALC         SGEOS               1.5522      0.0005   1.2980
EHDF             CALC         CALB               -0.3402      0.0005  -0.0047
EHDF             CALB         CALC                0.3406      0.0005   0.0043
EHDF             CALB         CALC                0.3408      0.0005   0.0041
EHDF             CALC         CALB               -0.3406      0.0005  -0.0043
EHDF             NGEO         MOB7(07)            3.3652      0.0005   1.3039
EHDF             MOB7(07)     NGEO               -3.3649      0.0005  -1.3042
EHDF             NGEO         MOB7(07)            3.3644      0.0005   1.3047
EHDF             MOB7(07)     NGEO               -3.3648      0.0005  -1.3043
EHDF             SGEOS        7125               -0.3596      0.0005  -1.2924
EHDF             7125         SGEOS               0.3595      0.0005   1.2925
EHDF             CAL(A)01     CALB                0.5436      0.0005  -1.3021
EHDF             CAL(A)01     CALB                0.5444      0.0005  -1.3029
EHDF             CALB         CAL(A)01           -0.5455      0.0005   1.3040
EHDF             CALC         CAL(A)01           -0.8856      0.0005   1.2992
EHDF             CAL(A)01     CALC                0.8848      0.0005  -1.2984
EHDF             SGEOS        CAL(A)01           -2.4376      0.0005   0.0010
EHDF             PIER(C)95    VLBA                1.1091      0.0005  -1.2705
EHDF             VLBA         PIER(C)95          -1.1097      0.0005   1.2711
EHDF             VLBA         7108RM1            -0.4064      0.0005   1.2723
EHDF             7108RM1      VLBA                0.4066      0.0005  -1.2725
EHDF             7108RM1      4005W               0.8816      0.0005  -0.0016
EHDF             4005W        7108RM1            -0.8817      0.0005   0.0017
EHDF             4005W        NGEO                4.7283      0.0005  -1.3050
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                          GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80           UNITS: m,DMS        Page 0011
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Misclosures (pass 1):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT          FROM          TO                OBSERVATION STD.DEV.   MISC
---- -----------  -----------  -----------  ----------------- -------- --------
EHDF             NGEO          4005W              -4.7280  0.0005   1.3047
EHDF             NGEO          CALB               -1.9930  0.0005   0.0033
EHDF             CALB          NGEO                1.9926  0.0005  -0.0029
EHDF             GORF          CAL(D)98            1.5343  0.0005   1.2990
EHDF             CAL(D)98      GORF               -1.5342  0.0005  -1.2991
EHDF             SGEOS         CAL(D)98            1.0166  0.0005  -0.0011
EHDF             CAL(D)98      SGEOS              -1.0167  0.0005   0.0012
EHDF             NGEO          PIER(B)95          -1.2152  0.0005   1.3045
EHDF             PIER(B)95     NGEO                1.2153  0.0005  -1.3046
EHDF             PIER(B)95     CAL(A)01           -1.3226  0.0005   0.0021
EHDF             CAL(A)01      PIER(B)95           1.3225  0.0005  -0.0020
EHDF             4005W         GODE                0.2681  0.0005  -1.2816
EHDF             GODE          4005W              -0.2681  0.0005   1.2816
EHDF             PIER(C)95     GODE                1.8533  0.0005  -1.2823
EHDF             GODE          PIER(C)95          -1.8532  0.0005   1.2822
EHDF             VLBA          GODE                0.7435  0.0005  -0.0111
EHDF             GODE          VLBA               -0.7435  0.0005   0.0111
EHDF             7105          NGEO               -0.2244  0.0010  -0.0157
EHDF             NGEO          7105                0.2243  0.0010   0.0158
EHDF             7105          NGEO               -0.2278  0.0010  -0.0123
EHDF             NGEO          7105                0.2268  0.0010   0.0133
EHDF             GORF          DORIS(07)MK         1.5656  0.0005   0.0067
EHDF             DORIS(07)MK   GORF               -1.5647  0.0005  -0.0076
EHDF             SGEOS         DORIS(07)MK         1.0480  0.0005  -1.2935
EHDF             DORIS(07)MK   SGEOS              -1.0479  0.0005   1.2934
DXCT             MV3(07PRE)    MV3(07)            -0.0130  0.0010   0.8282
DYCT             MV3(07PRE)    MV3(07)            -0.0062  0.0010  -2.4337
DZCT             MV3(07PRE)    MV3(07)             0.0288  0.0010   0.9210
DXCT             7105          MOB7(07)            0.5239  0.0010   0.5554
DYCT             7105          MOB7(07)           -2.3854  0.0010  -1.4505
DZCT             7105          MOB7(07)            1.9699  0.0010   0.1523
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                             GGAO SITE SURVEY 2007
GeoLab V3.72                 GRS 80            UNITS: m,DMS       Page 0012
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Solution (pass 1):
NAME         TYPE        OLD VALUE          CORRECTION        UPDATED VALUE
------------ ---- ------------------- ------------------- -------------------
4005W        ELAT N 39 01  17.99247   0  0   0.02909  N 39 01  18.02156
4005W        ELON W 76 49  37.50358   0  0  -0.01043  W 76 49  37.51401
4005W        EHYT          15.5300           -1.2829            14.2471
7105         ELAT N 39 01  14.17743   0  0   0.00051  N 39 01  14.17794
7105         ELON W 76 49  39.69784   0  0  -0.00193  W 76 49  39.69977
7105         EHYT          19.1940            0.0082            19.2022
7108(93)     ELAT N 39 01  18.90453   0  0   0.02912  N 39 01  18.93365
7108(93)     ELON W 76 49  35.54202   0  0  -0.01036  W 76 49  35.55238
7108(93)     EHYT          15.0360           -1.2837            13.7523
7108RM1      ELAT N 39 01  18.33901   0  0   0.02924  N 39 01  18.36825
7108RM1      ELON W 76 49  34.46714   0  0  -0.01034  W 76 49  34.47748
7108RM1      EHYT          14.6480           -1.2846            13.3634
7125         ELAT N 39 01  12.96876   0  0   0.00068  N 39 01  12.96944
7125         ELON W 76 49  38.80926   0  0  -0.00122  W 76 49  38.81048
7125         EHYT          18.5060            0.0061            18.5121
CAL(A)01     ELAT N 39 01  15.61136   0  0   0.02910  N 39 01  15.64046
CAL(A)01     ELON W 76 49  35.68088   0  0  -0.01021  W 76 49  35.69109
CAL(A)01     EHYT          17.7200           -1.2837            16.4363
CAL(D)98     ELAT N 39 01  12.11265   0  0   0.02785  N 39 01  12.14050
CAL(D)98     ELON W 76 49  40.63726   0  0  -0.01218  W 76 49  40.64944
CAL(D)98     EHYT          21.1750           -1.2762            19.8988
CALB         ELAT N 39 01  13.63413   0  0  -0.00105  N 39 01  13.63308
CALB         ELON W 76 49  32.47643   0  0   0.00494  W 76 49  32.47149
CALB         EHYT          16.9587            0.0192            16.9779
CALC         ELAT N 39 01  12.74706   0  0  -0.00100  N 39 01  12.74606
CALC         ELON W 76 49  32.86330   0  0   0.00493  W 76 49  32.85837
CALC         EHYT          17.3033            0.0152            17.3185
DORIS(07)ANT ELAT N 39 01  12.25143   0  0   0.00052  N 39 01  12.25195
DORIS(07)ANT ELON W 76 49  40.42715   0  0  -0.00006  W 76 49  40.42721
DORIS(07)ANT EHYT          20.4310            0.0067            20.4377
DORIS(07)MK  ELAT N 39 01  12.25143   0  0   0.00060  N 39 01  12.25203
DORIS(07)MK  ELON W 76 49  40.42715   0  0   0.00008  W 76 49  40.42707
DORIS(07)MK  EHYT          19.9140            0.0057            19.9197
GORF         ELAT N 39 01  12.78830   0  0  -0.00149  N 39 01  12.78681
GORF         ELON W 76 49  39.69118   0  0   0.00447  W 76 49  39.68671
GORF         EHYT          18.3410            0.0143            18.3553
MOB7(07)     ELAT N 39 01  14.14962   0  0   0.02766  N 39 01  14.17728
MOB7(07)     ELON W 76 49  39.69049   0  0  -0.01067  W 76 49  39.70116
MOB7(07)     EHYT          23.6230           -1.2826            22.3404
MV3(07)      ELAT N 39 01  18.90463   0  0   0.02903  N 39 01  18.93366
MV3(07)      ELON W 76 49  35.54212   0  0  -0.01046  W 76 49  35.55258
MV3(07)      EHYT          19.3880           -2.5675            16.8205
NG2000(07)   ELAT N 39 01  12.93765   0  0   0.02867  N 39 01  12.96632
NG2000(07)   ELON W 76 49  38.91766   0  0  -0.00986  W 76 49  38.92752
NG2000(07)   EHYT          23.4910           -1.2723            22.2187
NGEO         ELAT N 39 01  15.43514   0  0  -0.00104  N 39 01  15.43410
NGEO         ELON W 76 49  38.96613   0  0   0.00485  W 76 49  38.96128
NGEO         EHYT          18.9535            0.0215            18.9750
PIER(B)95    ELAT N 39 01  16.33345   0  0   0.02910  N 39 01  16.36255
PIER(B)95    ELON W 76 49  38.35535   0  0  -0.01020  W 76 49  38.36555
PIER(B)95    EHYT          19.0430           -1.2820            17.7610
PIER(C)95    ELAT N 39 01  19.42009   0  0   0.02910  N 39 01  19.44919
PIER(C)95    ELON W 76 49  37.48891   0  0  -0.01057  W 76 49  37.49948
PIER(C)95    EHYT          13.9460           -1.2828            12.6632
SGEOS        ELAT N 39 01  12.60829   0  0   0.02857  N 39 01  12.63686
SGEOS        ELON W 76 49  38.93259   0  0  -0.01014  W 76 49  38.94273
SGEOS        EHYT          20.1580           -1.2812            18.8768
VLBA         ELAT N 39 01  19.91964   0  0  -0.00065  N 39 01  19.91899
VLBA         ELON W 76 49  35.36780   0  0   0.00537  W 76 49  35.36243
VLBA         EHYT          13.7831           -0.0121            13.7710
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                          GGAO SITE SURVEY 2007
GeoLab V3.72                  GRS 80          UNITS: m,DMS          Page 0013
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Misclosures (pass 2):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT          FROM          TO               OBSERVATION STD.DEV.   MISC
---- ----------- ------------  ------------  ----------------- -------- --------
GROUP: 00000875.SSF,obs#:   1 day 10  OPT                    10 1 13:
DXCT          CALB          GORF          -165.0042  0.0009  -0.0097
DYCT          CALB          GORF           -56.5890  0.0030  -0.0072
DZCT          CALB          GORF           -19.3945  0.0025  -0.0136
GROUP: 00000871.SSF,obs#:   2 day 10  OPT                    10 1 13:
DXCT          CALB          NGEO          -159.6235  0.0006  -0.0019
DYCT          CALB          NGEO            -3.0402  0.0020  -0.0021
DZCT          CALB          NGEO            44.4055  0.0016   0.0016
GROUP: 00000867.SSF,obs#:   3 day 10  OPT                    10 1 14
DXCT          CALB          VLBA           -96.0993  0.0019   0.0028
DYCT          CALB          VLBA           105.3769  0.0072   0.0334
DZCT          CALB          VLBA           148.5907  0.0058  -0.0103
GROUP: 00000899.SSF,obs#:   4 day 31  OPT                    31 1 13:
DXCT          CALC          GORF          -159.9300  0.0012  -0.0074
DYCT          CALC          GORF           -37.4378  0.0040  -0.0110
DZCT          CALC          GORF             1.6415  0.0033  -0.0122
GROUP: 00000919.SSF,obs#:   6 day 31  OPT                    31 2 18:
DXCT          CALC          NGEO          -154.5464  0.0011  -0.0024
DYCT          CALC          NGEO            16.1106  0.0040  -0.0054
DZCT          CALC          NGEO            65.4420  0.0034   0.0025
GROUP: 00000907.SSF,obs#:   7 day 31  OPT                    31 1 14
DXCT          CALC          VLBA           -91.0253  0.0017   0.0053
DYCT          CALC          VLBA           124.5390  0.0062   0.0188
DZCT          CALC          VLBA           169.6213  0.0048  -0.0036
GROUP: 00000923.SSF,obs#:   8 day 31  OPT                    31 2 18:
DXCT          CALC          VLBA           -91.0270  0.0015   0.0070
DYCT          CALC          VLBA           124.5426  0.0055   0.0152
DZCT          CALC          VLBA           169.6195  0.0047  -0.0018
GROUP: 00000911.SSF,obs#:  12 day 31  OPT                    31    18:
DXCT          GODE          GORF           -47.9177  0.0008  -0.0074
DYCT          GODE          GORF          -122.5830  0.0032  -0.0095
DZCT          GODE          GORF          -127.7099  0.0027  -0.0106
GROUP: 00000859.SSF,obs#:  13 day  8  OPT                     8   15:2
DXCT          GODE          GORF           -47.9172  0.0010  -0.0079
DYCT          GODE          GORF          -122.5854  0.0034  -0.0071
DZCT          GODE          GORF          -127.7098  0.0027  -0.0107
GROUP: 00000879.SSF,obs#:  14 day 30  OPT                    30    14
DXCT          GODE          NGEO           -42.5348  0.0006  -0.0018
DYCT          GODE          NGEO           -69.0389  0.0020   0.0004
DZCT          GODE          NGEO           -63.9046  0.0017  -0.0007
GROUP: 00000855.SSF,obs#:  16 day  8  OPT                     8   14:5
DXCT          GODE          VLBA            20.9866  0.0016   0.0057
DYCT          GODE          VLBA            39.3953  0.0054   0.0188
DZCT          GODE          VLBA            40.2685  0.0042  -0.0006
GROUP: 00000915.SSF,obs#:  17 day 31  OPT                    31 2 18:
DXCT          GORF          CALC           159.9279  0.0012   0.0095
DYCT          GORF          CALC            37.4384  0.0047   0.0104
DZCT          GORF          CALC            -1.6430  0.0040   0.0137
GROUP: 00000891.SSF,obs#:  18 day 30  OPT                    30 1 14:
DXCT          NGEO          CALB           159.6230  0.0008   0.0024
DYCT          NGEO          CALB             3.0420  0.0028   0.0003
DZCT          NGEO          CALB           -44.4076  0.0022   0.0005
GROUP: 00000887.SSF,obs#:  19 day 30  OPT                    30 1 14:
DXCT          NGEO          GORF            -5.3828  0.0009  -0.0058
DYCT          NGEO          GORF           -53.5438  0.0032  -0.0102
DZCT          NGEO          GORF           -63.8054  0.0027  -0.0098
GROUP: 00000883.SSF,obs#:  20 day 30  OPT                    30 1 14:
DXCT          NGEO          VLBA            63.5206  0.0014   0.0082
DYCT          NGEO          VLBA           108.4320  0.0055   0.0206
DZCT          NGEO          VLBA           104.1764  0.0044  -0.0031
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GROUP: DISTANCES
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                            GGAO SITE SURVEY 2007
GeoLab V3.72                GRS 80          UNITS: m,DMS       Page 0014
================================================================================
Misclosures (pass 2):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT           FROM          TO               OBSERVATION STD.DEV.   MISC
---- ------------ ------------  ------------ ----------------- -------- --------
DIST              NGEO          7105               42.6203   0.0010  -0.0032
DIST              7105          NGEO               42.6206   0.0010  -0.0036
DIST              SGEOS         7105               50.8793   0.0010   0.0153
DIST              SGEOS         7105               50.8786   0.0031   0.0159
DIST              7105          SGEOS              50.8779   0.0010   0.0167
DIST              7105          SGEOS              50.8769   0.0031   0.0177
DIST              CAL(A)01      7105              106.4834   0.0010   0.0103
DIST              CAL(A)01      7105              106.4828   0.0031   0.0109
DIST              7105          CAL(A)01          106.4848   0.0010   0.0089
DIST              7105          CAL(A)01          106.4860   0.0031   0.0077
DIST              4005W         7108(93)           54.9340   0.0010   0.0030
DIST              NGEO          7108(93)          135.6317   0.0011   0.0085
DIST              NGEO          7108(93)          135.6312   0.0031   0.0090
DIST              7108(93)      NGEO              135.6320   0.0011   0.0082
DIST              7108(93)      NGEO              135.6318   0.0031   0.0084
DIST              NGEO          7108(93)          135.6311   0.0011   0.0091
DIST              NGEO          7108(93)          135.6314   0.0011   0.0088
DIST              PIER(B)95     7108(93)          104.3204   0.0010  -0.0031
DIST              PIER(B)95     7108(93)          104.3206   0.0010  -0.0033
DIST              PIER(B)95     7108(93)          104.3202   0.0010  -0.0029
DIST              PIER(C)95     7108(93)           49.4714   0.0010   0.0037
DIST              7108(93)      PIER(C)95          49.4695   0.0010   0.0055
DIST              7108RM1       7108(93)           31.1916   0.0010  -0.0026
DIST              7108(93)      7108RM1            31.1916   0.0010  -0.0026
DIST              CALB          MOB7(07)          174.8047   0.0011   0.0024
DIST              CALB          MOB7(07)          174.8043   0.0011   0.0028
DIST              CALB          NG2000(07)        156.7630   0.0011  -0.0134
DIST              CALB          NG2000(07)        156.7623   0.0011  -0.0127
DIST              CALB          SGEOS             158.6911   0.0011  -0.0047
DIST              CALB          SGEOS             158.6900   0.0011  -0.0036
DIST              CALB          CAL(A)01           99.1546   0.0010  -0.0037
DIST              CALB          CAL(A)01           99.1539   0.0010  -0.0030
DIST              CALB          7125              153.8830   0.0011  -0.0171
DIST              CALB          7125              153.8816   0.0011  -0.0157
DIST              CALB          CAL(D)98          202.0185   0.0011   0.0451
DIST              CALB          CAL(D)98          202.0178   0.0011   0.0458
DIST              CALB          PIER(B)95         164.8958   0.0011  -0.0052
DIST              CALB          PIER(B)95         164.8952   0.0011  -0.0046
DIST              CALB          GORF              175.5156   0.0011   0.0105
DIST              CALB          GORF              175.5151   0.0011   0.0110
DIST              NG2000(07)    CALB              156.7638   0.0011  -0.0143
DIST              NG2000(07)    CALB              156.7631   0.0011  -0.0136
DIST              NG2000(07)    CALC              146.2542   0.0011  -0.0141
DIST              NG2000(07)    CALC              146.2535   0.0011  -0.0134
DIST              NG2000(07)    SGEOS              10.6987   0.0010   0.0029
DIST              NG2000(07)    SGEOS              10.6979   0.0010   0.0037
DIST              NG2000(07)    MOB7(07)           41.7195   0.0010   0.0046
DIST              NG2000(07)    MOB7(07)           41.7184   0.0010   0.0057
DIST              NG2000(07)    GORF               19.4463   0.0010   0.0243
DIST              NG2000(07)    GORF               19.4457   0.0010   0.0249
DIST              NG2000(07)    NGEO               76.1692   0.0010   0.0053
DIST              NG2000(07)    NGEO               76.1681   0.0010   0.0064
DIST              NG2000(07)    CAL(A)01          113.5539   0.0011   0.0036
DIST              NG2000(07)    CAL(D)98           48.6228   0.0010   0.0575
DIST              NG2000(07)    CAL(D)98           48.6224   0.0010   0.0579
DIST              CALC          MOB7(07)          170.4965   0.0011   0.0022
DIST              CALC          NG2000(07)        146.2542   0.0011  -0.0141
DIST              CALC          NG2000(07)        146.2535   0.0011  -0.0134
DIST              CALC          SGEOS             146.4190   0.0011  -0.0059
DIST              CALC          SGEOS             146.4181   0.0011  -0.0050
DIST              CALC          7125              143.3701   0.0011  -0.0151
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                             GGAO SITE SURVEY 2007
GeoLab V3.72                 GRS 80          UNITS: m,DMS        Page 0015
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Misclosures (pass 2):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT           FROM           TO             OBSERVATION STD.DEV.   MISC
---- -----------  ------------   ------------   ----------------- -------- --------
DIST              CALC           7125              143.3692    0.0011  -0.0142
DIST              CALC           PIER(B)95         173.1763    0.0011  -0.0027
DIST              CALC           NGEO              168.6026    0.0011   0.0026
DIST              CALC           CAL(D)98          188.3264    0.0011   0.0424
DIST              CALC           CAL(D)98          188.3255    0.0011   0.0433
DIST              CALC           GORF              164.2626    0.0011   0.0086
DIST              CALC           GORF              164.2611    0.0011   0.0101
DIST              SGEOS          MOB7(07)           51.0015    0.0010   0.0026
DIST              SGEOS          MOB7(07)           51.0005    0.0010   0.0036
DIST              SGEOS          NG2000(07)         10.6969    0.0010   0.0046
DIST              SGEOS          NG2000(07)         10.6963    0.0010   0.0052
DIST              SGEOS          CALC              146.4197    0.0011  -0.0067
DIST              SGEOS          CALC              146.4194    0.0011  -0.0064
DIST              SGEOS          CALB              158.6924    0.0011  -0.0060
DIST              SGEOS          CALB              158.6917    0.0011  -0.0053
DIST              SGEOS          7125               10.7255    0.0010   0.0189
DIST              SGEOS          7125               10.7258    0.0010   0.0186
DIST              SGEOS          GORF               18.4795    0.0010   0.0128
DIST              SGEOS          GORF               18.4788    0.0010   0.0135
DIST              SGEOS          CAL(D)98           43.7793    0.0010   0.0501
DIST              SGEOS          CAL(D)98           43.7789    0.0010   0.0505
DIST              MOB7(07)       CALB              174.8040    0.0011   0.0031
DIST              MOB7(07)       CALB              174.8036    0.0011   0.0035
DIST              MOB7(07)       SGEOS              51.0016    0.0010   0.0025
DIST              MOB7(07)       SGEOS              50.9996    0.0010   0.0045
DIST              MOB7(07)       NGEO               42.7730    0.0010   0.0086
DIST              MOB7(07)       NGEO               42.7723    0.0010   0.0093
DIST              MOB7(07)       CAL(A)01          106.6462    0.0010   0.0141
DIST              MOB7(07)       CAL(A)01          106.6450    0.0010   0.0153
DIST              MOB7(07)       CALB              174.8048    0.0011   0.0023
DIST              MOB7(07)       CALC              170.4965    0.0011   0.0022
DIST              MOB7(07)       NG2000(07)         41.7191    0.0010   0.0050
DIST              MOB7(07)       NG2000(07)         41.7181    0.0010   0.0060
DIST              MOB7(07)       CAL(A)01          106.6461    0.0010   0.0142
DIST              MOB7(07)       CAL(A)01          106.6439    0.0010   0.0164
DIST              MOB7(07)       CAL(A)01          106.6444    0.0010   0.0159
DIST              7125           CALB              153.8838    0.0011  -0.0180
DIST              7125           CALB              153.8827    0.0011  -0.0169
DIST              7125           CAL(A)01          111.4547    0.0010  -0.0106
DIST              7125           CAL(A)01          111.4542    0.0010  -0.0101
DIST              7125           SGEOS              10.7253    0.0010   0.0192
DIST              7125           SGEOS              10.7256    0.0010   0.0189
DIST              7125           VLBA              229.8558    0.0011  -0.0066
DIST              7125           VLBA              229.8551    0.0011  -0.0059
DIST              7125           NGEO               76.1010    0.0010  -0.0084
DIST              7125           NGEO               76.1008    0.0010  -0.0082
DIST              CAL(A)01       7125              111.4548    0.0010  -0.0107
DIST              CAL(A)01       7125              111.4540    0.0010  -0.0099
DIST              CAL(A)01       GORF              130.3091    0.0011   0.0229
DIST              CAL(A)01       GORF              130.3085    0.0011   0.0235
DIST              CAL(A)01       MOB7(07)          106.6456    0.0010   0.0147
DIST              CAL(A)01       MOB7(07)          106.6447    0.0010   0.0156
DIST              CAL(A)01       NG2000(07)        113.5544    0.0011   0.0031
DIST              GORF           CALB              175.5161    0.0011   0.0099
DIST              GORF           CALB              175.5165    0.0011   0.0095
DIST              GORF           CAL(A)01          130.3085    0.0011   0.0235
DIST              GORF           CAL(A)01          130.3079    0.0011   0.0241
DIST              GORF           NGEO               83.4687    0.0010   0.0145
DIST              GORF           NGEO               83.4678    0.0010   0.0154
DIST              GORF           NG2000(07)         19.4448    0.0010   0.0258
DIST              GORF           NG2000(07)         19.4442    0.0010   0.0264
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                            GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80          UNITS: m,DMS        Page 0016
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Misclosures (pass 2):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT          FROM         TO              OBSERVATION STD.DEV.   MISC
---- ----------- ------------ ------------ ----------------- -------- --------
DIST         GORF         CAL(D)98          30.5621  0.0010   0.0320
DIST         GORF         CAL(D)98          30.5621  0.0010   0.0320
DIST         GORF         SGEOS             18.4785  0.0010   0.0138
DIST         GORF         SGEOS             18.4779  0.0010   0.0144
DIST         GORF         CALC             164.2621  0.0011   0.0091
DIST         GORF         CALC             164.2611  0.0011   0.0101
DIST         GORF         NG2000(07)        19.4455  0.0010   0.0251
DIST         GORF         NG2000(07)        19.4450  0.0010   0.0256
DIST         NGEO         MOB7(07)          42.7739  0.0010   0.0077
DIST         NGEO         MOB7(07)          42.7728  0.0010   0.0088
DIST         NGEO         NG2000(07)        76.1699  0.0010   0.0046
DIST         NGEO         NG2000(07)        76.1691  0.0010   0.0054
DIST         NGEO         MOB7(07)          42.7733  0.0010   0.0083
DIST         NGEO         MOB7(07)          42.7723  0.0010   0.0093
DIST         NGEO         PIER(C)95        128.8632  0.0011   0.0049
DIST         NGEO         PIER(C)95        128.8623  0.0011   0.0058
DIST         NGEO         VLBA             163.2397  0.0011   0.0084
DIST         NGEO         VLBA             163.2393  0.0011   0.0088
DIST         NGEO         PIER(B)95         32.0306  0.0010   0.0101
DIST         NGEO         PIER(B)95         32.0300  0.0010   0.0107
DIST         NGEO         GORF              83.4681  0.0010   0.0151
DIST         NGEO         GORF              83.4673  0.0010   0.0159
DIST         NGEO         7125              76.1015  0.0010  -0.0089
DIST         NGEO         7125              76.1006  0.0010  -0.0080
DIST         CAL(D)98     GORF              30.5620  0.0010   0.0322
DIST         CAL(D)98     GORF              30.5620  0.0010   0.0322
DIST         CAL(D)98     SGEOS             43.7788  0.0010   0.0506
DIST         CAL(D)98     SGEOS             43.7787  0.0010   0.0507
DIST         CAL(D)98     CALC             188.3258  0.0011   0.0430
DIST         CAL(D)98     CALC             188.3258  0.0011   0.0430
DIST         CAL(D)98     CALB             202.0186  0.0011   0.0449
DIST         CAL(D)98     CALB             202.0184  0.0011   0.0451
DIST         CAL(D)98     NG2000(07)        48.6229  0.0010   0.0575
DIST         CAL(D)98     NG2000(07)        48.6225  0.0010   0.0579
DIST         PIER(B)95    NGEO              32.0309  0.0010   0.0098
DIST         PIER(B)95    NGEO              32.0300  0.0010   0.0107
DIST         PIER(B)95    CAL(A)01          68.0959  0.0010  -0.0021
DIST         PIER(B)95    PIER(C)95         97.5765  0.0010  -0.0045
DIST         PIER(B)95    PIER(C)95         97.5757  0.0010  -0.0037
DIST         PIER(B)95    7108RM1          112.2214  0.0011  -0.0036
DIST         PIER(B)95    7108RM1          112.2206  0.0011  -0.0028
DIST         PIER(B)95    VLBA             131.3919  0.0011  -0.0035
DIST         PIER(B)95    VLBA             131.3912  0.0011  -0.0028
DIST         PIER(B)95    4005W             55.2253  0.0010  -0.0045
DIST         PIER(B)95    4005W             55.2248  0.0010  -0.0040
DIST         PIER(B)95    CALC             173.1762  0.0011  -0.0027
DIST         PIER(B)95    CALB             164.8966  0.0011  -0.0059
DIST         PIER(B)95    CALB             164.8963  0.0011  -0.0056
DIST         PIER(C)95    NGEO             128.8637  0.0011   0.0044
DIST         PIER(C)95    NGEO             128.8624  0.0011   0.0057
DIST         PIER(C)95    VLBA              53.4168  0.0010   0.0046
DIST         PIER(C)95    VLBA              53.4159  0.0010   0.0055
DIST         PIER(C)95    PIER(B)95         97.5760  0.0010  -0.0040
DIST         PIER(C)95    PIER(B)95         97.5753  0.0010  -0.0033
DIST         VLBA         7125             229.8561  0.0011  -0.0069
DIST         VLBA         7125             229.8551  0.0011  -0.0059
DIST         VLBA         NGEO             163.2388  0.0011   0.0093
DIST         VLBA         NGEO             163.2385  0.0011   0.0096
DIST         VLBA         PIER(B)95        131.3907  0.0011  -0.0023
DIST         VLBA         7108RM1           52.3500  0.0010  -0.0030
DIST         VLBA         7108RM1           52.3496  0.0010  -0.0026
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                          GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80              UNITS: m,DMS          Page 0017
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Misclosures (pass 2):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT          FROM          TO                    OBSERVATION STD.DEV.    MISC
---- ----------- ------------  ------------ ----------------- -------- --------
DIST             VLBA          PIER(C)95              53.4162   0.0010   0.0053
DIST             VLBA          PIER(C)95              53.4156   0.0010   0.0059
DIST             7108RM1       PIER(B)95             112.2213   0.0011  -0.0034
DIST             7108RM1       PIER(B)95             112.2206   0.0011  -0.0027
DIST             7108RM1       VLBA                   52.3512   0.0010  -0.0042
DIST             7108RM1       VLBA                   52.3503   0.0010  -0.0033
DIST             4005W         PIER(B)95              55.2246   0.0010  -0.0037
DIST             4005W         PIER(B)95              55.2239   0.0010  -0.0030
DIST             CAL(A)01      NGEO                   78.9561   0.0010   0.0088
DIST             CAL(A)01      NGEO                   78.9551   0.0010   0.0098
DIST             NGEO          VLBA                  163.2391   0.0011   0.0090
DIST             NGEO          VLBA                  163.2375   0.0011   0.0106
DIST             NGEO          CAL(A)01               78.9572   0.0010   0.0077
DIST             NGEO          CAL(A)01               78.9565   0.0010   0.0084
DIST             CALC          VLBA                  229.2781   0.0011   0.0023
DIST             CALC          VLBA                  229.2773   0.0011   0.0031
DIST             VLBA          CALC                  229.2778   0.0011   0.0025
DIST             VLBA          NGEO                  163.2390   0.0011   0.0091
DIST             VLBA          NGEO                  163.2379   0.0011   0.0102
DIST             CAL(D)98      DORIS(07)MK             6.2681   0.0010   0.0915
DIST             CAL(D)98      DORIS(07)MK             6.2677   0.0010   0.0919
DIST             GORF          DORIS(07)MK            24.3783   0.0010  -0.0548
DIST             GORF          DORIS(07)MK            24.3783   0.0010  -0.0548
DIST             SGEOS         DORIS(07)MK            37.6845   0.0010  -0.0419
DIST             SGEOS         DORIS(07)MK            37.6836   0.0010  -0.0410
DIST             DORIS(07)MK   CAL(D)98                6.2689   0.0010   0.0908
DIST             DORIS(07)MK   CAL(D)98                6.2688   0.0010   0.0909
DIST             DORIS(07)MK   GORF                   24.3792   0.0010  -0.0557
DIST             DORIS(07)MK   GORF                   24.3796   0.0010  -0.0561
DIST             DORIS(07)MK   SGEOS                  37.6847   0.0010  -0.0422
DIST             DORIS(07)MK   SGEOS                  37.6842   0.0010  -0.0417
GROUP: DIRECTIONS
DIR              GORF          SGEOS            0  0    0.00 4.59  -148.01
DIR              GORF          DORIS(07)ANT   122 44   11.30 6.18  -222.53
DIR              GORF          NG2000(07)     328 37   28.78 4.44   -54.97
DIR              GORF          NGEO             0  0    0.00 1.16    21.83
DIR              GORF          CAL(A)01        35 27   46.05 0.84     5.91
DIR              GORF          CALB            69 23   25.91 0.71    -6.01
DIR              GORF          CALC            78 22   48.99 0.73    -8.51
DIR              GORF          SGEOS           92 27   17.78 4.59  -100.07
DIR              GORF          CAL(D)98       217 12   18.02 2.87    73.40
DIR              NGEO          CALB             0  0    0.00 0.73     5.96
DIR              NGEO          GORF             0  0    0.00 1.16    20.50
DIR              NGEO          PIER(C)95      183 47   30.25 0.85     9.60
DIR              NGEO          VLBA           199 58   51.90 0.73    11.20
DIR              NGEO          NG2000(07)     347 20   16.36 1.24   -34.71
DIR              NGEO          PIER(B)95        0  0    0.00 2.84    45.56
DIR              NGEO          CALB            83  0    17.49 0.73     4.66
DIR              NGEO          CALC            92 52   18.14 0.72     5.14
DIR              NGEO          7125           150 42    7.65 1.25   -40.85
DIR              NGEO          GORF           165 29    2.94 1.16    19.65
DIR              NGEO          7105             0  0    0.00 2.11    24.70
DIR              NGEO          PIER(B)95      181 56   55.31 2.84    39.25
DIR              NGEO          GORF             0  0    0.00 1.16     9.01
DIR              NGEO          GORF             0  0    0.00 1.16     9.03
DIR              NGEO          GORF             0  0    0.00 1.16     6.89
DIR              SGEOS         CALB             0  0    0.00 0.74    -2.12
DIR              SGEOS         GORF           205 40   44.50 4.59  -101.92
DIR              SGEOS         7125           298 22   43.21 7.55    67.44
DIR              SGEOS         CAL(D)98         0  0    0.00 2.06    10.03
DIR              SGEOS         DORIS(07)ANT     2  3    20.42 5.54    26.11
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                        GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80              UNITS: m,DMS         Page 0018
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Misclosures (pass 2):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT           FROM         TO                 OBSERVATION STD.DEV.    MISC
---- -----------  ------------ ------------ ----------------- -------- --------
DIR               SGEOS        MOB7(07)      89 26   35.76 1.79    -18.04
DIR               SGEOS        NG2000(07)   112 27   45.55 8.20    171.62
DIR               7105         NGEO           0  0    0.00 2.11      9.94
DIR               7105         CAL(A)01       0  0    0.00 0.96      7.69
DIR               7105         SGEOS         94  6   25.23 1.76    -24.04
DIR               7125         NGEO           0  0    0.00 1.25    -45.91
DIR               7125         CAL(A)01      45  3   18.05 0.93     -3.24
DIR               7125         CALB          85  4   21.12 0.76     11.46
DIR               7125         CALC          95 28    8.30 0.79     17.76
DIR               7125         SGEOS        199 55   56.10 7.55     77.73
DIR               7125         NGEO           0  0    0.00 1.25    -32.55
DIR               7125         VLBA          23 52   45.72 0.63      8.25
DIR               7108(93)     NGEO          35 20   49.88 0.82      4.60
DIR               7108(93)     PIER(C)95    164 45   29.20 1.84     -8.01
DIR               CAL(A)01     VLBA          74 20   25.32 0.83    -12.40
DIR               CAL(A)01     CALB         199 32   23.42 1.02      5.52
DIR               CAL(A)01     CALC         213 32   44.72 0.93      5.52
DIR               CAL(A)01     SGEOS          0  0    0.00 0.88     -4.02
DIR               CAL(A)01     7125           2  9    4.89 0.93      3.01
DIR               CAL(A)01     GORF           7 20   28.40 0.84      4.70
DIR               CAL(A)01     PIER(B)95     68 54   17.65 1.38     16.02
DIR               CAL(A)01     GORF           0  0    0.00 0.84     10.49
DIR               CAL(A)01     NG2000(07)   355 50    0.98 0.92     -7.76
DIR               CAL(A)01     7105         102 17   49.27 0.96     -3.29
DIR               CALC         CAL(D)98       0  0    0.00 0.68    -17.76
DIR               CALC         SGEOS          4 22    4.08 0.78     -3.15
DIR               CALC         GORF           6  7   32.86 0.73     -8.90
DIR               CALC         7125           8 25   58.64 0.79     22.85
DIR               CALC         NGEO          35  7   58.48 0.72      7.53
DIR               CALC         NGEO           0  0    0.00 0.72      2.76
DIR               CALC         MOB7(07)     345 33   43.61 0.72     -7.70
DIR               CALC         NGEO           0  0    0.00 0.72    -10.54
DIR               CALC         PIER(B)95     10 38   14.85 0.71      2.91
DIR               CALC         CAL(A)01      23 11    6.59 0.93      4.63
DIR               CALC         CALB          79 20   25.38 3.07    -13.04
DIR               CAL(D)98     SGEOS          0  0    0.00 2.06    -27.87
DIR               CAL(D)98     NG2000(07)   348 50   56.75 1.87     22.87
DIR               CAL(D)98     GORF           0  0    0.00 2.87     83.89
DIR               CAL(D)98     DORIS(07)ANT   7 50   18.77 19.94   588.58
DIR               CAL(D)98     SGEOS         20 17   21.82 2.06      8.44
DIR               CAL(D)98     CALB          27 34    7.06 0.66      1.75
DIR               CAL(D)98     CALC          35  2   57.35 0.68     -6.12
DIR               VLBA         CAL(A)01       0  0    0.00 0.83      1.81
DIR               VLBA         7125          17 43   51.12 0.63     -3.71
DIR               VLBA         NGEO          28 36   52.19 0.73      7.09
DIR               VLBA         7108RM1        0  0    0.00 1.71      6.69
DIR               VLBA         PIER(C)95     98 15   32.88 1.72      3.85
DIR               PIER(B)95    CAL(A)01       0  0    0.00 1.38     13.65
DIR               PIER(B)95    NGEO          97 29   21.34 2.84     44.58
DIR               PIER(B)95    PIER(C)95      0  0    0.00 1.03    -16.88
DIR               PIER(B)95    4005W          9 28   25.08 1.66    -11.99
DIR               PIER(B)95    VLBA          21  1   24.61 0.83     -5.16
DIR               PIER(B)95    7108RM1       44 10   29.82 0.93     -9.52
DIR               PIER(B)95    CAL(A)01      96 44   21.80 1.38      4.43
DIR               PIER(B)95    CALB         108 20   30.15 0.73      8.08
DIR               PIER(B)95    CALC         117 44   16.04 0.71      8.48
DIR               PIER(B)95    NGEO           0  0    0.00 2.84     53.67
DIR               PIER(B)95    7108(93)     193 54   18.48 0.98      5.76
DIR               PIER(C)95    VLBA           0  0    0.00 1.72      6.75
DIR               PIER(C)95    7108RM1       40 22   29.49 1.20     -4.24
DIR               PIER(C)95    4005W        106 11   51.08 2.05     -6.94
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                          GGAO SITE SURVEY 2007
GeoLab V3.72                GRS 80            UNITS: m,DMS        Page 0019
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Misclosures (pass 2):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT          FROM         TO                OBSERVATION STD.DEV.    MISC
---- ----------- ------------ ------------ ----------------- -------- --------
DIR              PIER(C)95    PIER(B)95    118  5   18.62 1.03          -5.84
DIR              PIER(C)95    NGEO         121 35   34.68 0.85           9.86
DIR              7108RM1      4005W         25  9    3.05 1.29          -3.79
DIR              7108RM1      PIER(C)95     58  6   39.70 1.20          -3.98
DIR              7108RM1      VLBA          99 28   36.22 1.71          10.98
DIR              MOB7(07)     SGEOS          0  0    0.00 1.79          18.81
DIR              MOB7(07)     NG2000(07)   354 32    0.64 2.16         -27.53
DIR              CALB         CAL(D)98       0  0    0.00 0.66         -11.81
DIR              CALB         SGEOS          2  0    8.78 0.74          -3.93
DIR              CALB         GORF           4 36   58.64 0.71          -6.89
DIR              CALB         7125           5 30   58.70 0.76          17.68
DIR              CALB         NGEO          32 44   46.79 0.73           6.45
DIR              CALB         NGEO           0  0    0.00 0.73         -10.60
DIR              CALB         CAL(A)01      19  2   46.92 1.02           4.06
DIR              CALB         CALC         269 12   28.58 3.07         -15.17
DIR              CALB         NGEO           0  0    0.00 0.73           4.14
DIR              CALB         NG2000(07)   332 52   38.70 0.75          -3.96
DIR              CALB         MOB7(07)     345 55   51.51 0.71          -4.68
DIR              PIER(C)95    7108RM1        0  0    0.00 1.20         -11.00
DIR              PIER(C)95    GODE          35 16   18.98 2.10          19.64
DIR              PIER(C)95    4005W         65 49   16.78 2.05          -8.89
DIR              VLBA         7108RM1        0  0    0.00 1.71          -6.35
DIR              VLBA         GODE          53 17   30.29 1.54           3.39
DIR              VLBA         PIER(C)95     98 15   32.01 1.72          -8.33
DIR              7108RM1      GODE           3  8    2.25 1.78         -18.76
DIR              4005W        GODE          74 18   47.63 3.81          33.09
DIR              PIER(B)95    VLBA           0  0    0.00 0.83           7.23
DIR              PIER(B)95    7108RM1       23  9    2.79 0.93           5.29
DIR              CAL(A)01     CALC           0  0    0.00 0.93           2.99
DIR              CAL(A)01     NGEO         122 44   34.28 1.21         -21.59
DIR              CALC         NGEO           0  0    0.00 0.72          -4.35
DIR              CALC         VLBA          45 18   50.00 0.63           3.32
DIR              VLBA         CALC           0  0    0.00 0.63           1.77
DIR              VLBA         NGEO          47 16   48.39 0.73          -2.39
DIR              NGEO         VLBA           0  0    0.00 0.73           3.49
DIR              NGEO         CAL(A)01      53 20    1.60 1.21          -8.55
DIR              NGEO         CALC          87 24   25.19 0.72          -3.60
DIR              DORIS(07)MK  GORF           0  0    0.00 3.64        -128.60
DIR              DORIS(07)MK  SGEOS         24 21   26.42 2.38          75.50
DIR              DORIS(07)MK  CAL(D)98     189 51    4.18 12.99        623.06
DIR              GORF         SGEOS          0  0    0.00 4.59         -55.19
DIR              GORF         DORIS(07)MK  122 44   15.71 3.64        -137.97
DIR              CAL(D)98     GORF           0  0    0.00 2.87          89.28
DIR              CAL(D)98     DORIS(07)MK    7 50    4.91 12.99        599.44
DIR              SGEOS        DORIS(07)MK    0  0    0.00 2.38         -30.44
DIR              SGEOS        GORF          32 54   13.35 4.59        -147.25
GROUP: ORTHOMETRIC HEIGHT DIFFERENCES
EHDF             VLBA         GODE                      0.7457  0.0005  -0.0012
EHDF             GODE         VLBA                     -0.7455  0.0005   0.0010
EHDF             NGEO         GODE                     -4.4569  0.0005  -0.0014
EHDF             VLBA         GODE                      0.7434  0.0005   0.0011
EHDF             GORF         NGEO                      0.6172  0.0005   0.0024
EHDF             NGEO         GORF                     -0.6175  0.0005  -0.0021
EHDF             GORF         SGEOS                     0.5173  0.0005   0.0050
EHDF             SGEOS        GORF                     -0.5175  0.0005  -0.0048
EHDF             SGEOS        NGEO                      0.1000  0.0005  -0.0028
EHDF             NGEO         SGEOS                    -0.1000  0.0005   0.0028
EHDF             7105         NGEO                     -0.2289  0.0010   0.0021
EHDF             NGEO         7125                     -0.4599  0.0005  -0.0020
EHDF             7125         NGEO                      0.4599  0.0005   0.0020
EHDF             NGEO         CAL(A)01                 -2.5376  0.0005   0.0013
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                         GGAO SITE SURVEY 2007
GeoLab V3.72                   GRS 80          UNITS: m,DMS        Page 0020
================================================================================
Misclosures (pass 2):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT        FROM          TO              OBSERVATION STD.DEV.   MISC
---- ------------ ------------ ------------ ----------------- -------- --------
EHDF           CAL(A)01      NGEO                     2.5381   0.0005  -0.0018
EHDF           SGEOS         NG2000(07)               3.3364   0.0005   0.0055
EHDF           NG2000(07)    SGEOS                   -3.3360   0.0005  -0.0059
EHDF           GORF          NG2000(07)               3.8545   0.0005   0.0097
EHDF           NG2000(07)    GORF                    -3.8534   0.0005  -0.0108
EHDF           CALC          SGEOS                    1.5522   0.0005   0.0016
EHDF           SGEOS         7125                    -0.3596   0.0005  -0.0051
EHDF           7125          SGEOS                    0.3595   0.0005   0.0052
EHDF           CALB          CAL(A)01                -0.5455   0.0005   0.0011
EHDF           SGEOS         CAL(A)01                -2.4376   0.0005  -0.0015
EHDF           CAL(A)01      SGEOS                    2.4375   0.0005   0.0016
EHDF           NGEO          CALB                    -1.9930   0.0005   0.0010
EHDF           GORF          CAL(D)98                 1.5343   0.0005   0.0085
EHDF           CAL(D)98      GORF                    -1.5342   0.0005  -0.0086
EHDF           SGEOS         CAL(D)98                 1.0166   0.0005   0.0039
EHDF           CAL(D)98      SGEOS                   -1.0167   0.0005  -0.0038
EHDF           NGEO          PIER(B)95               -1.2152   0.0005   0.0010
EHDF           PIER(B)95     NGEO                     1.2153   0.0005  -0.0011
EHDF           4005W         GODE                     0.2681   0.0005   0.0013
EHDF           GODE          4005W                   -0.2681   0.0005  -0.0013
EHDF           7105          NGEO                    -0.2244   0.0010  -0.0024
EHDF           NGEO          7105                     0.2243   0.0010   0.0025
EHDF           GORF          DORIS(07)MK              1.5656   0.0005  -0.0019
EHDF           DORIS(07)MK   GORF                    -1.5647   0.0005   0.0010
EHDF           SGEOS         DORIS(07)MK              1.0480   0.0005  -0.0066
EHDF           DORIS(07)MK   SGEOS                   -1.0479   0.0005   0.0065
DXCT           7105          MOB7(07)                 0.5239   0.0010   0.0021
DYCT           7105          MOB7(07)                -2.3854   0.0010  -0.0088
DZCT           7105          MOB7(07)                 1.9699   0.0010  -0.0100
DXCT           DORIS(07)MK   DORIS(07)ANT             0.0917   0.0010  -0.0028
DYCT           DORIS(07)MK   DORIS(07)ANT            -0.3919   0.0010  -0.0022
DZCT           DORIS(07)MK   DORIS(07)ANT             0.3261   0.0010  -0.0018
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                          GGAO SITE SURVEY 2007
GeoLab V3.72                GRS 80            UNITS: m,DMS        Page 0021
================================================================================
Solution (pass 2):
NAME          TYPE          OLD VALUE           CORRECTION        UPDATED VALUE
------------  ----  ------------------  ------------------  ------------------
4005W         ELAT  N 39 01  18.02156   0  0  -0.00015  N 39 01  18.02141
4005W         ELON  W 76 49  37.51401   0  0  -0.00024  W 76 49  37.51424
4005W         EHYT           14.2471            0.0000             14.2471
7105          ELAT  N 39 01  14.17794   0  0  -0.00021  N 39 01  14.17774
7105          ELON  W 76 49  39.69977   0  0   0.00016  W 76 49  39.69961
7105          EHYT           19.2022            0.0001             19.2023
7108(93)      ELAT  N 39 01  18.93365   0  0  -0.00020  N 39 01  18.93345
7108(93)      ELON  W 76 49  35.55238   0  0  -0.00030  W 76 49  35.55268
7108(93)      EHYT           13.7523            0.0000             13.7522
7108RM1       ELAT  N 39 01  18.36825   0  0  -0.00028  N 39 01  18.36798
7108RM1       ELON  W 76 49  34.47748   0  0  -0.00024  W 76 49  34.47771
7108RM1       EHYT           13.3634           -0.0002             13.3632
7125          ELAT  N 39 01  12.96944   0  0  -0.00034  N 39 01  12.96910
7125          ELON  W 76 49  38.81048   0  0  -0.00067  W 76 49  38.81114
7125          EHYT           18.5121            0.0023             18.5144
CAL(A)01      ELAT  N 39 01  15.64046   0  0  -0.00017  N 39 01  15.64029
CAL(A)01      ELON  W 76 49  35.69109   0  0  -0.00032  W 76 49  35.69141
CAL(A)01      EHYT           16.4363           -0.0010             16.4353
CAL(D)98      ELAT  N 39 01  12.14050   0  0   0.00086  N 39 01  12.14136
CAL(D)98      ELON  W 76 49  40.64944   0  0   0.00164  W 76 49  40.64780
CAL(D)98      EHYT           19.8988           -0.0064             19.8925
CALB          ELAT  N 39 01  13.63308   0  0  -0.00004  N 39 01  13.63304
CALB          ELON  W 76 49  32.47149   0  0  -0.00003  W 76 49  32.47152
CALB          EHYT           16.9779           -0.0008             16.9770
CALC          ELAT  N 39 01  12.74606   0  0  -0.00004  N 39 01  12.74602
CALC          ELON  W 76 49  32.85837   0  0  -0.00003  W 76 49  32.85840
CALC          EHYT           17.3185           -0.0013             17.3173
DORIS(07)ANT  ELAT  N 39 01  12.25195   0  0  -0.00019  N 39 01  12.25176
DORIS(07)ANT  ELON  W 76 49  40.42721   0  0  -0.00180  W 76 49  40.42900
DORIS(07)ANT  EHYT           20.4377            0.0039             20.4416
DORIS(07)MK   ELAT  N 39 01  12.25203   0  0  -0.00026  N 39 01  12.25176
DORIS(07)MK   ELON  W 76 49  40.42707   0  0  -0.00194  W 76 49  40.42901
DORIS(07)MK   EHYT           19.9197            0.0039             19.9236
GORF          ELAT  N 39 01  12.78681   0  0   0.00041  N 39 01  12.78722
GORF          ELON  W 76 49  39.68671   0  0   0.00038  W 76 49  39.68633
GORF          EHYT           18.3553            0.0023             18.3576
MOB7(07)      ELAT  N 39 01  14.17728   0  0   0.00023  N 39 01  14.17751
MOB7(07)      ELON  W 76 49  39.70116   0  0   0.00015  W 76 49  39.70101
MOB7(07)      EHYT           22.3404           -0.0002             22.3402
MV3(07)       ELAT  N 39 01  18.93366   0  0   0.00000  N 39 01  18.93366
MV3(07)       ELON  W 76 49  35.55258   0  0   0.00000  W 76 49  35.55258
MV3(07)       EHYT           16.8205            0.0000             16.8205
NG2000(07)    ELAT  N 39 01  12.96632   0  0   0.00013  N 39 01  12.96645
NG2000(07)    ELON  W 76 49  38.92752   0  0  -0.00059  W 76 49  38.92812
NG2000(07)    EHYT           22.2187           -0.0080             22.2107
NGEO          ELAT  N 39 01  15.43410   0  0  -0.00003  N 39 01  15.43407
NGEO          ELON  W 76 49  38.96128   0  0   0.00004  W 76 49  38.96124
NGEO          EHYT           18.9750            0.0001             18.9750
PIER(B)95     ELAT  N 39 01  16.36255   0  0  -0.00025  N 39 01  16.36231
PIER(B)95     ELON  W 76 49  38.36555   0  0  -0.00040  W 76 49  38.36595
PIER(B)95     EHYT           17.7610           -0.0008             17.7602
PIER(C)95     ELAT  N 39 01  19.44919   0  0  -0.00016  N 39 01  19.44903
PIER(C)95     ELON  W 76 49  37.49948   0  0  -0.00011  W 76 49  37.49959
PIER(C)95     EHYT           12.6632            0.0000             12.6633
SGEOS         ELAT  N 39 01  12.63686   0  0   0.00021  N 39 01  12.63707
SGEOS         ELON  W 76 49  38.94273   0  0  -0.00029  W 76 49  38.94302
SGEOS         EHYT           18.8768           -0.0026             18.8743
VLBA          ELAT  N 39 01  19.91899   0  0  -0.00021  N 39 01  19.91877
VLBA          ELON  W 76 49  35.36243   0  0  -0.00033  W 76 49  35.36276
VLBA          EHYT           13.7710            0.0000             13.7710
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                        GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80           UNITS: m,DMS      Page 0022
================================================================================
Misclosures (pass 3):
NOTE: Observation values shown are reduced to mark-to-mark.
TYPE AT         FROM         TO               OBSERVATION STD.DEV.   MISC
---- ------------ ------------ ------------ ----------------- -------- --------
GROUP: 00000867.SSF,obs#:   3 day  10  OPT                  10  1  14
DXCT        CALB         VLBA             -96.0993  0.0019  -0.0034
DYCT        CALB         VLBA             105.3769  0.0072   0.0278
DZCT        CALB         VLBA             148.5907  0.0058  -0.0140
GROUP: 00000907.SSF,obs#:   7 day  31  OPT                  31  1  14
DXCT        CALC         VLBA             -91.0253  0.0017  -0.0007
DYCT        CALC         VLBA             124.5390  0.0062   0.0129
DZCT        CALC         VLBA             169.6213  0.0048  -0.0069
GROUP: 00000855.SSF,obs#:  16 day   8  OPT                   8    14:5
DXCT        GODE         VLBA              20.9866  0.0016  -0.0011
DYCT        GODE         VLBA              39.3953  0.0054   0.0130
DZCT        GODE         VLBA              40.2685  0.0042  -0.0057
GROUP: 00000883.SSF,obs#:  20 day  30  OPT                  30 1  14:
DXCT        NGEO         VLBA              63.5206  0.0014   0.0004
DYCT        NGEO         VLBA             108.4320  0.0055   0.0152
DZCT        NGEO         VLBA             104.1764  0.0044  -0.0076
GROUP: DIRECTIONS
DIR         NGEO         7105          0  0    0.00 2.11       5.06
DIR         CAL(A)01     VLBA         74 20   25.32 0.83      -1.88
DIR         PIER(C)95    4005W        65 49   16.78 2.05       4.35
DIR         NGEO         CAL(A)01     53 20    1.60 1.21       2.52
GROUP: ORTHOMETRIC HEIGHT DIFFERENCES
EHDF        VLBA         GODE               0.7457  0.0005  -0.0012
EHDF        GODE         VLBA              -0.7455  0.0005   0.0010
EHDF        NGEO         GODE              -4.4569  0.0005  -0.0014
EHDF        VLBA         GODE               0.7434  0.0005   0.0011
EHDF        7105         NGEO              -0.2289  0.0010   0.0021
EHDF        4005W        GODE               0.2681  0.0005   0.0013
EHDF        GODE         4005W             -0.2681  0.0005  -0.0013
EHDF        7105         NGEO              -0.2244  0.0010  -0.0024
EHDF        NGEO         7105               0.2243  0.0010   0.0025
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                            GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80            UNITS: m,DMS        Page 0023
================================================================================
Solution (pass 3):
NAME          TYPE         OLD VALUE            CORRECTION      UPDATED VALUE
------------  ----  ------------------- ------------------- -------------------
4005W         ELAT  N 39 01  18.02141    0  0   0.00000   N 39 01  18.02141
4005W         ELON  W 76 49  37.51424    0  0   0.00000   W 76 49  37.51424
4005W         EHYT           14.2471             0.0000            14.2471
7105          ELAT  N 39 01  14.17774    0  0   0.00000   N 39 01  14.17774
7105          ELON  W 76 49  39.69961    0  0   0.00000   W 76 49  39.69961
7105          EHYT           19.2023             0.0000            19.2023
7108(93)      ELAT  N 39 01  18.93345    0  0   0.00000   N 39 01  18.93345
7108(93)      ELON  W 76 49  35.55268    0  0   0.00000   W 76 49  35.55268
7108(93)      EHYT           13.7522             0.0000            13.7522
7108RM1       ELAT  N 39 01  18.36798    0  0   0.00000   N 39 01  18.36798
7108RM1       ELON  W 76 49  34.47771    0  0   0.00000   W 76 49  34.47771
7108RM1       EHYT           13.3632             0.0000            13.3632
7125          ELAT  N 39 01  12.96910    0  0   0.00000   N 39 01  12.96910
7125          ELON  W 76 49  38.81114    0  0   0.00000   W 76 49  38.81114
7125          EHYT           18.5144             0.0000            18.5144
CAL(A)01      ELAT  N 39 01  15.64029    0  0   0.00000   N 39 01  15.64029
CAL(A)01      ELON  W 76 49  35.69141    0  0   0.00000   W 76 49  35.69141
CAL(A)01      EHYT           16.4353             0.0000            16.4353
CAL(D)98      ELAT  N 39 01  12.14136    0  0   0.00000   N 39 01  12.14136
CAL(D)98      ELON  W 76 49  40.64780    0  0   0.00000   W 76 49  40.64780
CAL(D)98      EHYT           19.8925             0.0000            19.8925
CALB          ELAT  N 39 01  13.63304    0  0   0.00000   N 39 01  13.63304
CALB          ELON  W 76 49  32.47152    0  0   0.00000   W 76 49  32.47152
CALB          EHYT           16.9770             0.0000            16.9770
CALC          ELAT  N 39 01  12.74602    0  0   0.00000   N 39 01  12.74602
CALC          ELON  W 76 49  32.85840    0  0   0.00000   W 76 49  32.85840
CALC          EHYT           17.3173             0.0000            17.3173
DORIS(07)ANT  ELAT  N 39 01  12.25176    0  0   0.00000   N 39 01  12.25175
DORIS(07)ANT  ELON  W 76 49  40.42900    0  0   0.00000   W 76 49  40.42901
DORIS(07)ANT  EHYT           20.4416             0.0000            20.4416
DORIS(07)MK   ELAT  N 39 01  12.25176    0  0  -0.00001   N 39 01  12.25176
DORIS(07)MK   ELON  W 76 49  40.42901    0  0   0.00000   W 76 49  40.42901
DORIS(07)MK   EHYT           19.9236             0.0000            19.9236
GORF          ELAT  N 39 01  12.78722    0  0   0.00000   N 39 01  12.78722
GORF          ELON  W 76 49  39.68633    0  0   0.00000   W 76 49  39.68633
GORF          EHYT           18.3576             0.0000            18.3576
MOB7(07)      ELAT  N 39 01  14.17751    0  0   0.00000   N 39 01  14.17751
MOB7(07)      ELON  W 76 49  39.70101    0  0   0.00000   W 76 49  39.70101
MOB7(07)      EHYT           22.3402             0.0000            22.3402
MV3(07)       ELAT  N 39 01  18.93366    0  0   0.00000   N 39 01  18.93366
MV3(07)       ELON  W 76 49  35.55258    0  0   0.00000   W 76 49  35.55258
MV3(07)       EHYT           16.8205             0.0000            16.8205
NG2000(07)    ELAT  N 39 01  12.96645    0  0   0.00000   N 39 01  12.96645
NG2000(07)    ELON  W 76 49  38.92812    0  0   0.00000   W 76 49  38.92812
NG2000(07)    EHYT           22.2107             0.0000            22.2107
NGEO          ELAT  N 39 01  15.43407    0  0   0.00000   N 39 01  15.43407
NGEO          ELON  W 76 49  38.96124    0  0   0.00000   W 76 49  38.96124
NGEO          EHYT           18.9750             0.0000            18.9750
PIER(B)95     ELAT  N 39 01  16.36231    0  0   0.00000   N 39 01  16.36231
PIER(B)95     ELON  W 76 49  38.36595    0  0   0.00000   W 76 49  38.36595
PIER(B)95     EHYT           17.7602             0.0000            17.7602
PIER(C)95     ELAT  N 39 01  19.44903    0  0   0.00000   N 39 01  19.44903
PIER(C)95     ELON  W 76 49  37.49959    0  0   0.00000   W 76 49  37.49959
PIER(C)95     EHYT           12.6633             0.0000            12.6633
SGEOS         ELAT  N 39 01  12.63707    0  0   0.00000   N 39 01  12.63708
SGEOS         ELON  W 76 49  38.94302    0  0   0.00000   W 76 49  38.94302
SGEOS         EHYT           18.8743             0.0000            18.8743
VLBA          ELAT  N 39 01  19.91877    0  0   0.00000   N 39 01  19.91877
VLBA          ELON  W 76 49  35.36276    0  0   0.00000   W 76 49  35.36276
VLBA          EHYT           13.7710             0.0000            13.7710
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                            GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80              UNITS: m,DMS        Page 0024
================================================================================
Adjusted PLH Coordinates:
                                  LATITUDE        LONGITUDE   ELIP-HEIGHT
     CODE FFF STATION              STD DEV          STD DEV     STD DEV
     ---- --- ------------ ---------------- ----------------- ------------
      PLH  000 4005W        N 39  1 18.02141 W 76 49 37.51424    14.2471 m      0
                                     0.0003          0.0003      0.0002
      PLH  000 7105         N 39  1 14.17774 W 76 49 39.69961    19.2023 m      0
                                     0.0004          0.0003      0.0005
      PLH  000 7108(93)     N 39  1 18.93345 W 76 49 35.55268    13.7522 m      0
                                     0.0003          0.0004      0.0002
      PLH  000 7108RM1      N 39  1 18.36798 W 76 49 34.47771    13.3632 m      0
                                     0.0003          0.0003      0.0002
      PLH  000 7125         N 39  1 12.96910 W 76 49 38.81114    18.5144 m      0
                                     0.0003          0.0002      0.0003
      PLH  000 CAL(A)01     N 39  1 15.64029 W 76 49 35.69141    16.4353 m      0
                                     0.0002          0.0002      0.0003
      PLH  000 CAL(D)98     N 39  1 12.14136 W 76 49 40.64780    19.8925 m      0
                                     0.0003          0.0003      0.0004
      PLH  000 CALB         N 39  1 13.63304 W 76 49 32.47151    16.9770 m      0
                                     0.0002          0.0002      0.0003
      PLH  000 CALC         N 39  1 12.74602 W 76 49 32.85840    17.3173 m      0
                                     0.0002          0.0002      0.0003
      PLH  000 DORIS(07)ANT N 39  1 12.25175 W 76 49 40.42900    20.4416 m      0
                                     0.0007          0.0009      0.0011
      PLH  000 DORIS(07)MK  N 39  1 12.25176 W 76 49 40.42901    19.9236 m      0
                                     0.0004          0.0004      0.0004
      PLH  111 GODE         N 39  1 18.21864 W 76 49 36.58553    14.5160 m      0
                                     0.0000          0.0000      0.0000
      PLH  000 GORF         N 39  1 12.78722 W 76 49 39.68633    18.3576 m      0
                                     0.0002          0.0002      0.0003
      PLH  000 MOB7(07)     N 39  1 14.17751 W 76 49 39.70101    22.3402 m      0
                                     0.0003          0.0002      0.0003
      PLH  000 MV3(07)      N 39  1 18.93366 W 76 49 35.55258    16.8205 m      0
                                     0.0010          0.0010      0.0010
      PLH  111 MV3(07PRE)   N 39  1 18.93300 W 76 49 35.55200    16.8000 m      0
                                     0.0000          0.0000      0.0000
      PLH  000 NG2000(07)   N 39  1 12.96645 W 76 49 38.92812    22.2107 m      0
                                     0.0003          0.0002      0.0004
      PLH  000 NGEO         N 39  1 15.43407 W 76 49 38.96124    18.9750 m      0
                                     0.0002          0.0002      0.0002
      PLH  000 PIER(B)95    N 39  1 16.36231 W 76 49 38.36595    17.7602 m      0
                                     0.0003          0.0002      0.0003
      PLH  000 PIER(C)95    N 39  1 19.44903 W 76 49 37.49959    12.6633 m      0
                                     0.0002          0.0003      0.0002
      PLH  000 SGEOS        N 39  1 12.63708 W 76 49 38.94302    18.8743 m      0
                                     0.0003          0.0002      0.0003
      PLH  000 VLBA         N 39  1 19.91877 W 76 49 35.36276    13.7710 m      0
                                     0.0002          0.0003      0.0002
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                          GGAO SITE SURVEY 2007
GeoLab V3.72            GRS 80          UNITS: m,DMS        Page 0025
================================================================================
Adjusted XYZ Coordinates:
                       X-COORDINATE      Y-COORDINATE      Z-COORDINATE
     CODE FFF STATION     STD DEV           STD DEV           STD DEV
     ---- --- -------- ----------------- ----------------- -----------------
     XYZ     4005W       1130752.8943     -4831262.1947      3994195.5197 m    0
                             0.0003            0.0002            0.0002
     XYZ     7105        1130719.5906     -4831350.5873      3994106.5515 m    0
                             0.0003            0.0005            0.0005
     XYZ     7108(93)    1130794.7158     -4831233.8245      3994217.0589 m    0
                             0.0004            0.0003            0.0003
     XYZ     7108RM1     1130822.3276     -4831238.3273      3994203.2662 m    0
                             0.0003            0.0002            0.0003
     XYZ     7125        1130745.6270     -4831368.0452      3994077.1612 m    0
                             0.0003            0.0003            0.0003
     XYZ     CAL(A)01    1130806.5132     -4831298.8718      3994139.8498 m    0
                             0.0002            0.0002            0.0002
     XYZ     CAL(D)98    1130706.5129     -4831394.8040      3994058.1974 m    0
                             0.0003            0.0004            0.0004
     XYZ     CALB        1130890.9103     -4831319.5746      3994092.1004 m    0
                             0.0002            0.0003            0.0003
     XYZ     CALC        1130885.8336     -4831338.7218      3994071.0627 m    0
                             0.0002            0.0003            0.0003
     XYZ     DORIS(07)ANT 1130711.2466    -4831391.9332      3994061.1878 m    0
                             0.0009            0.0010            0.0009
     XYZ     DORIS(07)MK 1130711.1547     -4831391.5412      3994060.8618 m    0
                             0.0004            0.0004            0.0004
     XYZ     GODE        1130773.8221     -4831253.5782      3994200.4142 m    0
                             0.0000            0.0000            0.0000
     XYZ     GORF        1130725.9044     -4831376.1626      3994072.7049 m    0
                             0.0002            0.0003            0.0003
     XYZ     MOB7(07)    1130720.1143     -4831352.9730      3994108.5218 m    0
                             0.0002            0.0003            0.0003
     XYZ     MV3(07)     1130795.2604     -4831236.1411      3994218.9958 m    0
                             0.0010            0.0010            0.0010
     XYZ     MV3(07PRE)  1130795.2734     -4831236.1349      3994218.9670 m    0
                             0.0000            0.0000            0.0000
     XYZ     NG2000(07)  1130743.5533     -4831371.5327      3994079.4249 m    0
                             0.0003            0.0004            0.0003
     XYZ     NGEO        1130731.2866     -4831322.6171      3994136.5082 m    0
                             0.0002            0.0002            0.0002
     XYZ     PIER(B)95   1130740.9079     -4831300.8866      3994157.9824 m    0
                             0.0002            0.0003            0.0003
     XYZ     PIER(C)95   1130746.6402     -4831233.9269      3994228.7255 m    0
                             0.0003            0.0002            0.0002
     XYZ     SGEOS       1130744.0709     -4831375.3171      3994069.4329 m    0
                             0.0002            0.0003            0.0003
     XYZ     VLBA        1130794.8076     -4831214.1699      3994240.6770 m    0
                             0.0003            0.0002            0.0002
```

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================================================================================
                          GGAO SITE SURVEY 2007
GeoLab V3.72               GRS 80              UNITS: m,DMS        Page 0026
================================================================================
Geoid Values:
  CODE      STATION        N/S DEFLECTION    E/W DEFLECTION   UNDULATION
  ----      ------------   ----------------- ----------------- ------------
  GEOI      4005W        -  0  0    1.80    0  0    6.37     -33.3201 m
  GEOI      7105         -  0  0    1.80    0  0    6.37     -33.3195 m
  GEOI      7108(93)     -  0  0    1.80    0  0    6.38     -33.3214 m
  GEOI      7108RM1      -  0  0    1.80    0  0    6.38     -33.3221 m
  GEOI      7125         -  0  0    1.80    0  0    6.38     -33.3208 m
  GEOI      CAL(A)01     -  0  0    1.80    0  0    6.38     -33.3222 m
  GEOI      CAL(D)98     -  0  0    1.80    0  0    6.37     -33.3193 m
  GEOI      CALB         -  0  0    1.81    0  0    6.40     -33.3250 m
  GEOI      CALC         -  0  0    1.81    0  0    6.40     -33.3253 m
  GEOI      DORIS(07)ANT -  0  0    1.80    0  0    6.37     -33.3193 m
  GEOI      DORIS(07)MK  -  0  0    1.80    0  0    6.37     -33.3193 m
  GEOI      GODE         -  0  0    1.80    0  0    6.37     -33.3206 m
  GEOI      GORF         -  0  0    1.80    0  0    6.38     -33.3200 m
  GEOI      MOB7(07)     -  0  0    1.80    0  0    6.37     -33.3195 m
  GEOI      MV3(07)      -  0  0    1.80    0  0    6.38     -33.3214 m
  GEOI      MV3(07PRE)   -  0  0    1.80    0  0    6.38     -33.3214 m
  GEOI      NG2000(07)   -  0  0    1.80    0  0    6.38     -33.3208 m
  GEOI      NGEO         -  0  0    1.80    0  0    6.37     -33.3199 m
  GEOI      PIER(B)95    -  0  0    1.80    0  0    6.37     -33.3197 m
  GEOI      PIER(C)95    -  0  0    1.80    0  0    6.37     -33.3196 m
  GEOI      SGEOS        -  0  0    1.80    0  0    6.38     -33.3208 m
  GEOI      VLBA         -  0  0    1.80    0  0    6.38     -33.3211 m
```

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================================================================================
                         GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80           UNITS: m,DMS        Page 0027
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                          OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO             STD DEV  STD DEV     PPM
---- ------------ ------------ ------------ ----------------- -------- --------
GROUP: 00000875.SSF,obs#:   1 day  10  OPT                   10 1  13:
DXCT         CALB         GORF           -165.00420  -0.0016  -1.9702
                                            0.0009   0.0008     9.37
DYCT         CALB         GORF            -56.58900   0.0010   0.3401
                                            0.0030   0.0030     5.79
DZCT         CALB         GORF            -19.39450  -0.0009  -0.3882
                                            0.0025   0.0024     5.41
GROUP: 00000871.SSF,obs#:   2 day  10  OPT                   10 1  13:
DXCT         CALB         NGEO           -159.62350  -0.0002  -0.2857
                                            0.0006   0.0006     0.96
DYCT         CALB         NGEO             -3.04020  -0.0023  -1.1547
                                            0.0020   0.0020    13.77
DZCT         CALB         NGEO             44.40550   0.0024   1.5066
                                            0.0016   0.0016    14.21
GROUP: 00000867.SSF,obs#:   3 day  10  OPT                   10 1  14:
DXCT         CALB         VLBA            -96.09930  -0.0034  -1.7729
                                            0.0019   0.0019    16.38
DYCT         CALB         VLBA            105.37690   0.0278   3.8874
                                            0.0072   0.0071   134.92
DZCT         CALB         VLBA            148.59070  -0.0140  -2.4346
                                            0.0058   0.0058    68.15
GROUP: 00000899.SSF,obs#:   4 day  31  OPT                   31 1  13:
DXCT         CALC         GORF           -159.93000   0.0008   0.7053
                                            0.0012   0.0012     5.06
DYCT         CALC         GORF            -37.43780  -0.0030  -0.7363
                                            0.0040   0.0040    18.10
DZCT         CALC         GORF              1.64150   0.0007   0.2267
                                            0.0033   0.0032     4.47
GROUP: 00000903.SSF,obs#:   5 day  31  OPT                   31 1  13:
DXCT         CALC         NGEO           -154.54720   0.0002   0.2308
                                            0.0009   0.0009     1.28
DYCT         CALC         NGEO             16.10830  -0.0036  -1.1181
                                            0.0032   0.0032    21.19
DZCT         CALC         NGEO             65.44360   0.0019   0.7525
                                            0.0026   0.0026    11.50
GROUP: 00000919.SSF,obs#:   6 day  31  OPT                   31 2  18:
DXCT         CALC         NGEO           -154.54640  -0.0006  -0.5609
                                            0.0011   0.0010     3.47
DYCT         CALC         NGEO             16.11060  -0.0059  -1.4700
                                            0.0040   0.0040    34.83
DZCT         CALC         NGEO             65.44200   0.0035   1.0311
                                            0.0034   0.0034    20.99
GROUP: 00000907.SSF,obs#:   7 day  31  OPT                   31 1  14
DXCT         CALC         VLBA            -91.02530  -0.0007  -0.4084
                                            0.0017   0.0017     3.05
DYCT         CALC         VLBA            124.53900   0.0129   2.0761
                                            0.0062   0.0062    56.25
DZCT         CALC         VLBA            169.62130  -0.0070  -1.4522
                                            0.0048   0.0048    30.32
GROUP: 00000923.SSF,obs#:   8 day  31  OPT                   31 2  18:
DXCT         CALC         VLBA            -91.02700   0.0010   0.7038
                                            0.0015   0.0014     4.36
DYCT         CALC         VLBA            124.54260   0.0093   1.6912
                                            0.0055   0.0055    40.55
DZCT         CALC         VLBA            169.61950  -0.0052  -1.0946
                                            0.0047   0.0047    22.47
GROUP: 00000863.SSF,obs#:   9 day  10  OPT                   10    13:
DXCT         GODE         CALB            117.08810   0.0001   0.1597
                                            0.0006   0.0005     0.49
DYCT         GODE         CALB            -65.99670   0.0003   0.1466
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================================================================================
                            GGAO SITE SURVEY 2007
GeoLab V3.72                 GRS 80            UNITS: m,DMS          Page 0028
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                                OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM          TO                STD DEV   STD DEV     PPM
---- -----------  ------------  ------------  ----------------- --------  --------
                                                  0.0019    0.0019     1.61
DZCT            GODE          CALB            -108.31310   -0.0007   -0.4857
                                                  0.0016    0.0015     4.31
GROUP: 00000847.SSF,obs#:  10 day  8 OPT                    8    14:3
DXCT            GODE          CALB             117.08750    0.0007    0.9204
                                                  0.0008    0.0007     3.97
DYCT            GODE          CALB             -65.99790    0.0015    0.5552
                                                  0.0027    0.0027     8.56
DZCT            GODE          CALB            -108.31340   -0.0004   -0.2152
                                                  0.0021    0.0021     2.57
GROUP: 00000895.SSF,obs#:  11 day 31 OPT                   31    13:
DXCT            GODE          CALC             112.01290   -0.0014   -1.4858
                                                  0.0010    0.0009     7.27
DYCT            GODE          CALC             -85.14780    0.0042    1.3178
                                                  0.0032    0.0032    21.81
DZCT            GODE          CALC            -129.34900   -0.0025   -1.0117
                                                  0.0025    0.0025    13.23
GROUP: 00000911.SSF,obs#:  12 day 31 OPT                   31    18:
DXCT            GODE          GORF             -47.91770    0.0000    0.0551
                                                  0.0008    0.0007     0.22
DYCT            GODE          GORF            -122.58300   -0.0014   -0.4345
                                                  0.0032    0.0032     7.66
DZCT            GODE          GORF            -127.70990    0.0006    0.2221
                                                  0.0027    0.0027     3.31
GROUP: 00000859.SSF,obs#:  13 day  8 OPT                    8    15:2
DXCT            GODE          GORF             -47.91720   -0.0005   -0.4709
                                                  0.0010    0.0010     2.50
DYCT            GODE          GORF            -122.58540    0.0010    0.2953
                                                  0.0034    0.0034     5.42
DZCT            GODE          GORF            -127.70980    0.0005    0.1866
                                                  0.0027    0.0027     2.76
GROUP: 00000879.SSF,obs#:  14 day 30 OPT                   30    14
DXCT            GODE          NGEO             -42.53480   -0.0007   -1.2272
                                                  0.0006    0.0005     6.54
DYCT            GODE          NGEO             -69.03890    0.0000   -0.0023
                                                  0.0020    0.0020     0.04
DZCT            GODE          NGEO             -63.90460   -0.0014   -0.8359
                                                  0.0017    0.0017    13.46
GROUP: 00000851.SSF,obs#:  15 day  8 OPT                    8    14:2
DXCT            GODE          NGEO             -42.53550    0.0000    0.0392
                                                  0.0007    0.0006     0.24
DYCT            GODE          NGEO             -69.03880   -0.0001   -0.0470
                                                  0.0022    0.0022     1.01
DZCT            GODE          NGEO             -63.90740    0.0014    0.8037
                                                  0.0018    0.0018    13.66
GROUP: 00000855.SSF,obs#:  16 day  8 OPT                    8    14:5
DXCT            GODE          VLBA              20.98660   -0.0011   -0.7089
                                                  0.0016    0.0015    18.13
DYCT            GODE          VLBA              39.39530    0.0130    2.4158
                                                  0.0054    0.0054   215.66
DZCT            GODE          VLBA              40.26850   -0.0057   -1.3633
                                                  0.0042    0.0042    94.48
GROUP: 00000915.SSF,obs#:  17 day 31 OPT                   31 2  18:
DXCT            GORF          CALC             159.92790    0.0013    1.0387
                                                  0.0012    0.0012     7.73
DYCT            GORF          CALC              37.43840    0.0024    0.5053
                                                  0.0047    0.0047    14.45
DZCT            GORF          CALC              -1.64300    0.0008    0.1901
                                                  0.0040    0.0040     4.66
GROUP: 00000891.SSF,obs#:  18 day 30 OPT                   30 1  14:
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                         GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80           UNITS: m,DMS        Page 0029
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                         OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO             STD DEV  STD DEV      PPM
---- -----------  -----------  -----------  ----------------- -------- --------
DXCT          NGEO         CALB           159.62300   0.0007   0.8587
                                            0.0008   0.0008     3.98
DYCT          NGEO         CALB             3.04200   0.0005   0.1752
                                            0.0028   0.0028     2.91
DZCT          NGEO         CALB           -44.40760  -0.0003  -0.1161
                                            0.0022   0.0022     1.53
GROUP: 00000887.SSF,obs#:  19 day  30   OPT              30 1  14:
DXCT          NGEO         GORF            -5.38280   0.0006   0.7359
                                            0.0009   0.0008     7.38
DYCT          NGEO         GORF           -53.54380  -0.0017  -0.5311
                                            0.0032   0.0032    20.38
DZCT          NGEO         GORF           -63.80540   0.0021   0.7817
                                            0.0027   0.0027    25.11
GROUP: 00000883.SSF,obs#:  20 day  30   OPT              30 1  14:
DXCT          NGEO         VLBA            63.52060   0.0004   0.2711
                                            0.0014   0.0014     2.36
DYCT          NGEO         VLBA           108.43200   0.0152   2.7545
                                            0.0055   0.0055    92.93
DZCT          NGEO         VLBA           104.17640  -0.0076  -1.7143
                                            0.0044   0.0044    46.50
GROUP: DISTANCES
DIST          NGEO         7105            42.62028   0.0006   0.5749
                                            0.0010   0.0010    13.04
DIST          NGEO         7105            42.62158  -0.0007  -0.2397
                                            0.0031   0.0031    17.47
DIST          7105         NGEO            42.62063   0.0002   0.2061
                                            0.0010   0.0010     4.67
DIST          7105         NGEO            42.62019   0.0006   0.2056
                                            0.0031   0.0031    14.99
DIST          SGEOS        7105            50.87930  -0.0007  -0.6763
                                            0.0010   0.0010    12.96
DIST          SGEOS        7105            50.87860   0.0000   0.0124
                                            0.0031   0.0031     0.76
DIST          7105         SGEOS           50.87783   0.0008   0.8370
                                            0.0010   0.0010    16.04
DIST          7105         SGEOS           50.87688   0.0018   0.5662
                                            0.0031   0.0031    34.61
DIST          CAL(A)01     7105           106.48338   0.0005   0.4785
                                            0.0010   0.0010     4.47
DIST          CAL(A)01     7105           106.48275   0.0011   0.3537
                                            0.0031   0.0031    10.35
DIST          7105         CAL(A)01       106.48477  -0.0009  -0.9217
                                            0.0010   0.0010     8.61
DIST          7105         CAL(A)01       106.48601  -0.0022  -0.6907
                                            0.0031   0.0031    20.21
DIST          7108(93)     4005W           54.93512  -0.0002  -0.2413
                                            0.0010   0.0010     4.41
DIST          7108(93)     4005W           54.93473   0.0001   0.0470
                                            0.0031   0.0031     2.67
DIST          4005W        7108(93)        54.93404   0.0008   0.8344
                                            0.0010   0.0010    15.25
DIST          NGEO         7108(93)       135.63168  -0.0006  -0.5983
                                            0.0011   0.0010     4.53
DIST          NGEO         7108(93)       135.63116  -0.0001  -0.0304
                                            0.0031   0.0031     0.70
DIST          7108(93)     NGEO           135.63199  -0.0009  -0.9023
                                            0.0011   0.0010     6.83
DIST          7108(93)     NGEO           135.63179  -0.0007  -0.2308
                                            0.0031   0.0031     5.32
DIST          NGEO         7108(93)       135.63110   0.0000  -0.0390
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================================================================================
                          GGAO SITE SURVEY 2007
GeoLab V3.72               GRS 80          UNITS: m,DMS      Page 0030
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                       OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO           STD DEV  STD DEV      PPM
---- -----------  -----------  -----------  ----------------- -------- --------
                                             0.0011   0.0010     0.30
DIST             NGEO         7108(93)     135.63140 -0.0003  -0.3311
                                             0.0011   0.0010     2.51
DIST             PIER(B)95    7108(93)     104.32043 -0.0005  -0.5300
                                             0.0010   0.0010     5.19
DIST             PIER(B)95    7108(93)     104.32063 -0.0007  -0.7256
                                             0.0010   0.0010     7.11
DIST             PIER(B)95    7108(93)     104.32019 -0.0003  -0.2941
                                             0.0010   0.0010     2.88
DIST             7108(93)     PIER(B)95    104.31900  0.0009   0.8743
                                             0.0010   0.0010     8.57
DIST             PIER(C)95    7108(93)      49.47138 -0.0004  -0.3708
                                             0.0010   0.0010     7.34
DIST             7108(93)     PIER(C)95     49.46954  0.0015   1.5080
                                             0.0010   0.0010    29.86
DIST             7108RM1      7108(93)      31.19156  0.0001   0.1303
                                             0.0010   0.0010     4.06
DIST             7108(93)     7108RM1       31.19157  0.0001   0.1203
                                             0.0010   0.0010     3.74
DIST             CAL(A)01     7108(93)     101.64439 -0.0001  -0.1217
                                             0.0010   0.0010     1.21
DIST             7108(93)     CAL(A)01     101.64406  0.0002   0.2004
                                             0.0010   0.0010     1.99
DIST             CALB         MOB7(07)     174.80471 -0.0009  -0.8873
                                             0.0011   0.0010     5.27
DIST             CALB         MOB7(07)     174.80431 -0.0005  -0.5019
                                             0.0011   0.0010     2.98
DIST             CALB         NG2000(07)   156.76300 -0.0008  -0.7632
                                             0.0011   0.0010     5.04
DIST             CALB         NG2000(07)   156.76230 -0.0001  -0.0867
                                             0.0011   0.0010     0.57
DIST             CALB         SGEOS        158.69111 -0.0001  -0.0715
                                             0.0011   0.0010     0.47
DIST             CALB         SGEOS        158.69001  0.0010   0.9883
                                             0.0011   0.0010     6.46
DIST             CALB         CALC          28.89625 -0.0004  -0.3547
                                             0.0010   0.0010    12.57
DIST             CALB         CALC          28.89575  0.0001   0.1334
                                             0.0010   0.0010     4.73
DIST             CALB         CAL(A)01      99.15458 -0.0008  -0.7406
                                             0.0010   0.0010     7.66
DIST             CALB         CAL(A)01      99.15388 -0.0001  -0.0580
                                             0.0010   0.0010     0.60
DIST             CALB         7125         153.88293 -0.0005  -0.4996
                                             0.0011   0.0010     3.36
DIST             CALB         7125         153.88153  0.0009   0.8539
                                             0.0011   0.0010     5.74
DIST             CALB         CAL(D)98     202.01847 -0.0005  -0.4520
                                             0.0011   0.0010     2.32
DIST             CALB         CAL(D)98     202.01777  0.0002   0.2243
                                             0.0011   0.0010     1.15
DIST             CALB         PIER(B)95    164.89583 -0.0008  -0.7578
                                             0.0011   0.0010     4.78
DIST             CALB         PIER(B)95    164.89523 -0.0002  -0.1804
                                             0.0011   0.0010     1.14
DIST             CALB         NGEO         165.71399 -0.0003  -0.2908
                                             0.0011   0.0010     1.84
DIST             CALB         NGEO         165.71329  0.0004   0.3767
                                             0.0011   0.0010     2.38
DIST             CALB         GORF         175.51555 -0.0011  -1.0816
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                        GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80           UNITS: m,DMS         Page 0031
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                        OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO            STD DEV  STD DEV     PPM
---- ----------- ------------ ------------ ----------------- -------- --------
                                             0.0011   0.0010     6.45
DIST             CALB         GORF         175.51505 -0.0006  -0.6039
                                             0.0011   0.0010     3.60
DIST             NG2000(07)   CALB         156.76386 -0.0016  -1.5931
                                             0.0011   0.0010    10.52
DIST             NG2000(07)   CALB         156.76316 -0.0009  -0.9166
                                             0.0011   0.0010     6.05
DIST             NG2000(07)   CALC         146.25426 -0.0005  -0.4708
                                             0.0011   0.0010     3.32
DIST             NG2000(07)   CALC         146.25356  0.0002   0.2074
                                             0.0011   0.0010     1.46
DIST             NG2000(07)   SGEOS         10.69863 -0.0014  -1.4110
                                             0.0010   0.0010   134.27
DIST             NG2000(07)   SGEOS         10.69783 -0.0006  -0.6251
                                             0.0010   0.0010    59.49
DIST             NG2000(07)   MOB7(07)      41.71953 -0.0006  -0.5642
                                             0.0010   0.0010    13.70
DIST             NG2000(07)   MOB7(07)      41.71843  0.0005   0.5217
                                             0.0010   0.0010    12.67
DIST             NG2000(07)   GORF          19.44611 -0.0019  -1.8888
                                             0.0010   0.0010    99.44
DIST             NG2000(07)   GORF          19.44551 -0.0013  -1.3027
                                             0.0010   0.0010    68.58
DIST             NG2000(07)   NGEO          76.16914 -0.0002  -0.1597
                                             0.0010   0.0010     2.14
DIST             NG2000(07)   NGEO          76.16804  0.0009   0.9190
                                             0.0010   0.0010    12.30
DIST             NG2000(07)   CAL(A)01     113.55543 -0.0004  -0.4382
                                             0.0011   0.0010     3.95
DIST             NG2000(07)   CAL(A)01     113.55393  0.0011   1.0263
                                             0.0011   0.0010     9.26
DIST             NG2000(07)   CAL(D)98      48.62283 -0.0003  -0.2630
                                             0.0010   0.0010     5.46
DIST             NG2000(07)   CAL(D)98      48.62243  0.0001   0.1330
                                             0.0010   0.0010     2.76
DIST             CALC         CALB          28.89684 -0.0010  -0.9327
                                             0.0010   0.0010    33.07
DIST             CALC         CALB          28.89604 -0.0002  -0.1518
                                             0.0010   0.0010     5.38
DIST             CALC         MOB7(07)     170.49690 -0.0001  -0.1239
                                             0.0011   0.0010     0.75
DIST             CALC         MOB7(07)     170.49650  0.0003   0.2620
                                             0.0011   0.0010     1.59
DIST             CALC         NG2000(07)   146.25426 -0.0005  -0.4685
                                             0.0011   0.0010     3.31
DIST             CALC         NG2000(07)   146.25356  0.0002   0.2097
                                             0.0011   0.0010     1.48
DIST             CALC         SGEOS        146.41896  0.0001   0.0788
                                             0.0011   0.0010     0.56
DIST             CALC         SGEOS        146.41806  0.0010   0.9482
                                             0.0011   0.0010     6.70
DIST             CALC         7125         143.37012 -0.0002  -0.1882
                                             0.0011   0.0010     1.35
DIST             CALC         7125         143.36922  0.0007   0.6849
                                             0.0011   0.0010     4.92
DIST             CALC         CAL(A)01     112.30052  0.0001   0.0543
                                             0.0011   0.0010     0.50
DIST             CALC         CAL(A)01     112.29932  0.0013   1.2229
                                             0.0011   0.0010    11.18
DIST             CALC         PIER(B)95    173.17625 -0.0001  -0.1037
```

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================================================================================
                        GGAO SITE SURVEY 2007
GeoLab V3.72             GRS 80        UNITS: m,DMS        Page 0032
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                        OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO            STD DEV  STD DEV     PPM
---- -----------  -----------  -----------  -----------------  --------  --------
                                             0.0011   0.0010     0.62
DIST             CALC         PIER(B)95    173.17505  0.0011   1.0509
                                             0.0011   0.0010     6.31
DIST             CALC         NGEO         168.60337  0.0005   0.4384
                                             0.0011   0.0010     2.72
DIST             CALC         NGEO         168.60257  0.0013   1.2020
                                             0.0011   0.0010     7.47
DIST             CALC         CAL(D)98     188.32643 -0.0005  -0.5087
                                             0.0011   0.0010     2.79
DIST             CALC         CAL(D)98     188.32553  0.0004   0.3633
                                             0.0011   0.0010     1.99
DIST             CALC         GORF         164.26261 -0.0011  -1.0462
                                             0.0011   0.0010     6.65
DIST             CALC         GORF         164.26111  0.0004   0.3911
                                             0.0011   0.0010     2.48
DIST             SGEOS        MOB7(07)      51.00155 -0.0004  -0.4359
                                             0.0010   0.0010     8.67
DIST             SGEOS        MOB7(07)      51.00055  0.0006   0.5502
                                             0.0010   0.0010    10.94
DIST             SGEOS        NG2000(07)    10.69677  0.0004   0.4136
                                             0.0010   0.0010    39.36
DIST             SGEOS        NG2000(07)    10.69617  0.0010   1.0031
                                             0.0010   0.0010    95.45
DIST             SGEOS        CALC         146.41967 -0.0006  -0.6040
                                             0.0011   0.0010     4.27
DIST             SGEOS        CALC         146.41937 -0.0003  -0.3142
                                             0.0011   0.0010     2.22
DIST             SGEOS        CALB         158.69239 -0.0014  -1.3022
                                             0.0011   0.0010     8.52
DIST             SGEOS        CALB         158.69169 -0.0007  -0.6278
                                             0.0011   0.0010     4.11
DIST             SGEOS        7125          10.72533 -0.0002  -0.1655
                                             0.0010   0.0010    15.63
DIST             SGEOS        7125          10.72563 -0.0005  -0.4616
                                             0.0010   0.0010    43.61
DIST             SGEOS        GORF          18.47936 -0.0012  -1.1891
                                             0.0010   0.0010    66.13
DIST             SGEOS        GORF          18.47866 -0.0005  -0.5079
                                             0.0010   0.0010    28.25
DIST             SGEOS        CAL(D)98      43.77924 -0.0005  -0.4675
                                             0.0010   0.0010    10.83
DIST             SGEOS        CAL(D)98      43.77884 -0.0001  -0.0731
                                             0.0010   0.0010     1.69
DIST             MOB7(07)     CALB         174.80399 -0.0002  -0.1968
                                             0.0011   0.0010     1.17
DIST             MOB7(07)     CALB         174.80359  0.0002   0.1885
                                             0.0011   0.0010     1.12
DIST             MOB7(07)     CALC         170.49716 -0.0004  -0.3790
                                             0.0011   0.0010     2.30
DIST             MOB7(07)     CALC         170.49706 -0.0003  -0.2826
                                             0.0011   0.0010     1.72
DIST             MOB7(07)     SGEOS         51.00165 -0.0005  -0.5321
                                             0.0010   0.0010    10.58
DIST             MOB7(07)     SGEOS         50.99965  0.0015   1.4399
                                             0.0010   0.0010    28.63
DIST             MOB7(07)     NGEO          42.77303  0.0002   0.1566
                                             0.0010   0.0010     3.72
DIST             MOB7(07)     NGEO          42.77233  0.0009   0.8456
                                             0.0010   0.0010    20.08
DIST             MOB7(07)     CAL(A)01     106.64623 -0.0012  -1.1783
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                          GGAO SITE SURVEY 2007
GeoLab V3.72                 GRS 80          UNITS: m,DMS       Page 0033
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                           OBSERVATION RESIDUAL  STD RES
TYPE AT        FROM         TO             STD DEV   STD DEV     PPM
----  ------------ ------------ ------------ ----------------- -------- --------
                                             0.0010   0.0010    11.31
DIST           MOB7(07)     CAL(A)01       106.64503  0.0000   -0.0061
                                             0.0010   0.0010     0.06
DIST           MOB7(07)     CALB           174.80543 -0.0016   -1.5798
                                             0.0011   0.0010     9.38
DIST           MOB7(07)     CALB           174.80483 -0.0010   -1.0017
                                             0.0011   0.0010     5.95
DIST           MOB7(07)     CALC           170.49710 -0.0003   -0.3156
                                             0.0011   0.0010     1.92
DIST           MOB7(07)     CALC           170.49650  0.0003    0.2632
                                             0.0011   0.0010     1.60
DIST           MOB7(07)     NG2000(07)      41.71910 -0.0001   -0.1422
                                             0.0010   0.0010     3.45
DIST           MOB7(07)     NG2000(07)      41.71810  0.0009    0.8450
                                             0.0010   0.0010    20.52
DIST           MOB7(07)     CAL(A)01       106.64609 -0.0011   -1.0445
                                             0.0010   0.0010    10.03
DIST           MOB7(07)     CAL(A)01       106.64389  0.0011    1.1046
                                             0.0010   0.0010    10.60
DIST           MOB7(07)     CAL(A)01       106.64439  0.0006    0.6162
                                             0.0010   0.0010     5.91
DIST           7125         CALB           153.88379 -0.0014   -1.3283
                                             0.0011   0.0010     8.93
DIST           7125         CALB           153.88269 -0.0003   -0.2648
                                             0.0011   0.0010     1.78
DIST           7125         CAL(A)01       111.45465 -0.0008   -0.8105
                                             0.0010   0.0010     7.45
DIST           7125         CAL(A)01       111.45415 -0.0003   -0.3224
                                             0.0010   0.0010     2.96
DIST           7125         SGEOS           10.72501  0.0002    0.1552
                                             0.0010   0.0010    14.66
DIST           7125         SGEOS           10.72531 -0.0001   -0.1409
                                             0.0010   0.0010    13.31
DIST           7125         VLBA           229.85575  0.0002    0.1873
                                             0.0011   0.0010     0.84
DIST           7125         VLBA           229.85505  0.0009    0.8628
                                             0.0011   0.0010     3.89
DIST           7125         NGEO            76.10098  0.0005    0.4498
                                             0.0010   0.0010     6.02
DIST           7125         NGEO            76.10078  0.0007    0.6461
                                             0.0010   0.0010     8.65
DIST           CAL(A)01     7125           111.45473 -0.0009   -0.8887
                                             0.0010   0.0010     8.17
DIST           CAL(A)01     7125           111.45393 -0.0001   -0.1077
                                             0.0010   0.0010     0.99
DIST           CAL(A)01     GORF           130.30902 -0.0014   -1.3219
                                             0.0011   0.0010    10.49
DIST           CAL(A)01     GORF           130.30842 -0.0008   -0.7415
                                             0.0011   0.0010     5.88
DIST           CAL(A)01     MOB7(07)       106.64556 -0.0005   -0.5297
                                             0.0010   0.0010     5.08
DIST           CAL(A)01     MOB7(07)       106.64466  0.0004    0.3495
                                             0.0010   0.0010     3.35
DIST           CAL(A)01     PIER(B)95       68.09444  0.0003    0.3345
                                             0.0010   0.0010     5.03
DIST           CAL(A)01     PIER(B)95       68.09334  0.0014    1.4085
                                             0.0010   0.0010    21.18
DIST           CAL(A)01     VLBA           132.20410 -0.0014   -1.3650
                                             0.0011   0.0010    10.63
DIST           CAL(A)01     VLBA           132.20340 -0.0007   -0.6850
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                        GGAO SITE SURVEY 2007
GeoLab V3.72               GRS 80          UNITS: m,DMS        Page 0034
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                          OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO            STD DEV  STD DEV      PPM
---- ----------- ------------ ------------ ----------------- -------- --------
                                             0.0011   0.0010    5.33
DIST             CAL(A)01     NG2000(07)   113.55585 -0.0009  -0.8433
                                             0.0011   0.0010    7.61
DIST             CAL(A)01     NG2000(07)   113.55445  0.0005   0.5235
                                             0.0011   0.0010    4.72
DIST             GORF         CALB         175.51610 -0.0017  -1.6088
                                             0.0011   0.0010    9.59
DIST             GORF         CALB         175.51650 -0.0021  -1.9910
                                             0.0011   0.0010   11.87
DIST             GORF         CAL(A)01     130.30847 -0.0008  -0.7832
                                             0.0011   0.0010    6.21
DIST             GORF         CAL(A)01     130.30787 -0.0002  -0.2029
                                             0.0011   0.0010    1.61
DIST             GORF         NGEO          83.46865 -0.0004  -0.3756
                                             0.0010   0.0010    4.64
DIST             GORF         NGEO          83.46775  0.0005   0.4982
                                             0.0010   0.0010    6.15
DIST             GORF         NG2000(07)    19.44453 -0.0004  -0.3524
                                             0.0010   0.0010   18.55
DIST             GORF         NG2000(07)    19.44393  0.0002   0.2337
                                             0.0010   0.0010   12.31
DIST             GORF         CAL(D)98      30.56174 -0.0003  -0.2659
                                             0.0010   0.0010    8.84
DIST             GORF         CAL(D)98      30.56174 -0.0003  -0.2659
                                             0.0010   0.0010    8.84
DIST             GORF         SGEOS         18.47833 -0.0002  -0.1922
                                             0.0010   0.0010   10.69
DIST             GORF         SGEOS         18.47773  0.0004   0.3916
                                             0.0010   0.0010   21.78
DIST             GORF         CALC         164.26205 -0.0005  -0.5040
                                             0.0011   0.0010    3.20
DIST             GORF         CALC         164.26105  0.0005   0.4542
                                             0.0011   0.0010    2.89
DIST             GORF         NG2000(07)    19.44523 -0.0011  -1.0362
                                             0.0010   0.0010   54.55
DIST             GORF         NG2000(07)    19.44473 -0.0006  -0.5478
                                             0.0010   0.0010   28.84
DIST             NGEO         MOB7(07)      42.77388 -0.0007  -0.6812
                                             0.0010   0.0010   16.18
DIST             NGEO         MOB7(07)      42.77278  0.0004   0.4017
                                             0.0010   0.0010    9.54
DIST             NGEO         NG2000(07)    76.16983 -0.0009  -0.8367
                                             0.0010   0.0010   11.20
DIST             NGEO         NG2000(07)    76.16903 -0.0001  -0.0523
                                             0.0010   0.0010    0.70
DIST             NGEO         MOB7(07)      42.77328 -0.0001  -0.0914
                                             0.0010   0.0010    2.17
DIST             NGEO         MOB7(07)      42.77228  0.0009   0.8930
                                             0.0010   0.0010   21.21
DIST             NGEO         CALB         165.71381 -0.0001  -0.1162
                                             0.0011   0.0010    0.74
DIST             NGEO         CALB         165.71351  0.0002   0.1699
                                             0.0011   0.0010    1.08
DIST             NGEO         PIER(C)95    128.86318 -0.0001  -0.0981
                                             0.0011   0.0010    0.78
DIST             NGEO         PIER(C)95    128.86228  0.0008   0.7773
                                             0.0011   0.0010    6.20
DIST             NGEO         VLBA         163.23970 -0.0011  -1.0412
                                             0.0011   0.0010    6.63
DIST             NGEO         VLBA         163.23930 -0.0007  -0.6563
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                         GGAO SITE SURVEY 2007
GeoLab V3.72                  GRS 80          UNITS: m,DMS        Page 0035
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                           OBSERVATION RESIDUAL  STD RES
TYPE AT         FROM          TO              STD DEV  STD DEV      PPM
----  ------------  ------------  ------------  ----------------- -------- --------
                                            0.0011   0.0010     4.18
DIST            NGEO          PIER(B)95     32.03056  -0.0005   -0.5211
                                            0.0010   0.0010    16.68
DIST            NGEO          PIER(B)95     32.02996   0.0001    0.0641
                                            0.0010   0.0010     2.05
DIST            NGEO          GORF          83.46805   0.0002    0.2037
                                            0.0010   0.0010     2.51
DIST            NGEO          GORF          83.46725   0.0010    0.9804
                                            0.0010   0.0010    12.10
DIST            NGEO          CALB         165.71542  -0.0017   -1.6477
                                            0.0011   0.0010    10.43
DIST            NGEO          CALB         165.71402  -0.0003   -0.3127
                                            0.0011   0.0010     1.98
DIST            NGEO          CALC         168.60371   0.0001    0.1171
                                            0.0011   0.0010     0.73
DIST            NGEO          CALC         168.60341   0.0004    0.4035
                                            0.0011   0.0010     2.51
DIST            NGEO          7125          76.10147   0.0000   -0.0264
                                            0.0010   0.0010     0.35
DIST            NGEO          7125          76.10057   0.0009    0.8570
                                            0.0010   0.0010    11.47
DIST            CAL(D)98      GORF          30.56165  -0.0002   -0.1725
                                            0.0010   0.0010     5.74
DIST            CAL(D)98      GORF          30.56165  -0.0002   -0.1725
                                            0.0010   0.0010     5.74
DIST            CAL(D)98      SGEOS         43.77878   0.0000   -0.0201
                                            0.0010   0.0010     0.46
DIST            CAL(D)98      SGEOS         43.77868   0.0001    0.0785
                                            0.0010   0.0010     1.82
DIST            CAL(D)98      CALC         188.32584   0.0001    0.0616
                                            0.0011   0.0010     0.34
DIST            CAL(D)98      CALC         188.32584   0.0001    0.0616
                                            0.0011   0.0010     0.34
DIST            CAL(D)98      CALB         202.01864  -0.0006   -0.6180
                                            0.0011   0.0010     3.17
DIST            CAL(D)98      CALB         202.01844  -0.0004   -0.4247
                                            0.0011   0.0010     2.18
DIST            CAL(D)98      NG2000(07)    48.62285  -0.0003   -0.2855
                                            0.0010   0.0010     5.93
DIST            CAL(D)98      NG2000(07)    48.62245   0.0001    0.1105
                                            0.0010   0.0010     2.30
DIST            PIER(B)95     NGEO          32.03087  -0.0008   -0.8284
                                            0.0010   0.0010    26.52
DIST            PIER(B)95     NGEO          32.02997   0.0001    0.0494
                                            0.0010   0.0010     1.58
DIST            PIER(B)95     CAL(A)01      68.09593  -0.0011   -1.1178
                                            0.0010   0.0010    16.81
DIST            PIER(B)95     CAL(A)01      68.09483   0.0000   -0.0437
                                            0.0010   0.0010     0.66
DIST            PIER(B)95     PIER(C)95     97.57650  -0.0007   -0.6622
                                            0.0010   0.0010     6.95
DIST            PIER(B)95     PIER(C)95     97.57570   0.0001    0.1185
                                            0.0010   0.0010     1.24
DIST            PIER(B)95     7108RM1      112.22143  -0.0009   -0.8756
                                            0.0011   0.0010     8.00
DIST            PIER(B)95     7108RM1      112.22063  -0.0001   -0.0949
                                            0.0011   0.0010     0.87
DIST            PIER(B)95     VLBA         131.39187  -0.0017   -1.6921
                                            0.0011   0.0010    13.26
DIST            PIER(B)95     VLBA         131.39117  -0.0010   -1.0122
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                        GGAO SITE SURVEY 2007
GeoLab V3.72               GRS 80          UNITS: m,DMS        Page 0036
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                          OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO            STD DEV  STD DEV      PPM
---- ----------- ------------ ------------ ----------------- -------- --------
                                             0.0011   0.0010     7.93
DIST             PIER(B)95    4005W         55.22530 -0.0004   -0.3767
                                             0.0010   0.0010     6.90
DIST             PIER(B)95    4005W         55.22480  0.0001    0.1173
                                             0.0010   0.0010     2.15
DIST             PIER(B)95    CALC         173.17620 -0.0001   -0.0558
                                             0.0011   0.0010     0.33
DIST             PIER(B)95    CALC         173.17550  0.0006    0.6178
                                             0.0011   0.0010     3.71
DIST             PIER(B)95    CALB         164.89657 -0.0015   -1.4713
                                             0.0011   0.0010     9.27
DIST             PIER(B)95    CALB         164.89627 -0.0012   -1.1826
                                             0.0011   0.0010     7.45
DIST             PIER(C)95    NGEO         128.86368 -0.0006   -0.5829
                                             0.0011   0.0010     4.65
DIST             PIER(C)95    NGEO         128.86238  0.0007    0.6815
                                             0.0011   0.0010     5.44
DIST             PIER(C)95    VLBA          53.41684 -0.0008   -0.7734
                                             0.0010   0.0010    14.67
DIST             PIER(C)95    VLBA          53.41594  0.0001    0.1148
                                             0.0010   0.0010     2.18
DIST             PIER(C)95    7108RM1       79.97624 -0.0006   -0.5424
                                             0.0010   0.0010     6.91
DIST             PIER(C)95    7108RM1       79.97584 -0.0002   -0.1495
                                             0.0010   0.0010     1.90
DIST             PIER(C)95    4005W         44.05555 -0.0011   -1.0446
                                             0.0010   0.0010    24.07
DIST             PIER(C)95    4005W         44.05535 -0.0009   -0.8476
                                             0.0010   0.0010    19.53
DIST             PIER(C)95    PIER(B)95     97.57598 -0.0002   -0.1571
                                             0.0010   0.0010     1.65
DIST             PIER(C)95    PIER(B)95     97.57528  0.0005    0.5261
                                             0.0010   0.0010     5.52
DIST             VLBA         CAL(A)01     132.20318 -0.0005   -0.4752
                                             0.0011   0.0010     3.70
DIST             VLBA         CAL(A)01     132.20268  0.0000    0.0105
                                             0.0011   0.0010     0.08
DIST             VLBA         7125         229.85613 -0.0002   -0.1776
                                             0.0011   0.0010     0.80
DIST             VLBA         7125         229.85513  0.0008    0.7874
                                             0.0011   0.0010     3.55
DIST             VLBA         NGEO         163.23881 -0.0002   -0.1871
                                             0.0011   0.0010     1.19
DIST             VLBA         NGEO         163.23851  0.0001    0.1015
                                             0.0011   0.0010     0.65
DIST             VLBA         PIER(B)95    131.39069 -0.0006   -0.5523
                                             0.0011   0.0010     4.33
DIST             VLBA         PIER(B)95    131.39039 -0.0003   -0.2610
                                             0.0011   0.0010     2.04
DIST             VLBA         7108RM1       52.35003 -0.0003   -0.2515
                                             0.0010   0.0010     4.87
DIST             VLBA         7108RM1       52.34963  0.0001    0.1432
                                             0.0010   0.0010     2.77
DIST             VLBA         PIER(C)95     53.41618 -0.0001   -0.1238
                                             0.0010   0.0010     2.35
DIST             VLBA         PIER(C)95     53.41558  0.0005    0.4684
                                             0.0010   0.0010     8.88
DIST             7108RM1      PIER(B)95    112.22127 -0.0007   -0.7224
                                             0.0011   0.0010     6.60
DIST             7108RM1      PIER(B)95    112.22057  0.0000   -0.0393
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                          GGAO SITE SURVEY 2007
GeoLab V3.72            GRS 80              UNITS: m,DMS          Page 0037
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                         OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO             STD DEV  STD DEV    PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                            0.0011   0.0010    0.36
DIST         7108RM1      VLBA         52.35125  -0.0015  -1.4570
                                            0.0010   0.0010   28.20
DIST         7108RM1      VLBA         52.35035  -0.0006  -0.5688
                                            0.0010   0.0010   11.01
DIST         7108RM1      4005W        73.82902  -0.0005  -0.5371
                                            0.0010   0.0010    7.39
DIST         7108RM1      4005W        73.82862  -0.0001  -0.1433
                                            0.0010   0.0010    1.97
DIST         7108RM1      PIER(C)95    79.97534   0.0004   0.3456
                                            0.0010   0.0010    4.40
DIST         7108RM1      PIER(C)95    79.97494   0.0008   0.7384
                                            0.0010   0.0010    9.40
DIST         4005W        PIER(C)95    44.05535  -0.0009  -0.8516
                                            0.0010   0.0010   19.63
DIST         4005W        PIER(C)95    44.05535  -0.0009  -0.8516
                                            0.0010   0.0010   19.63
DIST         4005W        PIER(B)95    55.22456   0.0004   0.3543
                                            0.0010   0.0010    6.49
DIST         4005W        PIER(B)95    55.22386   0.0011   1.0459
                                            0.0010   0.0010   19.17
DIST         4005W        7108RM1      73.82914  -0.0007  -0.6585
                                            0.0010   0.0010    9.06
DIST         4005W        7108RM1      73.82884  -0.0004  -0.3631
                                            0.0010   0.0010    5.00
DIST         CAL(A)01     NGEO         78.95614  -0.0001  -0.1401
                                            0.0010   0.0010    1.83
DIST         CAL(A)01     NGEO         78.95514   0.0009   0.8277
                                            0.0010   0.0010   10.83
DIST         NGEO         VLBA        163.23910  -0.0005  -0.4709
                                            0.0011   0.0010    3.00
DIST         NGEO         VLBA        163.23750   0.0011   1.0686
                                            0.0011   0.0010    6.80
DIST         NGEO         CALC        168.60589  -0.0021  -1.9629
                                            0.0011   0.0010   12.20
DIST         NGEO         CALC        168.60569  -0.0019  -1.7720
                                            0.0011   0.0010   11.01
DIST         NGEO         CAL(A)01     78.95715  -0.0012  -1.1231
                                            0.0010   0.0010   14.70
DIST         NGEO         CAL(A)01     78.95645  -0.0005  -0.4456
                                            0.0010   0.0010    5.83
DIST         CALC         VLBA        229.27806  -0.0011  -1.0272
                                            0.0011   0.0010    4.68
DIST         CALC         VLBA        229.27726  -0.0003  -0.2619
                                            0.0011   0.0010    1.19
DIST         CALC         NGEO        168.60486  -0.0010  -0.9864
                                            0.0011   0.0010    6.13
DIST         CALC         NGEO        168.60470  -0.0009  -0.8271
                                            0.0011   0.0010    5.14
DIST         CALC         NGEO        168.60330   0.0005   0.5093
                                            0.0011   0.0010    3.16
DIST         VLBA         CALC        229.27877  -0.0018  -1.7120
                                            0.0011   0.0010    7.81
DIST         VLBA         CALC        229.27777  -0.0008  -0.7553
                                            0.0011   0.0010    3.44
DIST         VLBA         NGEO        163.23898  -0.0004  -0.3507
                                            0.0011   0.0010    2.23
DIST         VLBA         NGEO        163.23788   0.0007   0.7077
                                            0.0011   0.0010    4.51
```

```
DIST              CAL(D)98    DORIS(07)MK           6.26805   0.0003   0.2613



=============================================================================
                           GGAO SITE SURVEY 2007
GeoLab V3.72               GRS 80          UNITS: m,DMS          Page 0038
=============================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                          OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM        TO            STD DEV   STD DEV     PPM
---- ------------ ----------- -----------  --------- --------  --------
                                            0.0010    0.0010    41.22
DIST              CAL(D)98    DORIS(07)MK   6.26765   0.0007    0.6658
                                            0.0010    0.0010   105.03
DIST              GORF        DORIS(07)MK  24.37826   0.0003    0.3209
                                            0.0010    0.0010    13.10
DIST              GORF        DORIS(07)MK  24.37826   0.0003    0.3209
                                            0.0010    0.0010    13.10
DIST              SGEOS       DORIS(07)MK  37.68458   0.0004    0.4336
                                            0.0010    0.0010    11.45
DIST              SGEOS       DORIS(07)MK  37.68368   0.0013    1.3379
                                            0.0010    0.0010    35.33
DIST              DORIS(07)MK CAL(D)98      6.26828   0.0000    0.0294
                                            0.0010    0.0010     4.64
DIST              DORIS(07)MK CAL(D)98      6.26818   0.0001    0.1305
                                            0.0010    0.0010    20.59
DIST              DORIS(07)MK GORF         24.37917  -0.0006   -0.5912
                                            0.0010    0.0010    24.13
DIST              DORIS(07)MK GORF         24.37957  -0.0010   -0.9932
                                            0.0010    0.0010    40.54
DIST              DORIS(07)MK SGEOS        37.68480   0.0002    0.2147
                                            0.0010    0.0010     5.67
DIST              DORIS(07)MK SGEOS        37.68430   0.0007    0.7171
                                            0.0010    0.0010    18.94
```

```
===============================================================================
                         GGAO SITE SURVEY 2007
GeoLab V3.72                 GRS 80            UNITS: m,DMS        Page 0039
===============================================================================

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                             |:::|
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                             |:::|---
                             |:::|:::|
                             |:::|:::|
                             |:::|:::|
        0.4 -              ---|::***::|
                          |:::|:*:|:*:|
                          |:::|*::|::*|
                          |:::*|:::|:::*
                          |:::|:::|:::|
                          |::*|:::|:::|*
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                          |:::|:::|:::|
  R     0.3 -             |:*:|:::|:::|  *
  e                       |:::|:::|:::|
  l                       |*::|:::|:::|   *
  a                       |:::|:::|:::|
  t                       |:::|:::|:::|
  i                       *:::|:::|:::|    *
  v                       |:::|:::|:::|---
  e                      *|:::|:::|:::|:::|*
  F     0.2 -             |:::|:::|:::|:::|
  r                     * |:::|:::|:::|:::| *
  e                       |:::|:::|:::|:::|
  q                       |:::|:::|:::|:::|
  u                    *--|:::|:::|:::|:::|  *
  e                      |:::|:::|:::|:::|:::|
  n                    *:::|:::|:::|:::|:::|   *
  c                      |:::|:::|:::|:::|:::|
  y     0.1 -          *|:::|:::|:::|:::|:::|     *
                     *  |:::|:::|:::|:::|:::|      *
                       |:::|:::|:::|:::|:::|
                   *--|:::|:::|:::|:::|:::|---   *
                  *:::|:::|:::|:::|:::|:::|:::|    *
                *|:::|:::|:::|:::|:::|:::|:::|      *
               *  |:::|:::|:::|:::|:::|:::|:::|      *
             *** |:::|:::|:::|:::|:::|:::|:::|      ***
        +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
            -4      -3      -2      -1       0       1       2       3       4
                         DISTANCES (271 residuals)
```
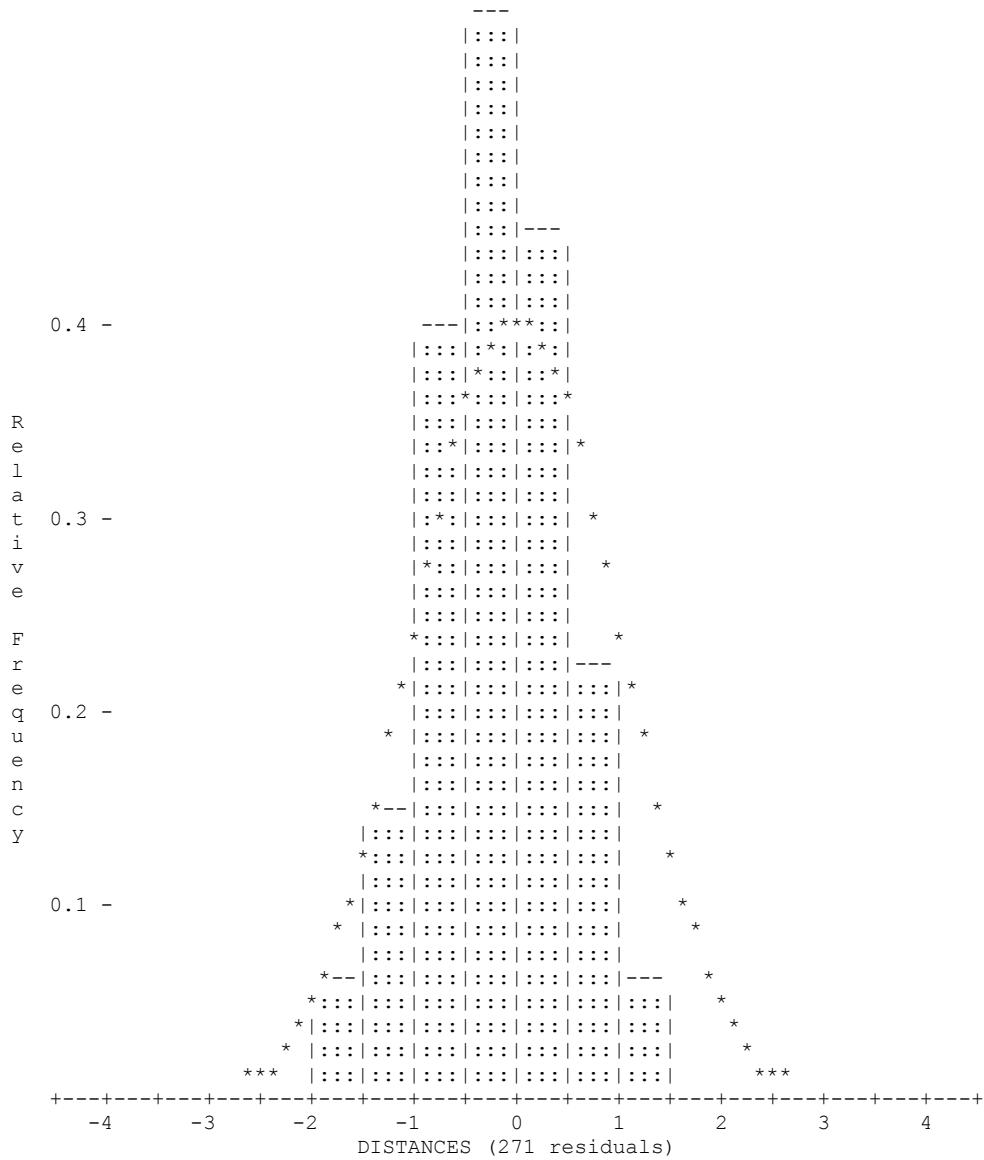
```
================================================================================
                          GGAO SITE SURVEY 2007
GeoLab V3.72                    GRS 80          UNITS: m,DMS        Page 0040
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                            OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO                STD DEV  STD DEV    PPM
---- ------------ ------------ ----------------- -------- --------
GROUP: DIRECTIONS
DIR         GORF         SGEOS          0   0   0.00      0.46     0.14
                                                4.59      3.29
DIR         GORF         DORIS(07)ANT 122  44  11.30      1.66     0.37
                                                6.18      4.43
DIR         GORF         NG2000(07)   328  37  28.78     -1.29    -0.43
                                                4.44      2.99
DIR         GORF         NGEO           0   0   0.00      0.42     0.41
                                                1.16      1.05
DIR         GORF         CAL(A)01      35  27  46.05      0.01     0.01
                                                0.84      0.70
DIR         GORF         CALB          69  23  25.91     -0.50    -0.90
                                                0.71      0.56
DIR         GORF         CALC          78  22  48.99      0.17     0.30
                                                0.73      0.59
DIR         GORF         SGEOS         92  27  17.78      0.76     0.18
                                                4.59      4.22
DIR         GORF         CAL(D)98     217  12  18.02      2.66     1.08
                                                2.87      2.47
DIR         NGEO         CALB           0   0   0.00     -0.10    -0.44
                                                0.73      0.22
DIR         NGEO         MOB7(07)      95   5   3.16      0.77     0.44
                                                2.07      1.76
DIR         NGEO         GORF           0   0   0.00      1.60     1.58
                                                1.16      1.02
DIR         NGEO         MOB7(07)      12  36  16.65      2.15     1.19
                                                2.07      1.81
DIR         NGEO         PIER(C)95    183  47  30.25     -0.45    -0.69
                                                0.85      0.66
DIR         NGEO         VLBA         199  58  51.90     -0.72    -1.32
                                                0.73      0.54
DIR         NGEO         NG2000(07)   347  20  16.36      0.42     0.40
                                                1.24      1.05
DIR         NGEO         PIER(B)95      0   0   0.00     -2.05    -0.78
                                                2.84      2.62
DIR         NGEO         CALB          83   0  17.49     -0.59    -1.05
                                                0.73      0.56
DIR         NGEO         CALC          92  52  18.14      0.30     0.54
                                                0.72      0.55
DIR         NGEO         7125         150  42   7.65      0.33     0.31
                                                1.25      1.08
DIR         NGEO         GORF         165  29   2.94      0.79     0.77
                                                1.16      1.03
DIR         NGEO         7105           0   0   0.00      5.06     3.11
                                                2.11      1.62
DIR         NGEO         PIER(B)95    181  56  55.31      1.60     0.62
                                                2.84      2.59
DIR         NGEO         VLBA         187  24  52.99     -0.71    -2.82
                                                0.73      0.25
DIR         NGEO         GORF           0   0   0.00      0.66     0.77
                                                1.16      0.87
DIR         NGEO         7108(93)     205   9  57.43     -0.33    -0.77
                                                0.82      0.43
DIR         NGEO         GORF           0   0   0.00      0.68     0.79
                                                1.16      0.87
DIR         NGEO         7108(93)     205   9  57.46     -0.34    -0.79
                                                0.82      0.43
DIR         NGEO         GORF           0   0   0.00     -1.45    -1.68
                                                1.16      0.87
DIR         NGEO         7108(93)     205   9  54.26      0.72     1.68
```

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================================================================================
                        GGAO SITE SURVEY 2007
GeoLab V3.72            GRS 80          UNITS: m,DMS         Page 0041
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                        OBSERVATION RESIDUAL  STD RES
TYPE AT         FROM         TO                 STD DEV  STD DEV    PPM
---- ----------- ------------ ------------ ----------------- -------- --------
                                             0.82     0.43
DIR          SGEOS        CALB          0   0   0.00    -0.03    -0.07
                                             0.74     0.51
DIR          SGEOS        CALC          9  50  43.82    0.34     0.60
                                             0.78     0.56
DIR          SGEOS        CAL(D)98    170  43   6.31    -0.93    -0.54
                                             2.06     1.71
DIR          SGEOS        GORF        205  40  44.50    -1.73    -0.42
                                             4.59     4.15
DIR          SGEOS        7125        298  22  43.21   -11.02    -1.70
                                             7.55     6.47
DIR          SGEOS        CAL(D)98      0   0   0.00    -0.24    -0.17
                                             2.06     1.39
DIR          SGEOS        DORIS(07)ANT  2   3  20.42    0.41     0.09
                                             5.54     4.75
DIR          SGEOS        MOB7(07)     89  26  35.76    0.07     0.06
                                             1.79     1.06
DIR          SGEOS        NG2000(07)  112  27  45.55    1.52     0.22
                                             8.20     6.93
DIR          7105         NGEO          0   0   0.00    -2.41    -1.40
                                             2.11     1.72
DIR          7105         CAL(A)01     40  18   2.71    0.50     1.40
                                             0.96     0.36
DIR          7105         CAL(A)01      0   0   0.00    -0.38    -1.08
                                             0.96     0.35
DIR          7105         SGEOS        94   6  25.23    1.27     1.08
                                             1.76     1.18
DIR          7125         NGEO          0   0   0.00    -0.63    -0.59
                                             1.25     1.07
DIR          7125         CAL(A)01     45   3  18.05    -0.60    -0.78
                                             0.93     0.77
DIR          7125         CALB         85   4  21.12    -0.46    -0.79
                                             0.76     0.59
DIR          7125         CALC         95  28   8.30    1.10     1.79
                                             0.79     0.62
DIR          7125         SGEOS       199  55  56.10    6.55     1.03
                                             7.55     6.37
DIR          7125         NGEO          0   0   0.00    0.81     0.76
                                             1.25     1.07
DIR          7125         VLBA         23  52  45.72    -0.20    -0.76
                                             0.63     0.27
DIR          7108(93)     CAL(A)01      0   0   0.00    1.27     1.73
                                             1.00     0.73
DIR          7108(93)     NGEO         35  20  49.88    -0.85    -1.73
                                             0.82     0.49
DIR          7108(93)     7108RM1       0   0   0.00    0.45     0.19
                                             2.85     2.32
DIR          7108(93)     CAL(A)01     57  53  18.93    0.00     0.00
                                             1.00     0.70
DIR          7108(93)     PIER(B)95    96  29  17.90    0.08     0.11
                                             0.98     0.70
DIR          7108(93)     PIER(C)95   164  45  29.20    -0.47    -0.33
                                             1.84     1.46
DIR          4005W        PIER(C)95     0   0   0.00    -0.45    -0.28
                                             2.05     1.60
DIR          4005W        7108RM1      81  13   1.86    -0.79    -1.00
                                             1.29     0.79
DIR          4005W        PIER(B)95   201  21  52.28    1.61     1.47
                                             1.66     1.09
DIR          CAL(A)01     PIER(B)95     0   0   0.00    0.47     0.41
```

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================================================================================
                        GGAO SITE SURVEY 2007
GeoLab V3.72                 GRS 80           UNITS: m,DMS       Page 0042
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                             OBSERVATION RESIDUAL STD RES
TYPE AT           FROM          TO                STD DEV STD DEV    PPM
---- -----------  -----------  -----------  ----------------- -------- --------
                                                      1.38     1.16
DIR               CAL(A)01     VLBA          74 20   25.32    -1.86    -3.21
                                                      0.83     0.58
DIR               CAL(A)01     CALB         199 32   23.42     0.55     0.67
                                                      1.02     0.83
DIR               CAL(A)01     CALC         213 32   44.72     1.70     2.32
                                                      0.93     0.73
DIR               CAL(A)01     SGEOS          0  0    0.00     0.32     0.45
                                                      0.88     0.71
DIR               CAL(A)01     7125           2  9    4.89     0.04     0.06
                                                      0.93     0.75
DIR               CAL(A)01     GORF           7 20   28.40    -0.17    -0.25
                                                      0.84     0.66
DIR               CAL(A)01     PIER(B)95     68 54   17.65    -0.43    -0.37
                                                      1.38     1.17
DIR               CAL(A)01     GORF           0  0    0.00     0.37     0.60
                                                      0.84     0.62
DIR               CAL(A)01     MOB7(07)      17 24   38.50    -0.12    -0.16
                                                      0.96     0.75
DIR               CAL(A)01     NG2000(07)   355 50    0.98    -0.34    -0.48
                                                      0.92     0.71
DIR               CAL(A)01     CALC           0  0    0.00     0.89     1.66
                                                      0.93     0.54
DIR               CAL(A)01     7105         102 17   49.27    -0.95    -1.66
                                                      0.96     0.57
DIR               CALC         CAL(D)98       0  0    0.00    -0.15    -0.26
                                                      0.68     0.57
DIR               CALC         SGEOS          4 22    4.08    -0.35    -0.51
                                                      0.78     0.69
DIR               CALC         GORF           6  7   32.86     0.11     0.18
                                                      0.73     0.64
DIR               CALC         7125           8 25   58.64    -0.13    -0.19
                                                      0.79     0.67
DIR               CALC         NGEO          35  7   58.48     0.46     0.75
                                                      0.72     0.61
DIR               CALC         NGEO           0  0    0.00    -0.08    -0.14
                                                      0.72     0.56
DIR               CALC         NG2000(07)   333 12   52.89     1.00     1.63
                                                      0.78     0.62
DIR               CALC         MOB7(07)     345 33   43.61    -0.77    -1.40
                                                      0.72     0.55
DIR               CALC         NGEO           0  0    0.00     0.42     0.75
                                                      0.72     0.55
DIR               CALC         PIER(B)95     10 38   14.85    -0.06    -0.11
                                                      0.71     0.54
DIR               CALC         CAL(A)01      23 11    6.59    -0.32    -0.40
                                                      0.93     0.80
DIR               CALC         CALB          79 20   25.38    -3.03    -1.07
                                                      3.07     2.84
DIR               CAL(D)98     SGEOS          0  0    0.00    -0.36    -0.25
                                                      2.06     1.42
DIR               CAL(D)98     NG2000(07)   348 50   56.75     0.29     0.25
                                                      1.87     1.17
DIR               CAL(D)98     GORF           0  0    0.00     1.83     0.71
                                                      2.87     2.57
DIR               CAL(D)98     DORIS(07)ANT   7 50   18.77     2.66     0.18
                                                     19.94    14.39
DIR               CAL(D)98     SGEOS         20 17   21.82     0.47     0.26
                                                      2.06     1.84
DIR               CAL(D)98     CALB          27 34    7.06     0.00    -0.01
```

```
================================================================================
                        GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80           UNITS: m,DMS        Page 0043
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                         OBSERVATION RESIDUAL  STD RES
TYPE AT        FROM         TO                    STD DEV STD DEV    PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                                   0.66     0.46
DIR       CAL(D)98     CALC         35  2   57.35   -0.16    -0.32
                                                   0.68     0.49
DIR       VLBA         CAL(A)01      0  0    0.00   -0.03    -0.05
                                                   0.83     0.68
DIR       VLBA         7125         17 43   51.12    0.20     0.43
                                                   0.63     0.46
DIR       VLBA         NGEO         28 36   52.19   -0.24    -0.41
                                                   0.73     0.59
DIR       VLBA         7108RM1       0  0    0.00   -0.25    -0.18
                                                   1.71     1.42
DIR       VLBA         PIER(B)95    57 22   18.51   -0.34    -0.77
                                                   0.83     0.44
DIR       VLBA         PIER(C)95    98 15   32.88    1.71     1.18
                                                   1.72     1.45
DIR       PIER(B)95    CAL(A)01      0  0    0.00    0.33     0.60
                                                   1.38     0.56
DIR       PIER(B)95    NGEO         97 29   21.34   -1.41    -0.60
                                                   2.84     2.36
DIR       PIER(B)95    PIER(C)95     0  0    0.00    0.24     0.28
                                                   1.03     0.87
DIR       PIER(B)95    4005W         9 28   25.08    1.64     1.13
                                                   1.66     1.45
DIR       PIER(B)95    VLBA         21  1   24.61    0.23     0.33
                                                   0.83     0.70
DIR       PIER(B)95    7108RM1      44 10   29.82   -0.01    -0.01
                                                   0.93     0.77
DIR       PIER(B)95    CAL(A)01     96 44   21.80   -0.27    -0.21
                                                   1.38     1.25
DIR       PIER(B)95    CALB        108 20   30.15   -0.49    -0.82
                                                   0.73     0.60
DIR       PIER(B)95    CALC        117 44   16.04   -0.04    -0.08
                                                   0.71     0.58
DIR       PIER(B)95    NGEO          0  0    0.00    4.44     1.87
                                                   2.84     2.38
DIR       PIER(B)95    7108(93)    193 54   18.48   -0.53    -1.87
                                                   0.98     0.28
DIR       PIER(C)95    VLBA          0  0    0.00    0.17     0.12
                                                   1.72     1.42
DIR       PIER(C)95    7108RM1      40 22   29.49    0.46     0.47
                                                   1.20     0.97
DIR       PIER(C)95    4005W       106 11   51.08    0.21     0.11
                                                   2.05     1.80
DIR       PIER(C)95    PIER(B)95   118  5   18.62    0.53     0.62
                                                   1.03     0.84
DIR       PIER(C)95    NGEO        121 35   34.68   -0.66    -1.07
                                                   0.85     0.62
DIR       PIER(C)95    PIER(B)95     0  0    0.00    0.09     0.20
                                                   1.03     0.44
DIR       PIER(C)95    7108(93)    276 24    5.51   -0.28    -0.20
                                                   1.84     1.42
DIR       7108RM1      PIER(B)95     0  0    0.00   -0.65    -1.02
                                                   0.93     0.64
DIR       7108RM1      4005W        25  9    3.05    0.39     0.38
                                                   1.29     1.03
DIR       7108RM1      PIER(C)95    58  6   39.70    0.88     0.90
                                                   1.20     0.97
DIR       7108RM1      VLBA         99 28   36.22   -0.26    -0.19
                                                   1.71     1.40
DIR       7108RM1      PIER(B)95     0  0    0.00    0.16     0.65
```

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================================================================================
                         GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80            UNITS: m,DMS        Page 0044
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                           OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO              STD DEV   STD DEV    PPM
---- ----------- ------------ ------------ ----------------- -------- --------
                                              0.93      0.25
DIR              7108RM1      7108(93)     67 28  9.00   -1.54    -0.65
                                              2.85      2.38
DIR              MOB7(07)     SGEOS         0  0  0.00    0.38     0.36
                                              1.79      1.06
DIR              MOB7(07)     NG2000(07)  354 32  0.64   -0.56    -0.36
                                              2.16      1.55
DIR              CALB         CAL(D)98      0  0  0.00   -0.78    -1.42
                                              0.66      0.55
DIR              CALB         SGEOS         2  0  8.78    0.26     0.39
                                              0.74      0.65
DIR              CALB         GORF          4 36 58.64    0.07     0.12
                                              0.71      0.62
DIR              CALB         7125          5 30 58.70    0.56     0.88
                                              0.76      0.64
DIR              CALB         NGEO         32 44 46.79    0.11     0.17
                                              0.73      0.63
DIR              CALB         NGEO          0  0  0.00    1.22     2.22
                                              0.73      0.55
DIR              CALB         PIER(B)95    11  6 31.42   -0.63    -1.13
                                              0.73      0.55
DIR              CALB         CAL(A)01     19  2 46.92   -0.75    -0.85
                                              1.02      0.88
DIR              CALB         CALC        269 12 28.58   -3.89    -1.38
                                              3.07      2.82
DIR              CALB         NGEO          0  0  0.00   -0.19    -0.34
                                              0.73      0.57
DIR              CALB         NG2000(07)  332 52 38.70   -0.09    -0.15
                                              0.75      0.59
DIR              CALB         MOB7(07)    345 55 51.51    0.26     0.48
                                              0.71      0.54
DIR              PIER(C)95    7108RM1       0  0  0.00   -0.20    -0.30
                                              1.20      0.69
DIR              PIER(C)95    GODE         35 16 18.98   -3.94    -2.38
                                              2.10      1.66
DIR              PIER(C)95    4005W        65 49 16.78    4.35     2.62
                                              2.05      1.66
DIR              VLBA         7108RM1       0  0  0.00   -1.58    -1.24
                                              1.71      1.27
DIR              VLBA         GODE         53 17 30.29    0.26     0.23
                                              1.54      1.12
DIR              VLBA         PIER(C)95    98 15 32.01    1.26     0.97
                                              1.72      1.29
DIR              7108RM1      4005W         0  0  0.00    0.09     0.10
                                              1.29      0.93
DIR              7108RM1      GODE          3  8  2.25    0.94     0.65
                                              1.78      1.45
DIR              7108RM1      PIER(C)95    32 57 37.74   -0.51    -0.61
                                              1.20      0.84
DIR              4005W        PIER(C)95     0  0  0.00    1.44     0.93
                                              2.05      1.55
DIR              4005W        GODE         74 18 47.63   -3.05    -0.97
                                              3.81      3.14
DIR              4005W        7108RM1      81 13  3.19   -0.22    -0.33
                                              1.29      0.68
DIR              PIER(B)95    VLBA          0  0  0.00   -1.15    -2.00
                                              0.83      0.58
DIR              PIER(B)95    GODE          3 25 44.05    0.81     0.74
                                              1.31      1.10
DIR              PIER(B)95    7108RM1      23  9  2.79    1.03     1.51
```

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================================================================================
                         GGAO SITE SURVEY 2007
GeoLab V3.72             GRS 80           UNITS: m,DMS         Page 0045
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                          OBSERVATION RESIDUAL  STD RES
TYPE AT         FROM         TO                   STD DEV STD DEV   PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                                   0.93     0.68
DIR             CAL(A)01     CALC            0   0    0.00     0.26     0.51
                                                   0.93     0.52
DIR             CAL(A)01     NGEO          122  44   34.28    -0.45    -0.51
                                                   1.21     0.88
DIR             CALC         NGEO            0   0    0.00     0.65     1.24
                                                   0.72     0.53
DIR             CALC         VLBA           45  18   50.00    -0.50    -1.24
                                                   0.63     0.40
DIR             VLBA         CALC            0   0    0.00     1.00     2.51
                                                   0.63     0.40
DIR             VLBA         NGEO           47  16   48.39    -1.36    -2.51
                                                   0.73     0.54
DIR             NGEO         VLBA            0   0    0.00    -0.42    -0.80
                                                   0.73     0.53
DIR             NGEO         CAL(A)01       53  20    1.60     2.53     2.41
                                                   1.21     1.05
DIR             NGEO         CALC           87  24   25.19    -0.49    -0.94
                                                   0.72     0.52
DIR             DORIS(07)MK  GORF            0   0    0.00    -2.69    -0.94
                                                   3.64     2.85
DIR             DORIS(07)MK  SGEOS          24  21   26.42     1.39     1.10
                                                   2.38     1.26
DIR             DORIS(07)MK  CAL(D)98      189  51    4.18    -7.14    -0.78
                                                  12.99     9.17
DIR             GORF         SGEOS           0   0    0.00     0.80     0.25
                                                   4.59     3.19
DIR             GORF         DORIS(07)MK   122  44   15.71    -0.50    -0.25
                                                   3.64     2.00
DIR             CAL(D)98     GORF            0   0    0.00    -0.33    -0.65
                                                   2.87     0.51
DIR             CAL(D)98     DORIS(07)MK     7  50    4.91     6.76     0.65
                                                  12.99    10.40
DIR             SGEOS        DORIS(07)MK     0   0    0.00    -0.37    -0.36
                                                   2.38     1.02
DIR             SGEOS        GORF           32  54   13.35     1.36     0.36
                                                   4.59     3.81
```

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================================================================================
                            GGAO SITE SURVEY 2007
GeoLab V3.72                 GRS 80              UNITS: m,DMS        Page 0046
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         0.4 -                     --***:::|
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                                   |*::|::*|
                                  *:::|:::*
   R                               |:::|:::|
   e                              *|:::|:::|*
   l                               |:::|:::|
   a                               |:::|:::|
   t   0.3 -                    *  |:::|:::|   *
   i                            ---|:::|:::|
   v                            |*::|:::|:::|    *
   e                            |:::|:::|:::|---
                                |:::|:::|:::|:::|
   F                           *:::|:::|:::|:::*
   r                            |:::|:::|:::|:::|
   e                          *|:::|:::|:::|:::|*
   q   0.2 -                   |:::|:::|:::|:::|
   u                         *  |:::|:::|:::|:::|  *
   e                           |:::|:::|:::|:::|
   n                           |:::|:::|:::|:::|
   c                       *   |:::|:::|:::|:::|   *
   y                       ---|:::|:::|:::|:::|
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         0.1 -          *|:::|:::|:::|:::|:::|--- *
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               *  |:::|:::|:::|:::|:::|:::|:::|:::| *
             ***  |:::|:::|:::|:::|:::|:::|:::|:::|--***
         +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
          -4      -3      -2      -1       0       1       2       3       4
                          DIRECTIONS (168 residuals)
```
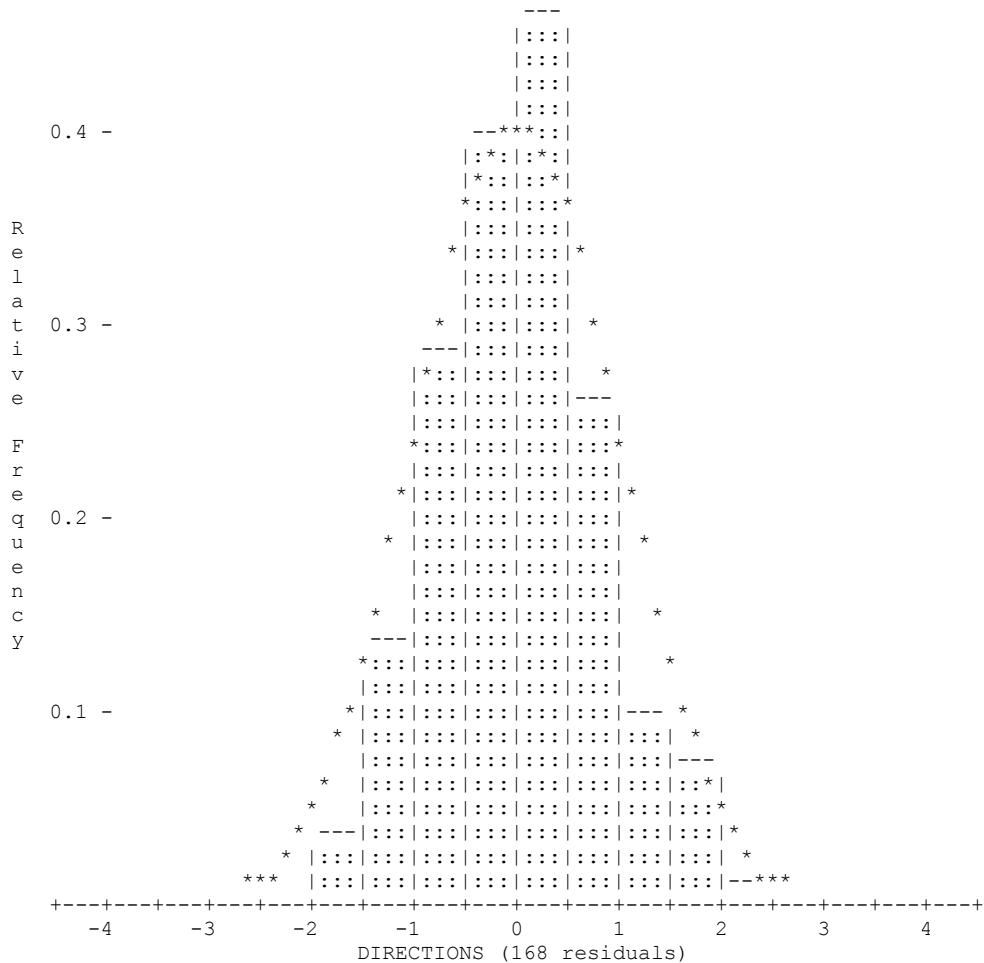
```
================================================================================
                          GGAO SITE SURVEY 2007
GeoLab V3.72               GRS 80          UNITS: m,DMS         Page 0047
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                          OBSERVATION RESIDUAL  STD RES
TYPE AT           FROM         TO            STD DEV   STD DEV    PPM
---- ------------ ------------ ------------ ----------------- -------- --------
GROUP: ORTHOMETRIC HEIGHT DIFFERENCES
OHDF             VLBA         GODE          0.74570   -0.0012  -2.5120
                                           0.0005    0.0005   19.97
OHDF             GODE         VLBA         -0.74530    0.0008   1.6752
                                           0.0005    0.0005   13.32
OHDF             VLBA         GODE          0.74520   -0.0005  -1.4660
                                           0.0005    0.0005   11.66
OHDF             GODE         VLBA         -0.74550    0.0010   2.0936
                                           0.0005    0.0005   16.65
OHDF             PIER(C)95    GODE          1.85460   -0.0009  -1.8145
                                           0.0005    0.0005   19.63
OHDF             GODE         PIER(C)95    -1.85460    0.0009   1.8147
                                           0.0005    0.0005   19.63
OHDF             PIER(C)95    GODE          1.85310    0.0006   1.3449
                                           0.0005    0.0005   14.55
OHDF             GODE         PIER(C)95    -1.85300   -0.0007  -1.5554
                                           0.0005    0.0005   16.82
OHDF             4005W        GODE          0.27010   -0.0007  -1.5039
                                           0.0005    0.0005   31.09
OHDF             GODE         4005W        -0.27000    0.0006   1.2950
                                           0.0005    0.0005   26.77
OHDF             4005W        GODE          0.26860    0.0008   1.6300
                                           0.0005    0.0005   33.69
OHDF             GODE         4005W        -0.26860   -0.0008  -1.6300
                                           0.0005    0.0005   33.69
OHDF             7108RM1      GODE          1.15130    0.0000  -0.0542
                                           0.0005    0.0005    0.49
OHDF             GODE         7108RM1      -1.15120   -0.0001  -0.1613
                                           0.0005    0.0005    1.47
OHDF             NGEO         GODE         -4.45690   -0.0014  -3.1941
                                           0.0005    0.0004   13.82
OHDF             GODE         NGEO          4.45740    0.0009   2.0754
                                           0.0005    0.0004    8.98
OHDF             4005W        GODE          0.27030   -0.0009  -1.9218
                                           0.0005    0.0005   39.72
OHDF             GODE         4005W        -0.27000    0.0006   1.2950
                                           0.0005    0.0005   26.77
OHDF             VLBA         GODE          0.74340    0.0011   2.2996
                                           0.0005    0.0005   18.28
OHDF             GODE         VLBA         -0.74360   -0.0009  -1.8812
                                           0.0005    0.0005   14.96
OHDF             7108RM1      7108(93)      0.38800    0.0003   0.6445
                                           0.0005    0.0004    9.06
OHDF             7108(93)     7108RM1      -0.38810   -0.0002  -0.4165
                                           0.0005    0.0004    5.86
OHDF             VLBA         7108(93)     -0.01830   -0.0002  -0.4345
                                           0.0005    0.0004    6.28
OHDF             7108(93)     VLBA          0.01840    0.0001   0.2093
                                           0.0005    0.0004    3.03
OHDF             PIER(C)95    7108(93)      1.09060    0.0001   0.3318
                                           0.0005    0.0004    2.96
OHDF             7108(93)     PIER(C)95    -1.09110    0.0004   0.8024
                                           0.0005    0.0004    7.15
OHDF             GORF         NGEO          0.61720    0.0001   0.2977
                                           0.0005    0.0005    1.61
OHDF             NGEO         GORF         -0.61750    0.0002   0.3674
                                           0.0005    0.0005    1.99
OHDF             GORF         SGEOS         0.51730    0.0002   0.3379
                                           0.0005    0.0005    8.51
OHDF             SGEOS        GORF         -0.51750    0.0000   0.0920
```

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=====================================================================================
                           GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80          UNITS: m,DMS          Page 0048
=====================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                        OBSERVATION RESIDUAL  STD RES
TYPE AT       FROM         TO            STD DEV   STD DEV     PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                           0.0005    0.0005    2.32
OHDF         GORF         7125            0.15750    0.0001    0.2585
                                           0.0005    0.0004    5.23
OHDF         7125         GORF           -0.15750   -0.0001   -0.2585
                                           0.0005    0.0004    5.23
OHDF         SGEOS        NGEO            0.10000   -0.0001   -0.2664
                                           0.0005    0.0005    1.43
OHDF         NGEO         SGEOS          -0.10000    0.0001    0.2663
                                           0.0005    0.0005    1.43
OHDF         NGEO         7105            0.22830   -0.0015   -1.5908
                                           0.0010    0.0009   34.53
OHDF         7105         NGEO           -0.22890    0.0021    2.2394
                                           0.0010    0.0009   48.61
OHDF         NGEO         7125           -0.45990    0.0002    0.4087
                                           0.0005    0.0004    2.36
OHDF         7125         NGEO            0.45990   -0.0002   -0.4087
                                           0.0005    0.0004    2.36
OHDF         NGEO         CAL(A)01       -2.53760    0.0002    0.3936
                                           0.0005    0.0005    2.31
OHDF         CAL(A)01     NGEO            2.53810   -0.0007   -1.4714
                                           0.0005    0.0005    8.64
OHDF         SGEOS        NG2000(07)      3.33640    0.0000    0.0531
                                           0.0005    0.0004    2.11
OHDF         NG2000(07)   SGEOS          -3.33600   -0.0004   -0.9930
                                           0.0005    0.0004   39.51
OHDF         GORF         NG2000(07)      3.85450   -0.0006   -1.4585
                                           0.0005    0.0004   31.90
OHDF         NG2000(07)   GORF           -3.85340   -0.0005   -1.1283
                                           0.0005    0.0004   24.68
OHDF         SGEOS        CALC           -1.55340    0.0009    2.0335
                                           0.0005    0.0004    6.11
OHDF         CALC         SGEOS           1.55220    0.0003    0.6957
                                           0.0005    0.0004    2.09
OHDF         CALC         CALB           -0.34020   -0.0003   -0.6765
                                           0.0005    0.0005   10.70
OHDF         CALB         CALC            0.34060   -0.0001   -0.1983
                                           0.0005    0.0005    3.14
OHDF         CALB         CALC            0.34080   -0.0003   -0.6357
                                           0.0005    0.0005   10.06
OHDF         CALC         CALB           -0.34060    0.0001    0.1983
                                           0.0005    0.0005    3.14
OHDF         NGEO         MOB7(07)        3.36520   -0.0004   -0.9264
                                           0.0005    0.0004    9.46
OHDF         MOB7(07)     NGEO           -3.36490    0.0001    0.2398
                                           0.0005    0.0004    2.45
OHDF         NGEO         MOB7(07)        3.36440    0.0004    0.9050
                                           0.0005    0.0004    9.24
OHDF         MOB7(07)     NGEO           -3.36480    0.0000    0.0109
                                           0.0005    0.0004    0.11
OHDF         SGEOS        7125           -0.35960   -0.0002   -0.5467
                                           0.0005    0.0004   22.67
OHDF         7125         SGEOS           0.35950    0.0003    0.7715
                                           0.0005    0.0004   32.00
OHDF         CAL(A)01     CALB            0.54360    0.0009    2.0225
                                           0.0005    0.0005    9.33
OHDF         CAL(A)01     CALB            0.54440    0.0001    0.2739
                                           0.0005    0.0005    1.26
OHDF         CALB         CAL(A)01       -0.54550    0.0010    2.1305
                                           0.0005    0.0005    9.83
OHDF         CALC         CAL(A)01       -0.88560    0.0006    1.2551
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                             GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80            UNITS: m,DMS          Page 0049
==================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                         OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO            STD DEV  STD DEV     PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                              0.0005   0.0005    5.03
OHDF         CAL(A)01     CALC             0.88480   0.0002   0.5209
                                              0.0005   0.0005    2.09
OHDF         SGEOS        CAL(A)01        -2.43760   0.0001   0.1316
                                              0.0005   0.0005    0.49
OHDF         CAL(A)01     SGEOS            2.43750   0.0000   0.0895
                                              0.0005   0.0005    0.33
OHDF         4005W        PIER(C)95       -1.58440   0.0000   0.0902
                                              0.0005   0.0005    0.95
OHDF         PIER(C)95    4005W            1.58440   0.0000  -0.0901
                                              0.0005   0.0005    0.95
OHDF         PIER(C)95    VLBA             1.10910   0.0001   0.2997
                                              0.0005   0.0005    2.61
OHDF         VLBA         PIER(C)95       -1.10970   0.0005   0.9918
                                              0.0005   0.0005    8.63
OHDF         VLBA         7108RM1         -0.40640  -0.0004  -0.8201
                                              0.0005   0.0005    7.17
OHDF         7108RM1      VLBA             0.40660   0.0002   0.3834
                                              0.0005   0.0005    3.35
OHDF         7108RM1      4005W            0.88160   0.0003   0.6444
                                              0.0005   0.0005    3.99
OHDF         4005W        7108RM1         -0.88170  -0.0002  -0.4257
                                              0.0005   0.0005    2.64
OHDF         4005W        NGEO             4.72830  -0.0006  -1.3346
                                              0.0005   0.0004    6.80
OHDF         NGEO         4005W           -4.72800   0.0003   0.6598
                                              0.0005   0.0004    3.36
OHDF         NGEO         CALB            -1.99300   0.0001   0.2402
                                              0.0005   0.0004    0.65
OHDF         CALB         NGEO             1.99260   0.0003   0.6513
                                              0.0005   0.0004    1.76
OHDF         GORF         CAL(D)98         1.53430  -0.0001  -0.2779
                                              0.0005   0.0004    3.85
OHDF         CAL(D)98     GORF            -1.53420   0.0000   0.0417
                                              0.0005   0.0004    0.58
OHDF         SGEOS        CAL(D)98         1.01660   0.0001   0.2956
                                              0.0005   0.0004    2.86
OHDF         CAL(D)98     SGEOS           -1.01670   0.0000  -0.0594
                                              0.0005   0.0004    0.57
OHDF         NGEO         PIER(B)95       -1.21520   0.0001   0.3467
                                              0.0005   0.0004    4.58
OHDF         PIER(B)95    NGEO             1.21530  -0.0002  -0.5831
                                              0.0005   0.0004    7.70
OHDF         PIER(B)95    CAL(A)01        -1.32260   0.0002   0.5579
                                              0.0005   0.0004    3.47
OHDF         CAL(A)01     PIER(B)95        1.32250  -0.0001  -0.3215
                                              0.0005   0.0004    2.00
OHDF         CAL(A)01     7108RM1         -3.07300   0.0008   1.8984
                                              0.0005   0.0004    9.16
OHDF         7108RM1      CAL(A)01         3.07290  -0.0007  -1.6651
                                              0.0005   0.0004    8.03
OHDF         4005W        GODE             0.26810   0.0013   2.6747
                                              0.0005   0.0005   55.29
OHDF         GODE         4005W           -0.26810  -0.0013  -2.6747
                                              0.0005   0.0005   55.29
OHDF         PIER(C)95    GODE             1.85330   0.0004   0.9236
                                              0.0005   0.0005    9.99
OHDF         GODE         PIER(C)95       -1.85320  -0.0005  -1.1341
                                              0.0005   0.0005   12.27
OHDF         VLBA         GODE             0.74350   0.0010   2.0904
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                         GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80          UNITS: m,DMS        Page 0050
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                        OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO            STD DEV  STD DEV     PPM
---- ------------ ------------ ------------ ----------------- -------- --------
                                             0.0005   0.0005    16.62
OHDF             GODE         VLBA         -0.74350  -0.0010   -2.0904
                                             0.0005   0.0005    16.62
OHDF             7105         NGEO         -0.22440  -0.0024   -2.6246
                                             0.0010   0.0009    56.97
OHDF             NGEO         7105          0.22430   0.0025    2.7326
                                             0.0010   0.0009    59.32
OHDF             7105         NGEO         -0.22780   0.0010    1.0504
                                             0.0010   0.0009    22.80
OHDF             NGEO         7105          0.22680   0.0000    0.0305
                                             0.0010   0.0009     0.66
OHDF             GORF         DORIS(07)MK   1.56560  -0.0003   -0.7619
                                             0.0005   0.0004    13.23
OHDF             DORIS(07)MK  GORF         -1.56470  -0.0006   -1.3642
                                             0.0005   0.0004    23.69
OHDF             SGEOS        DORIS(07)MK   1.04800  -0.0002   -0.4247
                                             0.0005   0.0004     4.77
OHDF             DORIS(07)MK  SGEOS        -1.04790   0.0001    0.1884
                                             0.0005   0.0004     2.12
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================================================================================
                            GGAO SITE SURVEY 2007
GeoLab V3.72                GRS 80              UNITS: m,DMS        Page 0051
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    0.4 -                            ***::|
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   R                                  |:::|
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   t  0.3 -                    *      |:::|  *
   i                                  |:::|
   v                       *    ---|:::|   *
   e                           |:::|:::|
                               |:::|:::|
   F                     *     |:::|:::|---*
   r                           |:::|:::|:::|
   e                      *    |:::|:::|:::|*
   q  0.2 -                    |:::|:::|:::|
   u                    *      |:::|:::|:::| *
   e                           |:::|:::|:::|
   n                           |:::|:::|:::|
   c              --- *    ---|:::|:::|:::| *      ---
   y             |:::|   |:::|:::|:::|:::|       |:::|
                 |:::*---|:::|:::|:::|:::|   *   |:::|
                 |:::|:::|:::|:::|:::|:::|       |:::|
    0.1 -        |::*|:::|:::|:::|:::|:::|    *  |:::|
                 |:*:|:::|:::|:::|:::|:::|--- * |:::|
                 |:::|:::|:::|:::|:::|:::|:::|   |:::|
                 |*::|:::|:::|:::|:::|:::|:::|--*|:::|
              ---   *::|:::|:::|:::|:::|:::|:::|:::*:::|
             |:::|  *|:::|:::|:::|:::|:::|:::|:::|*::|
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             |::***  |:::|:::|:::|:::|:::|:::|:::|::***::|
      +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
        -4      -3      -2      -1       0       1       2       3       4
             ORTHOMETRIC HEIGHT DIFFERENCES (99 residuals)
```
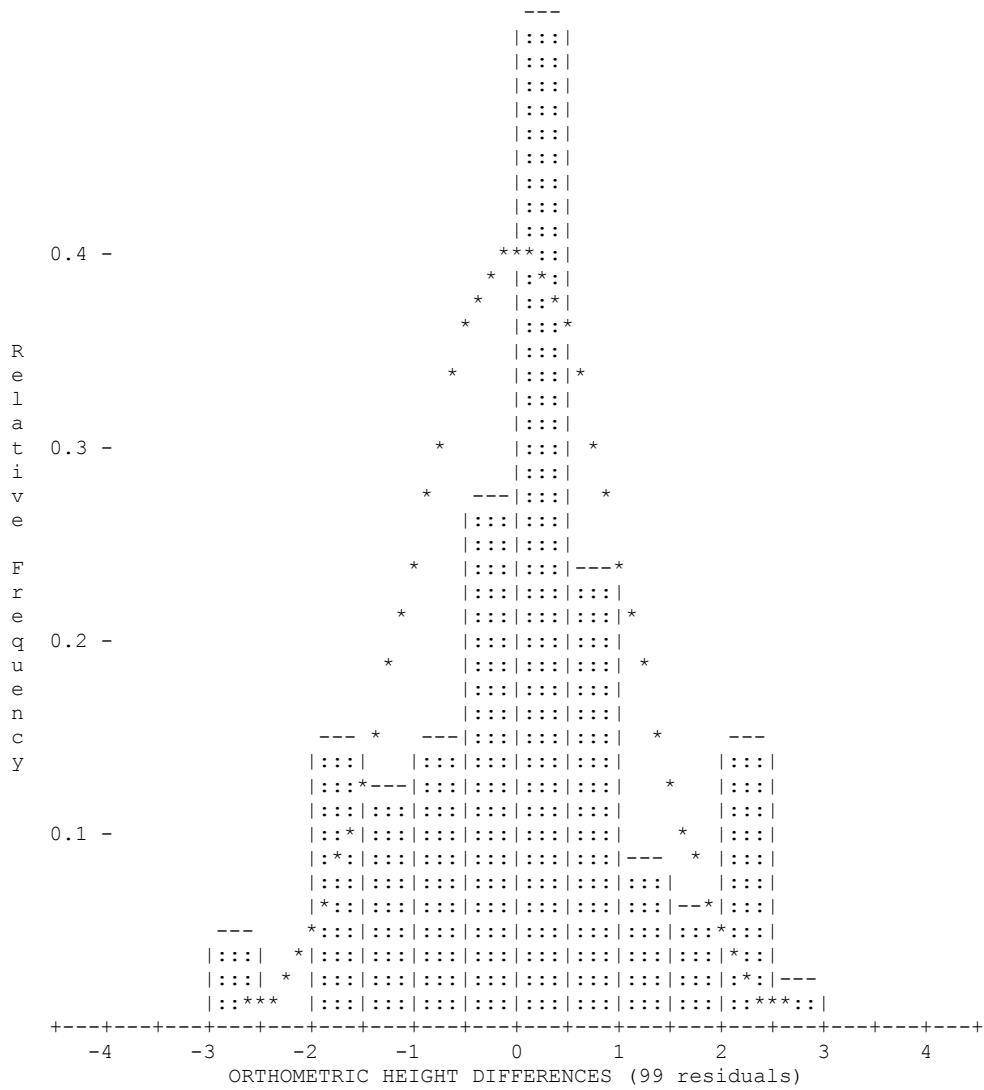
```
================================================================================
                            GGAO SITE SURVEY 2007
GeoLab V3.72                GRS 80           UNITS: m,DMS        Page 0052
================================================================================
Residuals (critical value = 4.072):
NOTE: Observation values shown are reduced to mark-to-mark.
                                            OBSERVATION RESIDUAL  STD RES
TYPE AT          FROM         TO               STD DEV  STD DEV     PPM
---- ------------ ------------ ------------ ------------------ -------- --------
DXCT             MV3(07PRE)   MV3(07)           -0.01300   0.0000   0.0000
                                                 0.0010   0.0000     0.00*
DYCT             MV3(07PRE)   MV3(07)           -0.00620   0.0000   0.0000
                                                 0.0010   0.0000        *
DZCT             MV3(07PRE)   MV3(07)            0.02880   0.0000   0.0000
                                                 0.0010   0.0000     0.00*
DXCT             7105         MOB7(07)           0.52390  -0.0002  -0.2003
                                                 0.0010   0.0009    60.53
DYCT             7105         MOB7(07)          -2.38540  -0.0003  -0.3769
                                                 0.0010   0.0009   108.40
DZCT             7105         MOB7(07)           1.96990   0.0004   0.4188
                                                 0.0010   0.0009   120.45
DXCT             DORIS(07)MK  DORIS(07)ANT       0.09170   0.0002   0.2768
                                                 0.0010   0.0006   331.97
DYCT             DORIS(07)MK  DORIS(07)ANT      -0.39190  -0.0001  -0.1590
                                                 0.0010   0.0004   116.61
DZCT             DORIS(07)MK  DORIS(07)ANT       0.32610  -0.0001  -0.2035
                                                 0.0010   0.0006   233.46
```

```
================================================================================
                        GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80              UNITS: m,DMS        Page 0053
================================================================================



                                     ---
                                 ---|:::|
                                 |:::|:::|
                                 |:::|:::|
                                 |:::|:::|
                                 |:::|:::|
        0.4 -                    |::***::|
                                 |:*:|:*:|
                                 |*::|::*|
                                *:::|:::*
     R                           |:::|:::|
     e                         *|:::|:::|*
     l                           |:::|:::|
     a                           |:::|:::|
     t    0.3 -              -*-|:::|:::| *
     i                         |:::|:::|:::|
     v                         |*::|:::|:::|   *
     e                         |:::|:::|:::|
                               |:::|:::|:::|
     F                        *:::|:::|:::|---*
     r                         |:::|:::|:::|:::|
     e                       *|:::|:::|:::|:::|*
     q    0.2 -               |:::|:::|:::|:::|
     u                      *  |:::|:::|:::|:::| *
     e                         |:::|:::|:::|:::|
     n                         |:::|:::|:::|:::|
     c                      *--|:::|:::|:::|:::|  *
     y                         |:::|:::|:::|:::|:::|
                             *:::|:::|:::|:::|:::|   *
                               |:::|:::|:::|:::|:::|
        0.1 -               *|:::|:::|:::|:::|:::|    *
                          *  |:::|:::|:::|:::|:::|      *
                        ---|:::|:::|:::|:::|:::|---
                         |*::|:::|:::|:::|:::|:::|  *
                        *:::|:::|:::|:::|:::|:::|:::|   *
                      *|:::|:::|:::|:::|:::|:::|:::|--- *
                   *  |:::|:::|:::|:::|:::|:::|:::|:::|-*-
                 ***  |:::|:::|:::|:::|:::|:::|:::|:::|::***
        +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
         -4      -3      -2      -1      0       1       2       3       4
                        covariance (607 residuals)
```
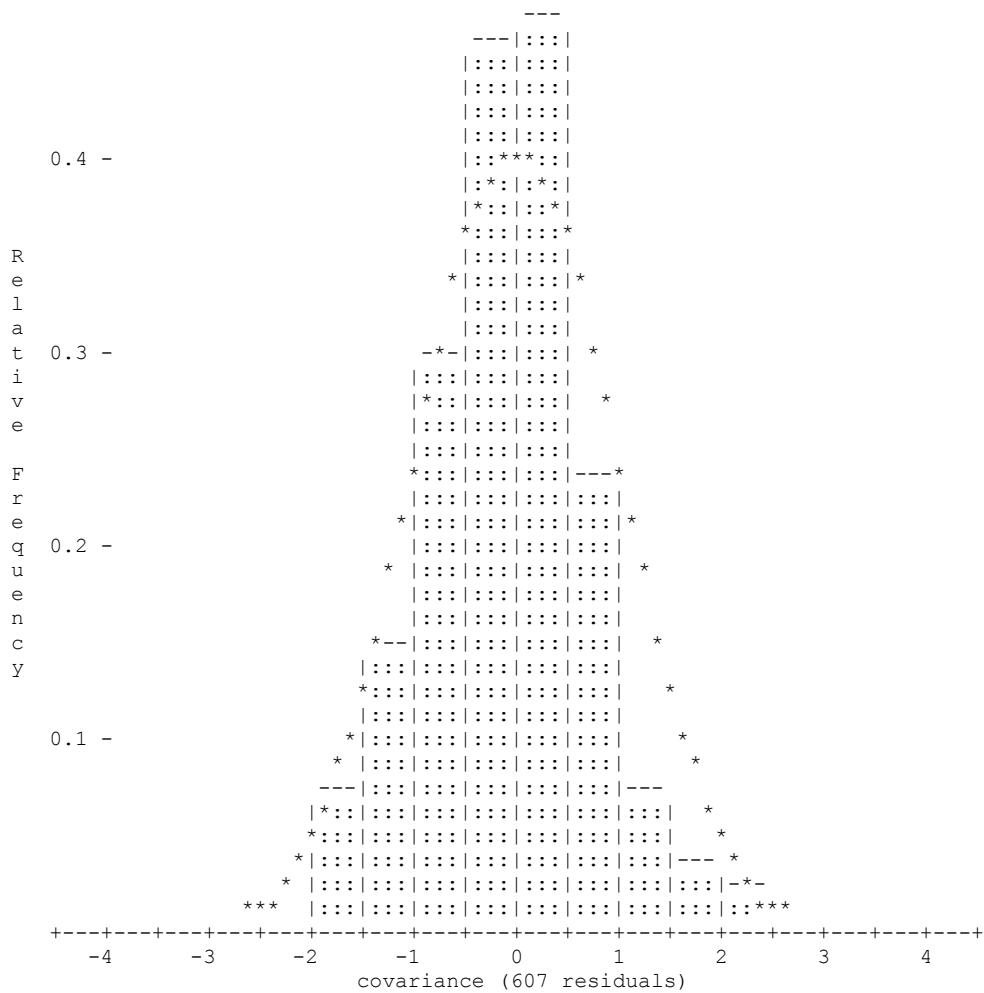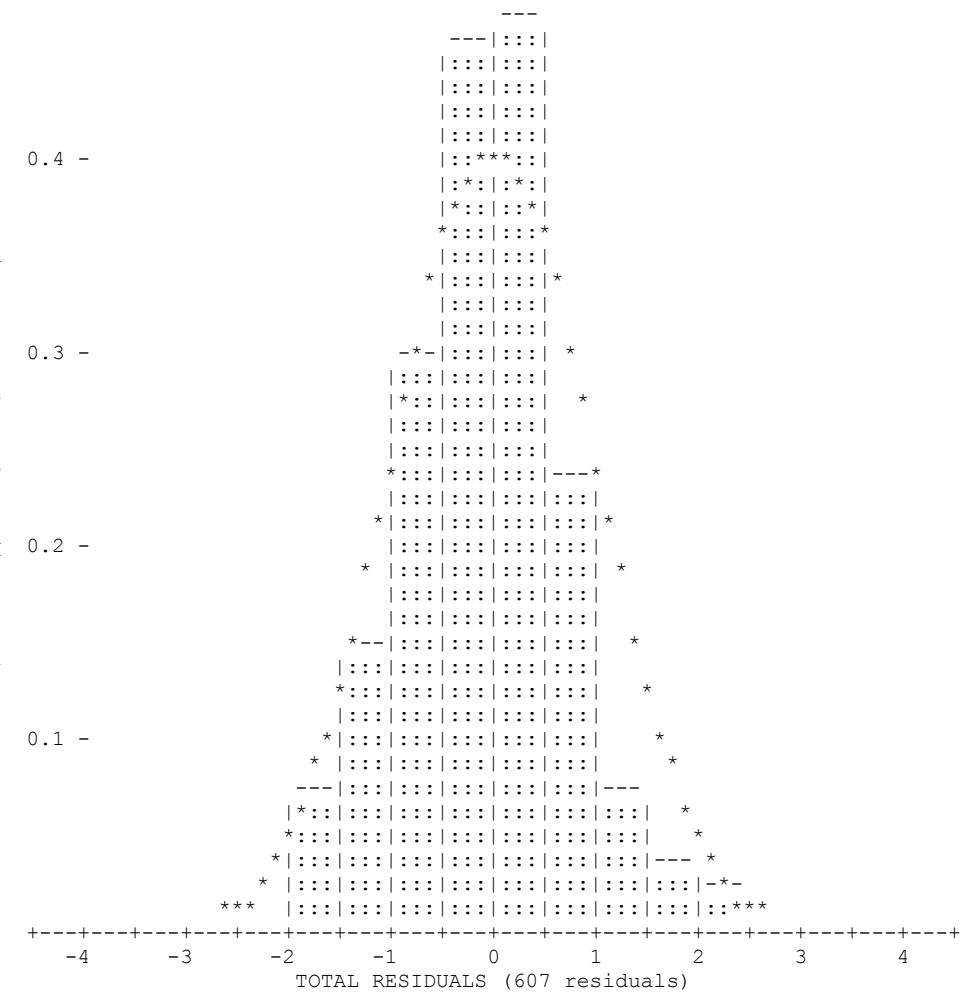
```
================================================================================
                            GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80              UNITS: m,DMS        Page 0054
================================================================================


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                                |:::|:::|
                                |:::|:::|
        0.4 -                   |::***::|
                                |:*:|:*:|
                                |*::|::*|
                                *:::|:::*
      R                         |:::|:::|
      e                       *|:::|:::|*
      l                         |:::|:::|
      a                         |:::|:::|
      t   0.3 -              -*-|:::|:::| *
      i                       |:::|:::|:::|
      v                       |*::|:::|:::|   *
      e                       |:::|:::|:::|
                              |:::|:::|:::|
      F                      *:::|:::|:::|---*
      r                       |:::|:::|:::|:::|
      e                     *|:::|:::|:::|:::|*
      q   0.2 -              |:::|:::|:::|:::|
      u                   *  |:::|:::|:::|:::| *
      e                      |:::|:::|:::|:::|
      n                      |:::|:::|:::|:::|
      c                   *--|:::|:::|:::|:::|  *
      y                     |:::|:::|:::|:::|:::|
                          *:::|:::|:::|:::|:::|    *
                            |:::|:::|:::|:::|:::|
        0.1 -             *|:::|:::|:::|:::|:::|     *
                        *  |:::|:::|:::|:::|:::|       *
                     ---|:::|:::|:::|:::|:::|---
                      |*::|:::|:::|:::|:::|:::|:::|  *
                     *:::|:::|:::|:::|:::|:::|:::|    *
                   *|:::|:::|:::|:::|:::|:::|:::|--- *
                 *  |:::|:::|:::|:::|:::|:::|:::|:::|-*-
              ***  |:::|:::|:::|:::|:::|:::|:::|:::|::***
          +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
           -4      -3      -2      -1       0       1       2       3       4
                      TOTAL RESIDUALS (607 residuals)
```

```
================================================================================
                         GGAO SITE SURVEY 2007
GeoLab V3.72                  GRS 80              UNITS: m,DMS        Page 0055
================================================================================


                                     ---
                                  ---|:::|
                                  |:::|:::|
                                  |:::|:::|
                                  |:::|:::|
                                  |:::|:::|
        0.4 -                     |::***::|
                                  |:*:|:*:|
                                  |*::|::*|
                                  *:::|:::*
  R                               |:::|:::|
  e                              *|:::|:::|*
  l                               |:::|:::|
  a                               |:::|:::|
  t     0.3 -                   -*-|:::|:::|  *
  i                              |:::|:::|:::|
  v                              |*::|:::|:::|   *
  e                              |:::|:::|:::|
                                 |:::|:::|:::|
  F                             *:::|:::|:::|---*
  r                             |:::|:::|:::|:::|
  e                            *|:::|:::|:::|:::|*
  q     0.2 -                   |:::|:::|:::|:::|
  u                          *  |:::|:::|:::|:::| *
  e                             |:::|:::|:::|:::|
  n                             |:::|:::|:::|:::|
  c                          *--|:::|:::|:::|:::|   *
  y                             |:::|:::|:::|:::|
                            *:::|:::|:::|:::|:::|    *
                            |:::|:::|:::|:::|:::|
        0.1 -              *|:::|:::|:::|:::|:::|      *
                       *  |:::|:::|:::|:::|:::|        *
                      ---|:::|:::|:::|:::|:::|---
                     |*::|:::|:::|:::|:::|:::|:::|  *
                    *:::|:::|:::|:::|:::|:::|:::|    *
                 * |:::|:::|:::|:::|:::|:::|:::|--- *
              *  |:::|:::|:::|:::|:::|:::|:::|:::|-*-
             ***  |:::|:::|:::|:::|:::|:::|:::|:::|::***
        +---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+---+
          -4      -3      -2      -1       0       1       2       3       4
                        TOTAL RESIDUALS (607 residuals)
```
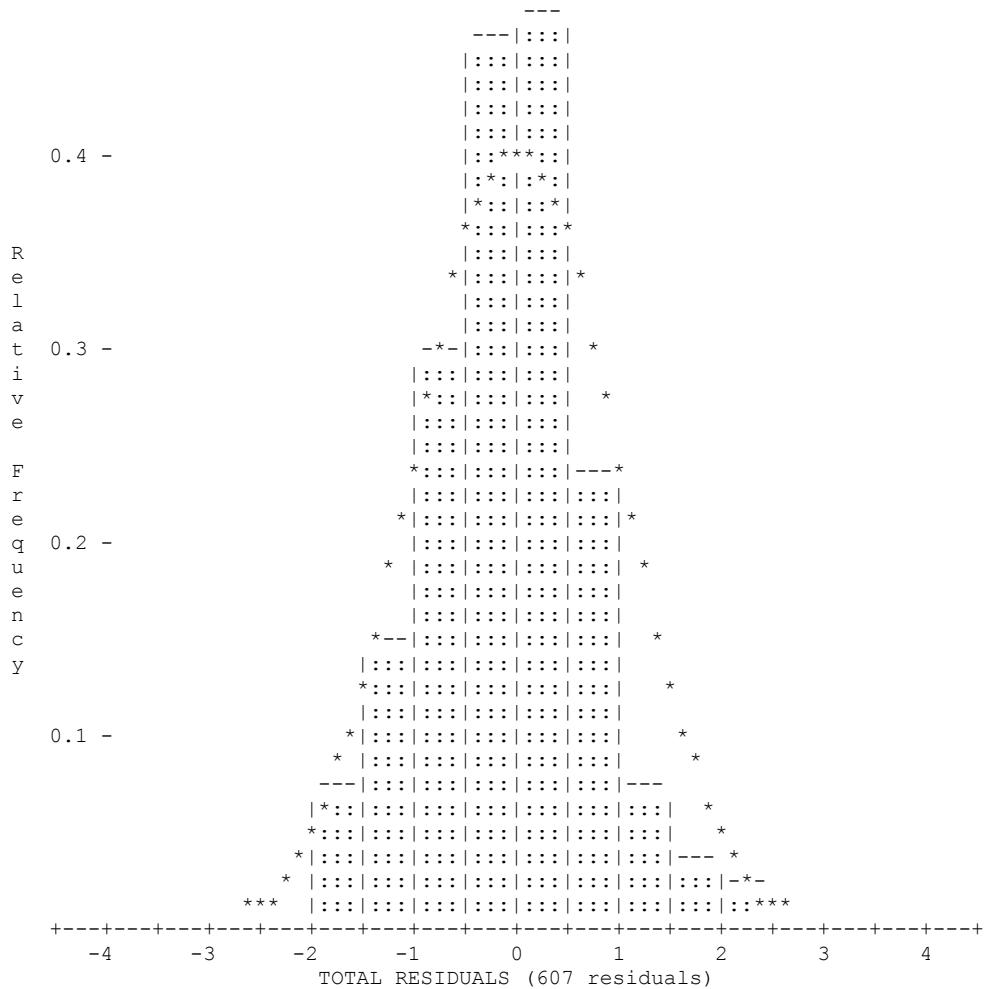
```
================================================================================
                            GGAO SITE SURVEY 2007
GeoLab V3.72                    GRS 80          UNITS: m,DMS         Page 0056
================================================================================


    ----------------------------------------------------------------------------
    |                                                                          |
    |             S T A T I S T I C S    S U M M A R Y                         |
    |                                                                          |
    ----------------------------------------------------------------------------
    |                                  |                                       |
    |    Residual Critical Value Type  |            Tau Max                    |
    |    Residual Critical Value       |            4.0721                     |
    |    Number of Flagged Residuals   |               0                      |
    |    Convergence Criterion         |            0.0010                     |
    |    Final Iteration Counter Value |               3                      |
    |    Confidence Level Used         |           95.0000                     |
    |    Estimated Variance Factor     |            1.0788                     |
    |    Number of Degrees of Freedom  |             494                      |
    |                                  |                                       |
    ----------------------------------------------------------------------------
    |                                                                          |
    |         Chi-Square Test on the Variance Factor:                          |
    |                                                                          |
    |          9.5593e-01  <  1.0000  <  1.2270e+00  ?                         |
    |                                                                          |
    |                      THE TEST PASSES                                     |
    |                                                                          |
    ----------------------------------------------------------------------------


    ----------------------------------------------------------------------------
    |                                                                          |
    | NOTE:  All confidence regions were computed using the following factors: |
    |        ----------------------------------------------------------        |
    |        Variance factor used      =            1.0788                      |
    |        1-D expansion factor      =            1.9600                      |
    |        2-D expansion factor      =            2.4477                      |
    |                                                                          |
    |        Note that, for relative confidence regions, precisions are        |
    |        computed from the ratio of the major semi-axis and the spatial    |
    |        distance between the two stations.                                |
    |                                                                          |
    ----------------------------------------------------------------------------
```

```
================================================================================
                          GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80              UNITS: m,DMS         Page 0057
================================================================================
2-D and 1-D Station Confidence Regions (95.000 and 95.000 percent):
STATION           MAJOR SEMI-AXIS  AZ    MINOR SEMI-AXIS          VERTICAL
------------ --------------------- --- ------------------- ---------------------
4005W                  0.0007  49           0.0006                0.0003
7105                   0.0011  11           0.0008                0.0009
7108(93)               0.0010 120           0.0007                0.0005
7108RM1                0.0007 145           0.0006                0.0004
7125                   0.0007 165           0.0006                0.0007
CAL(A)01               0.0006 149           0.0005                0.0005
CAL(D)98               0.0008 170           0.0007                0.0008
CALB                   0.0005 179           0.0004                0.0006
CALC                   0.0006  13           0.0005                0.0006
DORIS(07)ANT           0.0026  56           0.0013                0.0022
DORIS(07)MK            0.0010   9           0.0009                0.0008
GORF                   0.0006 172           0.0005                0.0006
MOB7(07)               0.0008   7           0.0006                0.0007
MV3(07)                0.0025   0           0.0025                0.0020
NG2000(07)             0.0007 167           0.0006                0.0008
NGEO                   0.0005   2           0.0004                0.0005
PIER(B)95              0.0006  19           0.0005                0.0007
PIER(C)95              0.0008  71           0.0006                0.0003
SGEOS                  0.0006 163           0.0006                0.0006
VLBA                   0.0007  99           0.0006                0.0003
```

```
================================================================================
                          GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80            UNITS: m,DMS        Page 0058
================================================================================
2-D and 1-D Relative Station Confidence Regions (95.000 and 95.000 percent):
FROM         TO          MAJ-SEMI  AZ MIN-SEMI VERTICAL     DISTANCE     PPM
------------ ----------- -------- --- -------- --------- ------------ --------
4005W        7108(93)     0.0010 131   0.0007   0.0005      54.9349    18.34
4005W        7108RM1      0.0008 179   0.0006   0.0004      73.8285    10.59
4005W        GODE         0.0007  49   0.0006   0.0003      23.1554    31.79
4005W        NGEO         0.0007  34   0.0006   0.0005      87.1787     7.88
4005W        PIER(B)95    0.0007  20   0.0006   0.0007      55.2249    12.08
4005W        PIER(C)95    0.0006 179   0.0006   0.0004      44.0545    14.29
7105         CAL(A)01     0.0010   6   0.0008   0.0009     106.4839     9.77
7105         DORIS(07)ANT 0.0027  54   0.0014   0.0023      61.9433    43.25
7105         DORIS(07)MK  0.0013  17   0.0010   0.0010      61.9349    20.75
7105         MOB7(07)     0.0011  15   0.0008   0.0009       3.1382   352.27
7105         MV3(07)      0.0028  11   0.0027   0.0022     177.3910    15.63
7105         MV3(07PRE)   0.0011  11   0.0008   0.0009     177.3823     6.24
7105         NGEO         0.0010  15   0.0007   0.0008      42.6208    23.87
7105         SGEOS        0.0011  14   0.0007   0.0009      50.8786    20.64
7108(93)     7108RM1      0.0010 124   0.0006   0.0005      31.1917    31.33
7108(93)     CAL(A)01     0.0010 122   0.0006   0.0007     101.6443    10.07
7108(93)     NGEO         0.0010 123   0.0006   0.0006     135.6311     7.16
7108(93)     PIER(B)95    0.0010 126   0.0006   0.0008     104.3199     9.32
7108(93)     PIER(C)95    0.0009 118   0.0006   0.0005      49.4710    18.88
7108(93)     VLBA         0.0010 121   0.0006   0.0005      30.7267    32.53
7108RM1      CAL(A)01     0.0008 141   0.0006   0.0005      89.0919     8.88
7108RM1      GODE         0.0007 145   0.0006   0.0004      50.9265    14.10
7108RM1      PIER(B)95    0.0008 162   0.0006   0.0007     112.2205     6.99
7108RM1      PIER(C)95    0.0007  33   0.0006   0.0005      79.9757     9.32
7108RM1      VLBA         0.0007 148   0.0006   0.0004      52.3498    12.49
7125         CAL(A)01     0.0008 147   0.0006   0.0006     111.4538     6.77
7125         CALB         0.0007 167   0.0005   0.0006     153.8824     4.86
7125         CALC         0.0007 174   0.0006   0.0006     143.3699     5.21
7125         GORF         0.0007 179   0.0006   0.0005      21.7883    29.89
7125         NGEO         0.0006 166   0.0005   0.0005      76.1014     8.09
7125         SGEOS        0.0006  13   0.0005   0.0005      10.7252    59.89
7125         VLBA         0.0009 119   0.0007   0.0007     229.8559     3.90
CAL(A)01     CALB         0.0006 153   0.0005   0.0004      99.1538     5.79
CAL(A)01     CALC         0.0006 136   0.0005   0.0004     112.3006     4.97
CAL(A)01     GORF         0.0007 146   0.0005   0.0005     130.3077     5.08
CAL(A)01     MOB7(07)     0.0008 163   0.0006   0.0006     106.6450     7.09
CAL(A)01     NG2000(07)   0.0008 144   0.0006   0.0007     113.5550     6.75
CAL(A)01     NGEO         0.0005 145   0.0004   0.0004      78.9560     6.44
CAL(A)01     PIER(B)95    0.0006 143   0.0005   0.0005      68.0948     8.29
CAL(A)01     SGEOS        0.0007 133   0.0005   0.0004     121.2497     5.75
CAL(A)01     VLBA         0.0007 115   0.0005   0.0006     132.2027     5.25
CAL(D)98     CALB         0.0009 171   0.0006   0.0007     202.0180     4.25
CAL(D)98     CALC         0.0009 178   0.0006   0.0007     188.3259     4.60
CAL(D)98     DORIS(07)ANT 0.0026  57   0.0011   0.0022       6.2922   405.98
CAL(D)98     DORIS(07)MK  0.0009  55   0.0006   0.0007       6.2683   136.05
CAL(D)98     GORF         0.0006  51   0.0005   0.0005      30.5615    20.15
CAL(D)98     NG2000(07)   0.0008 167   0.0007   0.0007      48.6226    16.48
CAL(D)98     SGEOS        0.0006  50   0.0006   0.0005      43.7788    14.83
CALB         CALC         0.0005   8   0.0004   0.0004      28.8959    18.05
CALB         GODE         0.0005 179   0.0004   0.0006     172.6182     3.09
CALB         GORF         0.0006 173   0.0004   0.0006     175.5144     3.61
CALB         MOB7(07)     0.0008   6   0.0005   0.0007     174.8038     4.52
CALB         NG2000(07)   0.0007 170   0.0005   0.0007     156.7622     4.76
CALB         NGEO         0.0005   5   0.0003   0.0004     165.7137     3.09
CALB         PIER(B)95    0.0007  17   0.0005   0.0006     164.8950     4.01
CALB         SGEOS        0.0007 168   0.0005   0.0005     158.6910     4.10
CALB         VLBA         0.0007  91   0.0006   0.0006     205.9633     3.36
CALC         GODE         0.0006  13   0.0005   0.0006     191.1226     3.09
CALC         GORF         0.0006   2   0.0004   0.0006     164.2615     3.93
CALC         MOB7(07)     0.0008  14   0.0005   0.0007     170.4968     4.75
CALC         NG2000(07)   0.0007 179   0.0005   0.0007     146.2538     5.12
CALC         NGEO         0.0006  20   0.0004   0.0005     168.6038     3.28
```

```
================================================================================
                           GGAO SITE SURVEY 2007
GeoLab V3.72              GRS 80            UNITS: m,DMS        Page 0059
================================================================================
2-D and 1-D Relative Station Confidence Regions (95.000 and 95.000 percent):
FROM          TO          MAJ-SEMI  AZ MIN-SEMI  VERTICAL    DISTANCE       PPM
------------  ----------- -------- --- -------- --------- ------------ --------
CALC          PIER(B)95    0.0007  28   0.0005   0.0007    173.1761     4.00
CALC          SGEOS        0.0007 179   0.0005   0.0005    146.4190     4.47
CALC          VLBA         0.0008  80   0.0006   0.0007    229.2770     3.29
DORIS(07)ANT  DORIS(07)MK  0.0024  57   0.0011   0.0020      0.5180  4692.33
DORIS(07)ANT  GORF         0.0025  57   0.0011   0.0021     24.4174   104.28
DORIS(07)ANT  MOB7(07)     0.0026  57   0.0013   0.0022     61.9438    41.77
DORIS(07)ANT  MV3(07)      0.0036  56   0.0028   0.0030    237.1347    15.25
DORIS(07)ANT  MV3(07PRE)   0.0026  56   0.0013   0.0022    237.1242    10.85
DORIS(07)ANT  SGEOS        0.0025  57   0.0011   0.0021     37.7029    67.61
DORIS(07)MK   GORF         0.0008  55   0.0007   0.0005     24.3786    33.22
DORIS(07)MK   MOB7(07)     0.0010  30   0.0009   0.0008     61.9617    16.14
DORIS(07)MK   MV3(07)      0.0027   9   0.0027   0.0022    237.1272    11.45
DORIS(07)MK   MV3(07PRE)   0.0010   9   0.0009   0.0008    237.1167     4.01
DORIS(07)MK   SGEOS        0.0008  38   0.0007   0.0005     37.6850    22.19
GODE          GORF         0.0006 172   0.0005   0.0006    183.3922     3.31
GODE          NGEO         0.0005   2   0.0004   0.0005    103.2454     4.76
GODE          PIER(B)95    0.0006  19   0.0005   0.0007     71.5674     8.82
GODE          PIER(C)95    0.0008  71   0.0006   0.0003     43.8925    17.68
GODE          VLBA         0.0007  99   0.0006   0.0003     60.1207    11.25
GORF          NG2000(07)   0.0006 175   0.0005   0.0005     19.4442    32.57
GORF          NGEO         0.0005   3   0.0004   0.0004     83.4683     5.82
GORF          SGEOS        0.0005  83   0.0004   0.0004     18.4781    25.94
MOB7(07)      MV3(07)      0.0027   7   0.0026   0.0021    177.4856    14.97
MOB7(07)      MV3(07PRE)   0.0008   7   0.0006   0.0007    177.4773     4.34
MOB7(07)      NG2000(07)   0.0007  32   0.0006   0.0008     41.7190    17.13
MOB7(07)      NGEO         0.0006  16   0.0005   0.0005     42.7732    14.65
MOB7(07)      SGEOS        0.0007  32   0.0006   0.0006     51.0011    13.86
MV3(07)       MV3(07PRE)   0.0025   0   0.0025   0.0020      0.0322 78952.77
NG2000(07)    NGEO         0.0006 169   0.0005   0.0006     76.1690     7.90
NG2000(07)    SGEOS        0.0006 165   0.0006   0.0005     10.6972    56.24
NGEO          PIER(B)95    0.0005  23   0.0004   0.0005     32.0300    15.88
NGEO          PIER(C)95    0.0007  80   0.0005   0.0005    128.8631     5.54
NGEO          SGEOS        0.0005  25   0.0005   0.0004     86.2545     5.91
NGEO          VLBA         0.0006 117   0.0005   0.0005    163.2386     3.93
PIER(B)95     PIER(C)95    0.0007  84   0.0006   0.0007     97.5758     6.93
PIER(B)95     VLBA         0.0007 133   0.0005   0.0007    131.3901     5.19
PIER(C)95     VLBA         0.0007  78   0.0005   0.0004     53.4161    12.25

11:01:27, Tue Jun 17, 2008
```

Appendix H. GGAO Survey Control Network
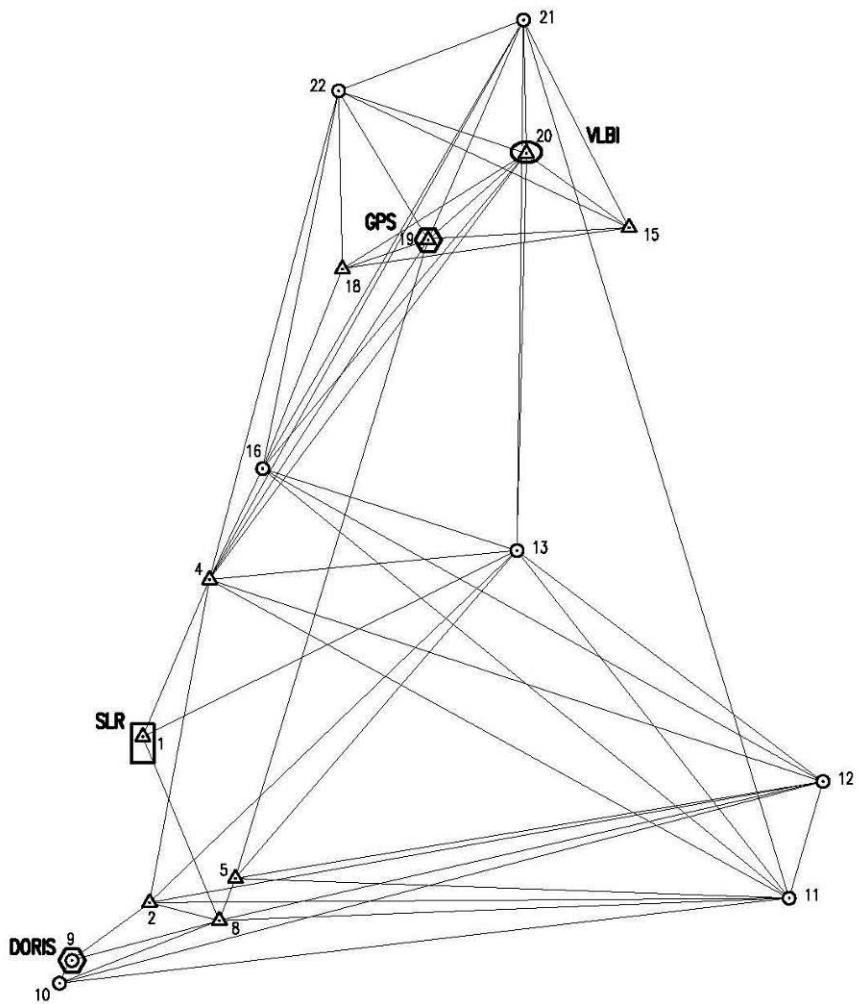
SURVEY CONTROL MONUMENT IDENTIFICATION

STA.	NASA HAVAGO ADJUST ID	DOME #	PID #	REMARKS
1	CDP STATION 7105	40451M105		THIS SURVEY MONUMENT OCCUPIED BY NASA MOBLAS 7 SATELLITE LASER RANGING SYSTEM
2	GORF 1989		JV6501	
3	NG2000 (NOV. 2007)			NASA SATELLITE LASER RANGING SYSTEM
4	NORTH GEOS PIER 1979		JV5895	
5	CDP STATION 7125	40451M114		NG2000 REFERENCE MONUMENT
6	NORTH GEOS RM1 1982			
7	NORTH GEOS RM2 1982			
8	SOUTH GEOS PIER 1976		JV5894	
9	DORIS ANTENNA (2007)	40451S176		DORIS ANTENNA ON PILLAR
10	CAL-PIER D			
11	CAL-PIER C			LASER SYSTEMS PRIMARY CALIBRATION PIER
12	CAL-PIER B3 (2002)			LASER SYSTEMS SECONDARY CALIBRATION PIER
13	CAL-PIER A			LASER SYSTEMS SECONDARY CALIBRATION PIER
14	GEOS AZIMUTH 1982			
15	7108 RM1			
16	GGAO VLBI RM PIER B			
17	BM WSSG TS 20428 PG			
18	JPL 4005 (GGAO GPS WEST)			
19	JPL 4006 (GGAO GPS EAST)	40451M123	AA3496	THIS SURVEY MONUMENT OCCUPIED WITG GPS ANTENNA
20	SGP 7108-1993	40451M125		THIS SURVEY MONUMENT OCCUPIED WITH NASA MV3 VLBI ANTENNA
21	GGAO VLBI FRM PIER A		AH5618	
22	GGAO VLBI RM PIER C		AH5617	
23	48" TEL. REF. PT. (CDP 7106)			TELESCOPE INSIDE DOME
24	GODDARD 2		JV5873	
25	GODDARD 1962		JV5872	
26	CDP STATION 7918	40451M120		
27	CDP STATION 7103	40451M103		
28	CDP STATION 7102	40451M102		
29	CAL-PIER B2 (FEB. 2001)			THIS PIER NO LONGER USED DUE TO MOVEMENT
30	CAL-PIER B (ORIGINAL)			THIS PIER NO LONGER USED DUE TO MOVEMENT

LEGEND:

⊙ SURVEY CONTROL MONUMENT

△ SURVEY CONTROL MONUMENT/CONCRETE PIER