

National Geodetic Survey

OPUS:

Online Positioning User Service

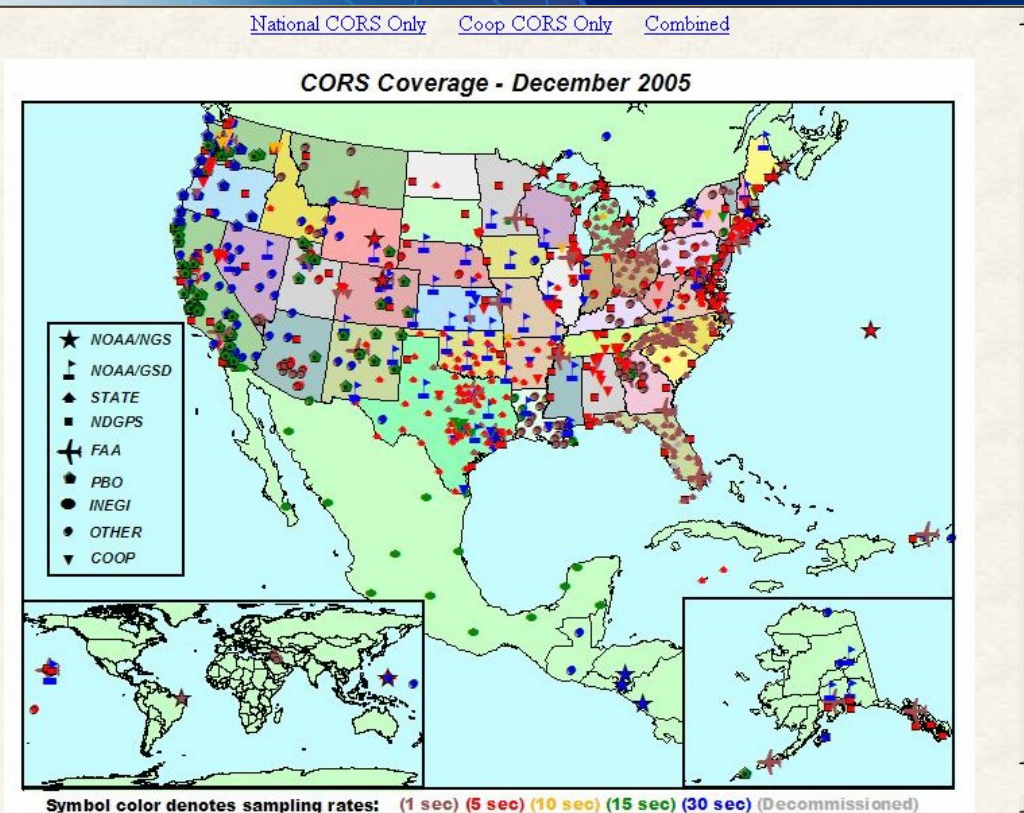
<http://www.ngs.noaa.gov/OPUS/>
ngs.opus@noaa.gov



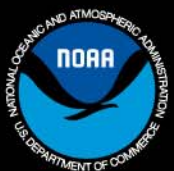
National Oceanic and Atmospheric Administration

WHAT IS OPUS?

National Geodetic Survey



- **On-line Positioning User Service**
- **Fast & easy access to the NSRS (National Spatial Reference System) for GPS users**



National Oceanic and Atmospheric Administration

How to Access NSRS

National Geodetic Survey

1) Passive monuments

- Datasheets <http://geodesy.noaa.gov/cgi-bin/datasheet.prl>

2) Active GPS

- CORS data <http://geodesy.noaa.gov/CORS>
- OPUS processing <http://geodesy.noaa.gov/OPUS>

DATASHEETS

The NGS Data Sheet

See file [dsdata.txt](#) for more information about the datasheet.

```
DATABASE = Sybase ,PROGRAM = datasheet, VERSION = 7.12
1 National Geodetic Survey, Retrieval Date = FEBRUARY 28, 2005
AB2289 *****
AB2289 CBN - This is a Cooperative Base Network Control Station.
AB2289 TIDAL BM - This is a Tidal Bench Mark.
AB2289 DESIGNATION - 602
AB2289 PID - AB2289
AB2289 STATE/COUNTY - MO/ST LOUIS
AB2289 USGS QUAD - DULUTH (1993)
AB2289
AB2289 *CURRENT SURVEY CONTROL
AB2289
AB2289 *HAD 83 (1997) - 46 46 29.11054(W) 092 05 37.38918(N) ADJUSTED
AB2289 * NAVD 88 - 184.348 (meters) 604.92 (feet) ADJUSTED
AB2289
AB2289 X - -159,876.211 (meters) COMP
AB2289 Y - -4,373,152.973 (meters) COMP
AB2289 Z - 4,624,765.082 (meters) COMP
AB2289 LAPLACE CORR - -3.07 (seconds) DEFLECP9
AB2289 ELLIP HEIGHT - 156.13 (meters) (05/25/99) GFS OBS
AB2289 GEOID HEIGHT - -18.19 (meters) GEOID03
AB2289 DYNAMIC HT - 184.373 (meters) 604.90 (feet) COMP
AB2289 MODELED GRAV - 980,748.1 (mgal) NAVD 88
AB2289
AB2289 NOSE ORDER - A
AB2289 VERT ORDER - FIRST CLASS II
AB2289 ELLP ORDER - THIRD CLASS I
AB2289
AB2289 The horizontal coordinates were established by GPS observations
AB2289 and adjusted by the National Geodetic Survey in May 1993.
AB2289
AB2289 The orthometric height was determined by differential leveling
AB2289 and adjusted by the National Geodetic Survey in July 1999.
AB2289 No vertical observational check was made to the station.
AB2289
AB2289 This Tidal Bench Mark is designated as VM 13392
AB2289 by the Center for Operational Oceanographic Products and Services.
AB2289
AB2289 Photographs are available for this station.
AB2289
AB2289 The X, Y, and Z were computed from the position and the ellipsoidal ht.
AB2289
AB2289 The Laplace correction was computed from DEFLECP9 derived deflections.
AB2289
AB2289 The ellipsoidal height was determined by GPS observations
AB2289 and is referenced to NAD 83.
AB2289
AB2289 The geoid height was determined by GEOID03.
```



National Oceanic and Atmospheric Administration

How to Maintain NSRS

National Geodetic Survey

1) Passive monuments

- Add observations via *BLUEBOOKING*
- Online recovery recvy_entry_www.prl
- Online GPS observations via OPUS-DB

2) Active GPS

- Join Cooperative CORS
<http://geodesy.noaa.gov/CORS/Coop/>

Input Formats and Specifications of the National Geodetic Survey Data Base

Volume I. Horizontal Control Data

Federal Geodetic Control Committee

Members

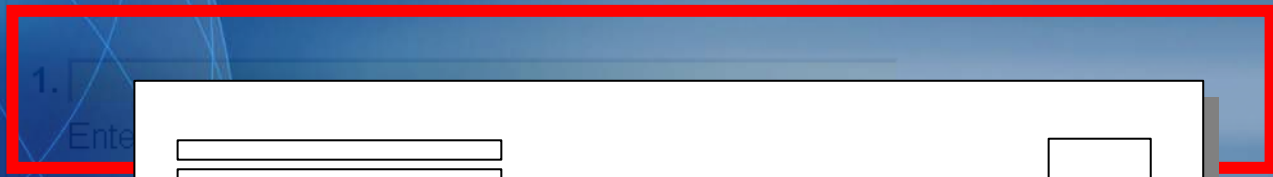
U.S. Department of Agriculture
U.S. Department of Commerce
U.S. Department of Defense
U.S. Department of Energy
U.S. Department of Housing and Urban Development
U.S. Department of Justice
U.S. Department of Transportation
National Aeronautics and Space Administration
Tennessee Valley Authority



National Oceanic and Atmospheric Administration

<http://www.ngs.noaa.gov/OPUS>

[OPUS Upload](#) | [What is OPUS](#) | [Using OPUS](#) | [Recent Solutions](#) | [FAQ](#) | [OPUS Policies](#) | [Contact OPUS](#)



1. Enter

2. Enter

3. NOM Sele

4. 0.0 Enter

You've got mail!

OPUS solution

Recent Developments

[Nov 10, 2004]
of the
NOAA
changed to
space
for the



National Oceanic and Atmospheric Administration

Upload File

frequency data (L1 and L2) and a minimum of 2 hours of observations is recommended.
Your collection rate must be 1,2,3,5,10,15 or 30 seconds.



Subject: OPUS solution : doro128o.03o 000384055

From: opus@ngs.noaa.gov

Date: 2:28 PM

To: joe.evjen@noaa.gov

FILE: doro128o.03o 000384055

NGS OPUS SOLUTION REPORT

=====

USER: joe.evjen@noaa.gov
 RINEX FILE: doro128o.03o

DATE: October 20, 2005
 TIME: 18:28:23 UTC

SOFTWARE: page5 0411.19 master30.pl
 EPHEMERIS: igs12174.eph [precise]
 NAV FILE: brdc1280.03n
 ANT NAME: ASH701975.01A+GP
 ARP HEIGHT: 2.0

START: 2003/05/08 14:29:00
 STOP: 2003/05/08 20:22:00
 OBS USED: 12128 / 12305 : 99%
 # FIXED AMB: 57 / 59 : 97%
 OVERALL RMS: 0.018 (m)

REF FRAME: NAD_83 (CORS96) (EPOCH:2002.0000)

ITRF00 (EPOCH:2003.3500)

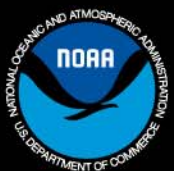
X:	592840.506 (m)	0.004 (m)	592839.863 (m)	0.004 (m)
Y:	-4856853.798 (m)	0.006 (m)	-4856852.383 (m)	0.006 (m)
Z:	4078078.293 (m)	0.007 (m)	4078078.180 (m)	0.007 (m)

LAT:	39 59 58.25431	0.004 (m)	39 59 58.28240	0.004 (m)
E LON:	276 57 33.29650	0.004 (m)	276 57 33.27682	0.004 (m)
W LON:	83 2 26.70350	0.004 (m)	83 2 26.72318	0.004 (m)
EL HGT:	208.417 (m)	0.008 (m)	207.209 (m)	0.008 (m)
ORTHO HGT:	242.150 (m)	0.026 (m)	[Geoid03 NAVD88]	

Many Flavors of OPUS Planned

National Geodetic Survey

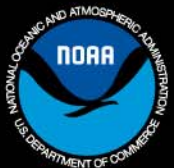
- OPUS
 - » Lone \$\$\$ receiver, hours of data, no archive
- OPUS-DB
 - » Lone \$\$\$ receiver, hours of data, **archive results**
- OPUS Projects
 - » **Multiple** \$\$\$ receivers, archive results
- OPUS Rapid Static
 - » \$\$\$ receiver, **minutes** of data, no archive
- OPUS GIS
 - » **¢¢** receiver, minutes of data, no archive



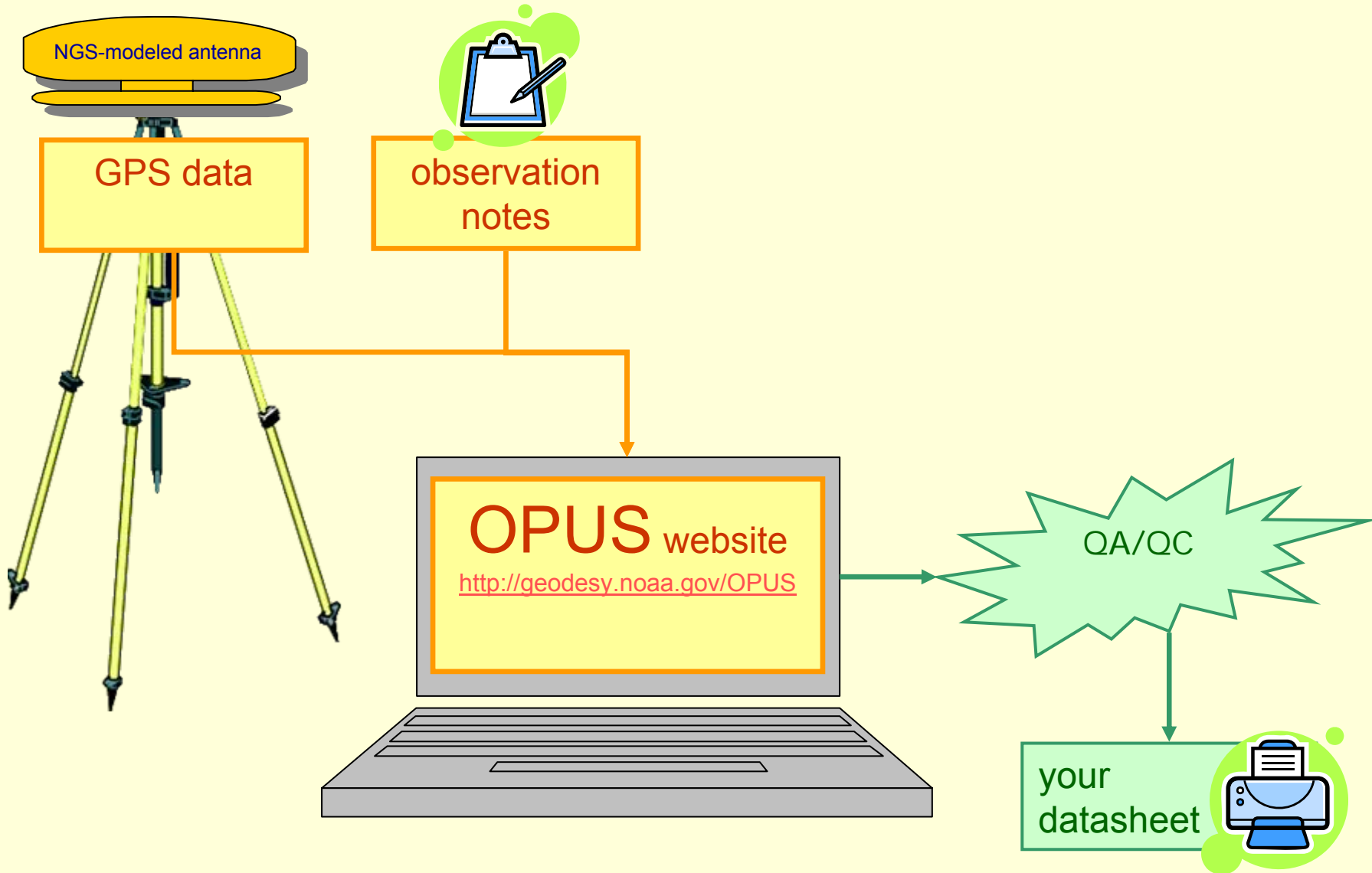
Many Flavors of OPUS Planned

National Geodetic Survey

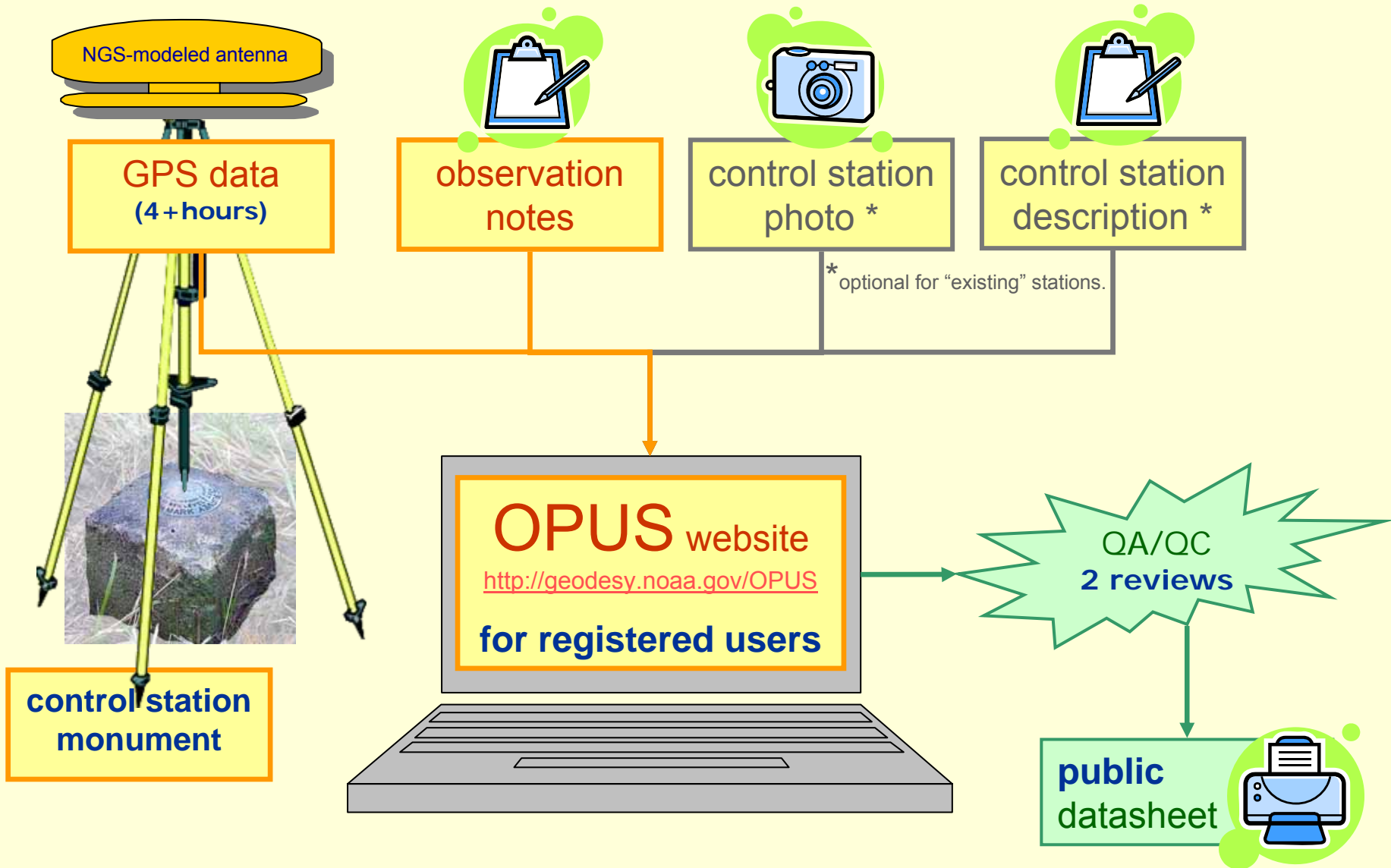
- OPUS
 - » Lone \$\$\$ receiver, hours of data, no archive
- OPUS-DB
 - » Lone \$\$\$ receiver, hours of data, **archive results**
- OPUS Projects
 - » **Multiple** \$\$\$ receivers, archive results
- OPUS Rapid Static
 - » \$\$\$ receiver, minutes of data, no archive
- OPUS GIS
 - » ₤ receiver, minutes of data, no archive



OPUS Concept



OPUS → Datasheet Concept



control station requirements

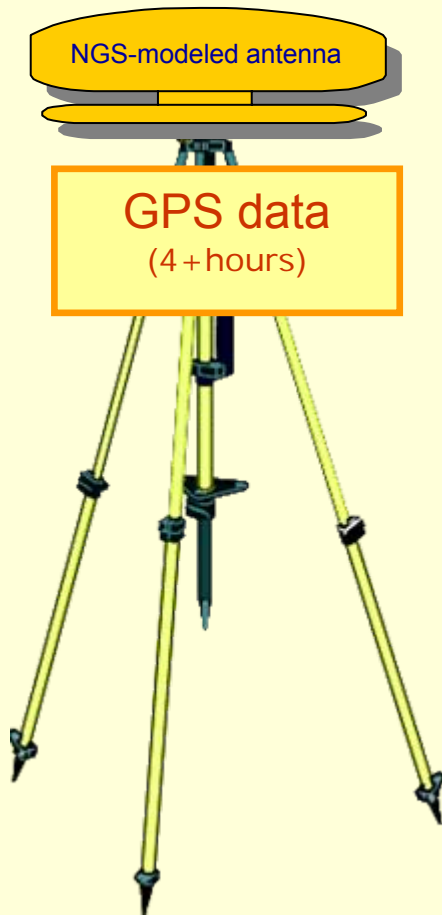
Stable
Permanent
Unique
Recoverable
Safe



control station
monument



GPS data requirements



“OPUSable”

4+ hours of dual frequency data

NGS-calibrated antenna

OPUS must achieve:

≥ 90% observations used

≥ 80% ambiguities fixed

≤ 0.02m peak-to-peak horizontal

≤ 0.04m peak-to-peak vertical

metadata requirements



observation
notes



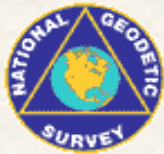
control station
photo *



control station
description *

* optional for "existing" stations.

Simplified bluebooking



Mark Recovery



Rinex File Name: **doro128o.03o**

Enter the mark's PID: | [What's a PID ?](#) | [Find PID](#) | [no PID ?](#) |

O
P
T
I
O
N
A
L

The mark was found in Good condition.
[Explain.](#) Poor, disturbed, mutilated, requires maintenance.

OPTIONAL comments
[Explain.](#)

Your initials

OPTIONAL photos:
[Explain.](#)

- | | | | |
|----|--|--|--|
| 1. | <input type="text" value="C:\DOROTA_1.jpg"/> | <input type="button" value="Browse..."/> | - CLOSE-UP <input type="button" value="v"/> |
| 2. | <input type="text" value="C:\DOROTA_3.jpg"/> | <input type="button" value="Browse..."/> | Select photo type <input type="button" value="v"/> |
| 3. | <input type="text"/> | <input type="button" value="Browse..."/> | Select photo type |
- CLOSE-UP
 - MONUMENT
 - HORIZON
 - EQUIPMENT
 - map or form
 - other

Privacy Policy

- The data you provide are reviewed by NGS personnel, are recorded in our database, and are displayed on datasheets.
- Providing this information is voluntary. See also our [NOAA Privacy Policy](#).



Mark Description



Rinex File Name: **doro128o.03o**

REQUIRED

Designation: **Stamping:**

Type:

IF Type = "Rod": **Rod Depth** **Sleeve Depth** ft m

Setting:

specific setting:

Descriptive Comments:

Photo 1:

OPTIONAL

Photo 2:

Photo 3:

Stability:

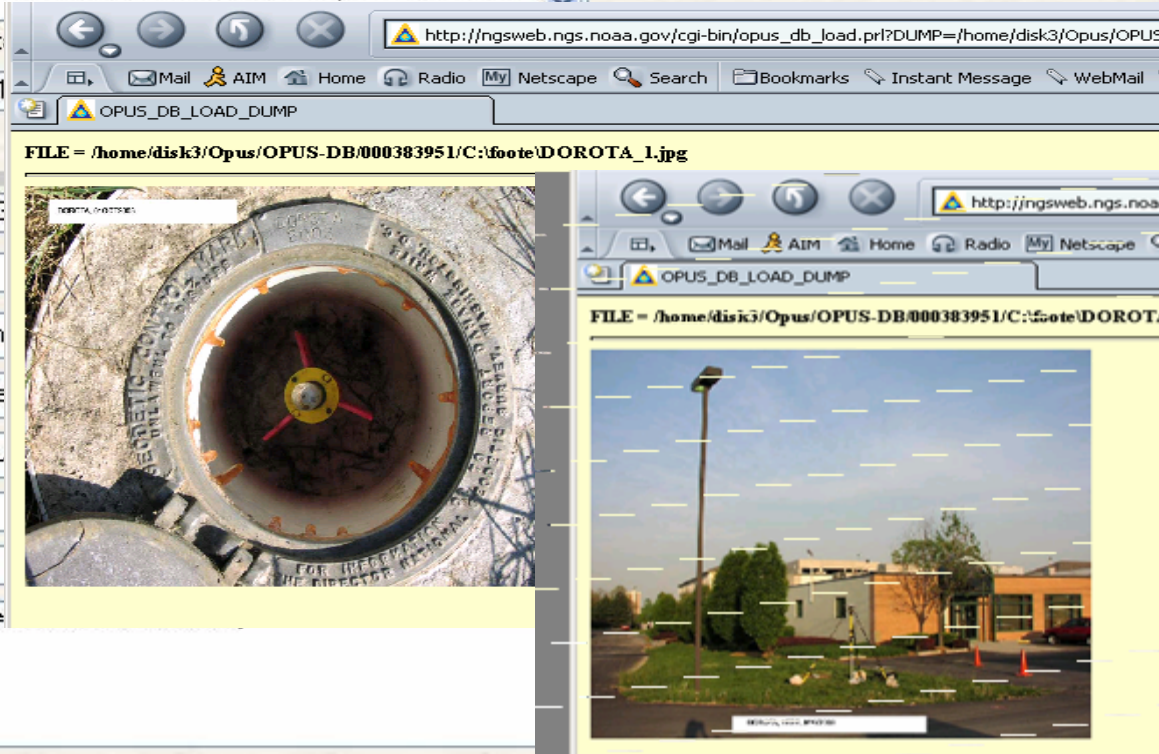
Magnetic:

Application:

Antenna S/N:

Receiver S/N:

Observer Remarks:



OPUS registry

Registration stores the following:

- Name
- Address
- Agency
- Experience- GPS & OPUS





Online Positioning User Service



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What is OPUS

Using OPUS

FAQs

OPUS Policies

Contact OPUS

OPUS News!

Register To
Publish
OPUS Results

1.

Enter your [email address](#)

2.

Enter your [DATA file](#) Now accepting RINEX and selected receiver formats.
Data files may also be compressed (.ZIP, .zip, .Z, .gz)

3. NONE no antenna selected - see FAQ #6

Select the [antenna type](#)

4. 0.0 meters

Enter the [antenna height](#)

5.

If desired, select from several options to modify the basic OPUS procedures.

Your data must be dual frequency data (L1 and L2) and a minimum of 2 hours of observations is recommended.
Your collection rate must be 1,2,3,5,10,15 or 30 seconds.

New Registrants

All OPUS submissions to the NGS Integrated Data Base must be reviewed by a registered reviewer. These registered reviewers will complete this form and select their User Name and Password which is needed in order to elect the OPUS Option "Submit to Data Base". Prior to publication in the Data Base, OPUS submissions for that User Name and Password will be emailed to the registered reviewer uniquely identified by that User Name and Password. The reviewer will notify NGS by reply email that 1) all the information is correct and NGS may proceed to publication or 2) corrections are required prior to publication, or 3) withdraw the submission.

To start the registration process, NGS needs to know who will be reviewing the OPUS submissions to the Data Base. Please complete the information below and note that the email address that you enter here is the address to which your OPUS submissions will be sent for review. The information provided here will be kept strictly confidential.

First Name:	<input type="text" value="joe"/>	*
Last Name:	<input type="text" value="evjen"/>	*
Title:	<input type="text" value="geodesist"/>	*
Company/Agency:	<input type="text" value="NGS"/> , Or: <input type="text"/>	*
Address 1:	<input type="text" value="1315 east-west highway"/>	*
Address 2:	<input type="text" value="ssmc3 station 8854"/>	
City:	<input type="text" value="Silver Spring"/>	*
State:	<input type="text" value="Maryland"/> * Zip: <input type="text" value="20910"/>	*
Phone:	<input type="text" value="301.713.3194"/>	*
Email:	<input type="text" value="joe.evjen@noaa.gov"/>	*

Please enter a User Name and Password for your submissions to the NGS Data Base. You may share this User Name and Password as you wish, however all submissions via OPUS to the Data Base using your User Name and Password will be sent to you at the above email address for review and verification.

Enter Your User Name:	<input type="text" value="joejoe"/>	*
Enter Your Password:	<input type="text" value="junkjunk"/>	*
Re-Enter Your Password:	<input type="text" value="junkjunk"/>	*

NGS would like to know about your professional qualifications and/or your experience with GPS positioning. This information should convey to us that you understand the relevant elements of precise GPS and geodetic positioning. Registrants should be thoroughly familiar with the content of [Using OPUS](#), [PAT22 Report](#), [GPS Manual](#). Please answer below as appropriate. All responses will be kept strictly confidential.

Describe your professional qualifications (For example, Are you a License Surveyor; What GPS equipment have you used; Year experience with GPS; Previous experience with OPUS; Projects submitted to NGS using "Blue Book"; etc ..):

quality control

```
$ ../verify doro128o.03o.txt

EPHEMERIS:      OK
OBS USED:      OK    98.5615603413247 %
DURATION:      OK
ANTENNA:       ASH701975.01A
FIXED AMB:     OK    94.9152542372881 %
ARP HGT:       OK    2.0 (m)
RMS:           OK    0.019 (m)
LAT RANGE:     OK    0.001 (m)
LON RANGE:     OK    0.005 (m)
HGT RANGE:     OK    0.013 (m)
SEQ:           OK    000383951          000383951
PID:           OK    DG7181    DG7181
```

1) I have reviewed the information above as well as the datasheet and photos submitted for this file and verify that this information is correct. Please proceed with this publication.

Name: Gerry Mader

2) This contribution is withdrawn. Do not publish at this time.

Name:

OPUS datasheet

Identical to normal datasheet

PLUS agency attribution

PLUS links to OPUS reports & statistics

public
datasheet




```

K00203
K00203
K00203* NAD 83(1986)- 39 10 52. (N) 112 42 07. (W) SCALED
K00203* NAVD 88 - 1407.788 (meters) ← 4618.72 (feet) ADJUSTED
K00203

```

```

LAT: 39 10 52.70828 0.006 (m)
E LON: 247 17 52.19600 0.027 (m)
W LON: 112 42 7.80400 0.027 (m)
EL HGT: 1387.827 (m) 0.056 (m)
ORTHO HGT: 1407.770 (m) 0.062 (m)

```

```

K00203
K00203* NAD 83(CORS) → 39 10 52.70828(N) 112 42 07.80400(W) OPUS
K00203* NAVD 88 - 1407.788 (meters) ← 4618.72 (feet) ADJUSTED
K00203

```

Bench mark elevation retained

Position accuracy improved 95 feet!

One more tie between GRS80-NAVD88.

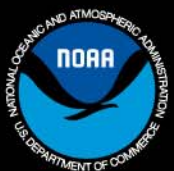
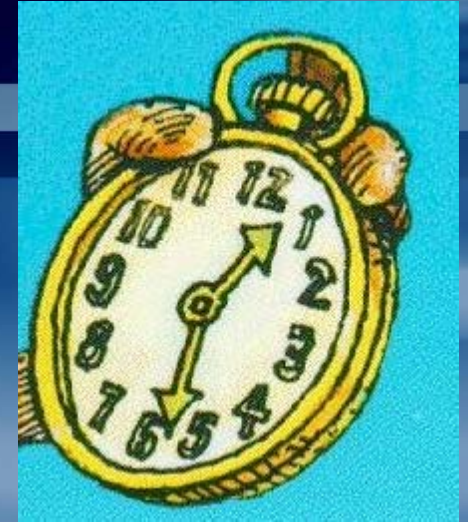
K00203'RECOVERED AS DESCRIBED

*** retrieval complete.
Elapsed Time = 00:00:00

OPUS-DB benefits

National Geodetic Survey

- Data submittal
 - fast, cheap, easy
 - consistent, reliable
- Improve maintenance of NSRS
 - Add GPS on bench marks
 - Archive PLSS corners?
 - Archive tidal bench marks



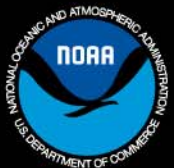
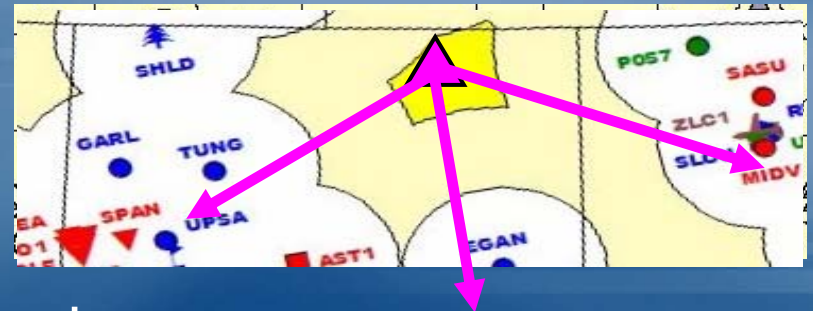
National Oceanic and Atmospheric Administration

OPUS-DB limitations

National Geodetic Survey



- GPS data only
- PAGES software only
- No direct tie to adjacent monuments
- No redundancy
- Reduced oversight
- Idiot-proofing?
- Field logs are not archived

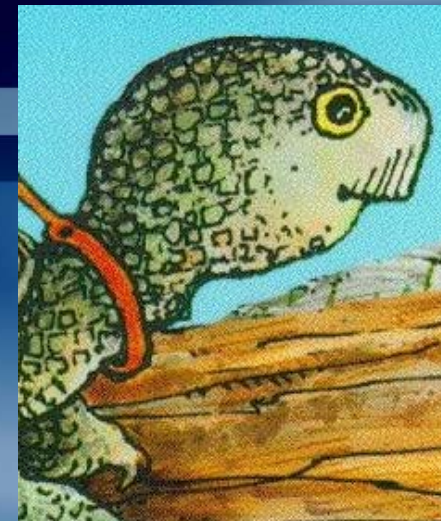


National Oceanic and Atmospheric Administration

OPUS-DB data quality

National Geodetic Survey

- Registered, trained users
- 4+ hours of static GPS
- OPUS error checking
- NGS reviews each submittal
- Datasheet includes:
 - “Caveat emptor” warning
 - Datasheet includes DQA statistics
 - Agency attribution
- Coordinates: first, best, average

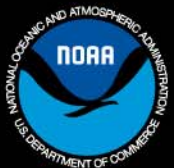


National Oceanic and Atmospheric Administration

Many Flavors of OPUS Planned

National Geodetic Survey

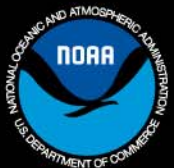
- OPUS
 - » Lone \$\$\$ receiver, hours of data, no archive
- OPUS-DB
 - » Lone \$\$\$ receiver, hours of data, archive results
- OPUS Projects
 - » **Multiple** \$\$\$ receivers, archive results
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OPUS - RS

Online Positioning User Service - Rapid Static



OPUS Rapid Static is a new version of OPUS designed to handle short (15 minute) data sets. It uses an entirely new processing engine. Its accuracy, reliability, and failure modes may be different from the original OPUS. This site should be treated as an Operational Prototype. [more](#)

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[Using OPUS - RS](#)

[Recent Solutions](#)

[FAQs](#)

[OPUS Policies](#)

[Contact OPUS](#)

[Recent Developments](#)

1.

Enter your [email address](#)

2.

Enter your [DATA file](#) Now accepting RINEX and selected receiver formats.
Data files may also be compressed (.ZIP, .zip, .Z, .gz)

3. no antenna selected - see FAQ #6

Select the [antenna type](#)

4. meters

FILE: txarO-RS.06o 000004405

1008 NOTE: Antenna offsets supplied by the user were zero. Coordinates
1008 returned will be for the antenna reference point (ARP).

1008

6011 Warning!!! OPUS-RS was able to find a set of reference stations
6011 with data suitable for use with your dataset. However, your
6011 position does not fall within the polygon enclosing these reference
6011 stations. This means that the geographic interpolation algorithms
6011 performed within OPUS-RS must instead perform extrapolation.
6011 Extrapolation, especially if your position is far from the
6011 reference stations, is prone to error. Use this solution with
6011 caution.

Distance to polygon enclosing the reference stations is 5 KM

NGS OPUS-RS SOLUTION REPORT

=====

USER: rick.foote@noaa.gov
RINEX FILE: txar223o.06o

DATE: September 01, 2006
TIME: 17:34:22 UTC

SOFTWARE: rsgps 0.91 RS23.prl
EPHEMERIS: igs13875.eph [precise]
NAV FILE: brdc2230.06n
ANT NAME: TRM41249.00
ARP HEIGHT: 0.0

START: 2006/08/11 14:01:00
STOP: 2006/08/11 14:15:00
OBS USED: 924 / 1008 : 92%
QUALITY IND. 40.60/ 10.48
OVERALL RMS: 0.424

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000)

ITRF00 (EPOCH:2006.61110)

X:	-659935.002(m)	0.002(m)	-659935.682(m)	0.002(m)
Y:	-5328392.049(m)	0.014(m)	-5328390.624(m)	0.014(m)
Z:	3431593.066(m)	0.008(m)	3431592.908(m)	0.008(m)

IAT:	32 45 32 50006	0.002(m)	32 45 32 51912	0.002(m)
------	----------------	----------	----------------	----------

24 hour OPUS run Diff: DN .0058 DE 0.0121 DU -.0256

NGS OPUS SOLUTION REPORT

=====

USER: rick.foote@noaa.gov
RINEX FILE: txar2230.06o

DATE: September 01, 2006
TIME: 15:01:54 UTC

SOFTWARE: page5 0601.10 master28.pl
EPHEMERIS: igsl3875.eph [precise]
NAV FILE: brdc2230.06n
ANT NAME: TRM41249.00 NONE
ARP HEIGHT: 0.0

START: 2006/08/11 00:00:00
STOP: 2006/08/11 23:59:00
OBS USED: 52174 / 53338 : 98%
FIXED AMB: 130 / 175 : 74%
OVERALL RMS: 0.023(m)

REF FRAME: NAD_83(CORS96)(EPOCH:2002.0000)

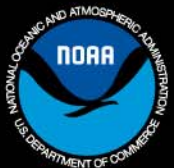
ITRF00 (EPOCH:2006.6096)

LAT:	32 45 32.49988	0.013(m)	32 45 32.51893	0.013(m)
E LON:	262 56 23.00951	0.012(m)	262 56 22.97685	0.012(m)
W LON:	97 3 36.99049	0.012(m)	97 3 37.02315	0.012(m)
EL HGT:	144.015(m)	0.023(m)	142.810(m)	0.023(m)
ORTHO HGT:	171.230(m)	0.034(m)	[Geoid03 NAVD88]	

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OPUS GIS BETA



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- [OPUS Policies](#)
- [Contact OPUS](#)

Recent Developments

[Nov 10, 2004] ▲
 Format of the OPUS data sheet is changed to provide space for the combined factor for

1.

Enter your [email address](#)

2.

Enter your [DATA file](#) Now accepting RINEX and selected receiver formats.
Data files may also be compressed (.ZIP, .zip, .Z, .gz)

3. no antenna selected - see FAQ #6

Select the [antenna type](#)

4. meters

Enter the [antenna height](#)

5.

If desired, select from several options to modify the basic OPUS procedures.

Your data must be dual frequency data (L1 and L2) and a minimum of 2 hours of observations is recommended.
Your collection rate must be 1,2,3,5,10,15 or 30 seconds.

OPUS-GIS output

- Station #: 1 File: zzyy2230.06o
- 2006/ 8/11 1: 1: 0 -659935.745 0.286 32 1 32.5158 0.314
- 2006/ 8/11 2:15: 0 -5328390.873 0.484 -97 3 37.0249 0.260
- #sec: 4440 #pts: 146 3431592.952 0.401 143.0226 0.558

- Station #: 2 File: zzyy2230.06o
- 2006/ 8/11 2:15:30 -659935.581 0.281 32 15 32.5078 0.296
- 2006/ 8/11 2:20: 0 -5328391.041 0.626 -97 3 37.0178 0.292
- #sec: 270 #pts: 10 3431592.750 0.424 143.0372 0.692

- Station #: 3 File: zzyy2230.06o
- 2006/ 8/11 2:33:30 -659935.568 0.344 32 33 32.5096 0.266
- 2006/ 8/11 2:38:30 -5328391.003 0.586 -97 3 37.0175 0.365
- #sec: 300 #pts: 11 3431592.792 0.361 143.0265 0.623

- Station #: 4 File: zzyy2230.06o
- 2006/ 8/11 2:41:30 -659935.598 0.488 32 41 32.5175 0.259
- 2006/ 8/11 2:52: 0 -5328390.395 0.757 -97 3 37.0215 0.431
- #sec: 630 #pts: 22 3431592.697 0.428 142.4706 0.861

- Station #: 5 File: zzyy2230.06o
- 2006/ 8/11 2:52:30 -659935.747 0.421 32 52 32.5170 0.280
- 2006/ 8/11 3:35: 0 -5328390.635 0.682 -97 3 37.0260 0.361
- #sec: 2550 #pts: 86 3431592.843 0.425 142.7651 0.784