CERES Data Management System

Items for Discussion - September, 1996

Schedule

Working Group Status

Release 1 Integration and Testing at LaRC DAAC

Current Release 2 Issues

Near-term Plans

Jim Kibler - J.F.Kibler@LaRC.NASA.GOV
Data Management Office
Atmospheric Sciences Division
Langley Research Center

LANGLEY RESEARCH CENTER

APPROVAL: _____
J.F. Kibler

ACCOMPLISHMENT _____

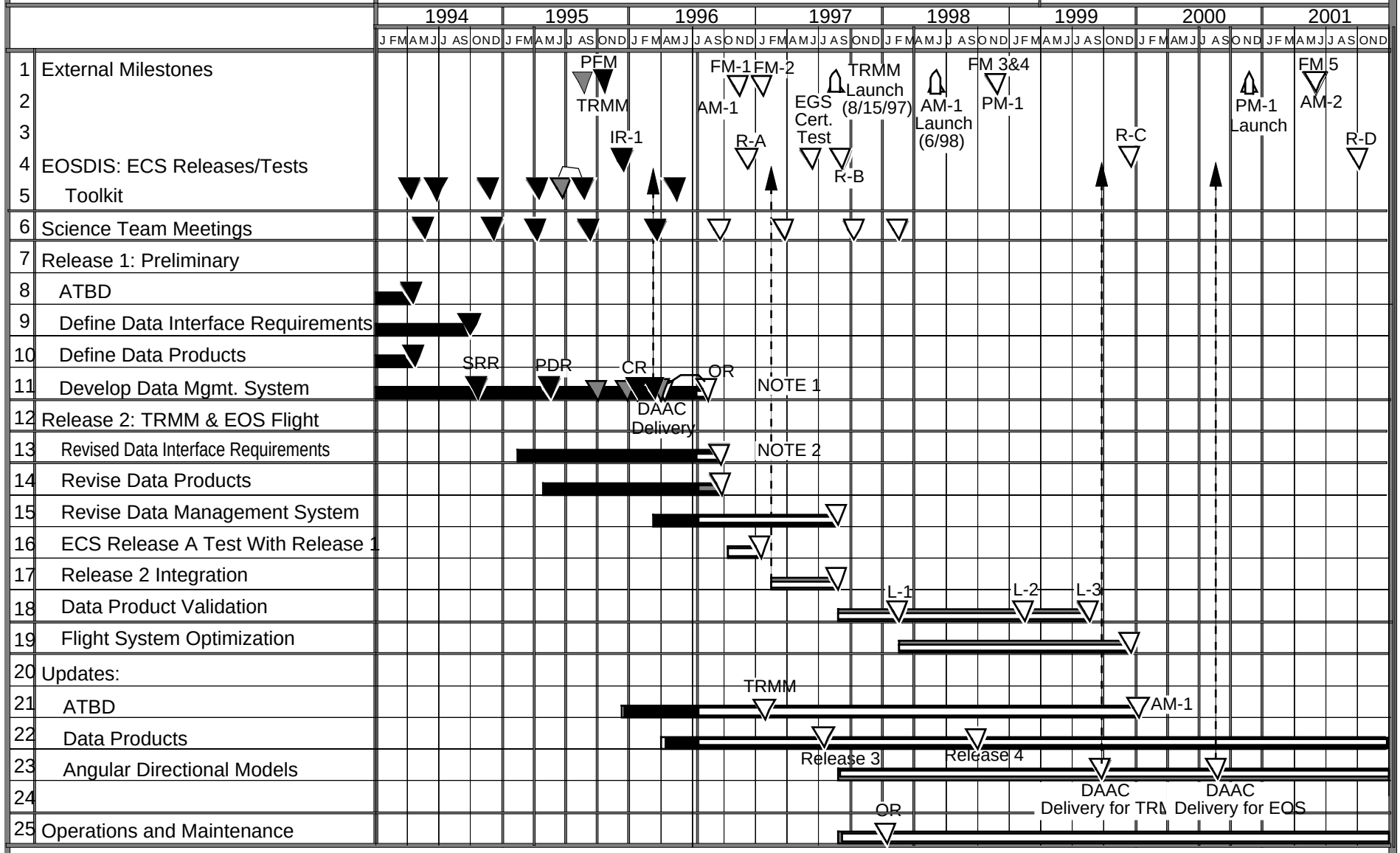
CERES
Data Management System Development

LEVEL

ORIGINAL SCHEDULE APPROVAL 10/8/92

LAST SCHEDULE CHANGE 5/1/96

STATUS AS OF 7/31/96



Note 1: Operations review re-scheduled to allow completion of Release 2 tests at DAAC.
Note 2: Interface and Data Products revised to match ATBD-2 schedule from King.

KEY:
CR: Code Reviews
ATBD: Algorithm Theoretical Basis Documents
Baseline
OR: Operations Reviews
SRR: Software Requirements Reviews
PDR: Preliminary Design Reviews
L - # : Level 1, 2, & 3 Data Products

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CERES
Data Management System Development
Release 1 Integration & Test

LEVEL

ORIGINAL SCHEDULE APPROVAL _____

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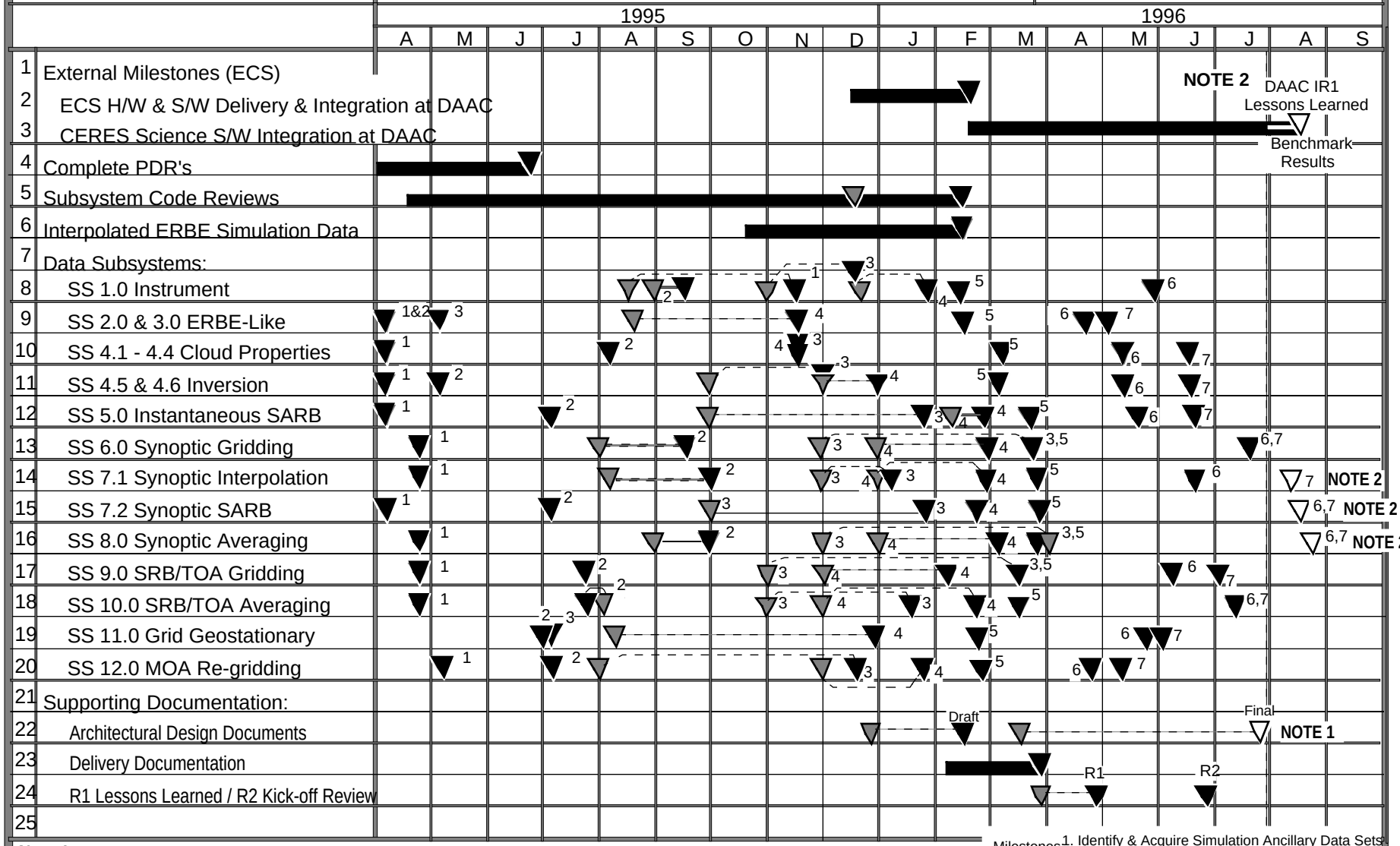

Note 1 : Of 9 architectural design documents, 1 is in final review and 8 are ready for distribution. Completion date delayed to allow posting to WEB Server for electronic distribution.

Note 2 : DAAC Testing delayed to correct erroneous time in part of the simulated data and to correct processing algorithms.

Milestones

Baseline

1. Identify & Acquire Simulation Ancillary Data Sets
2. End-to-End Interface Testing
3. Test Subsystems with Science Algorithms
4. "Thunder" (SCF) Integration
5. Delivery for DAAC Integration
6. Production Volume Stress Test
7. One Full Month Test

8/2/96 8:32AM

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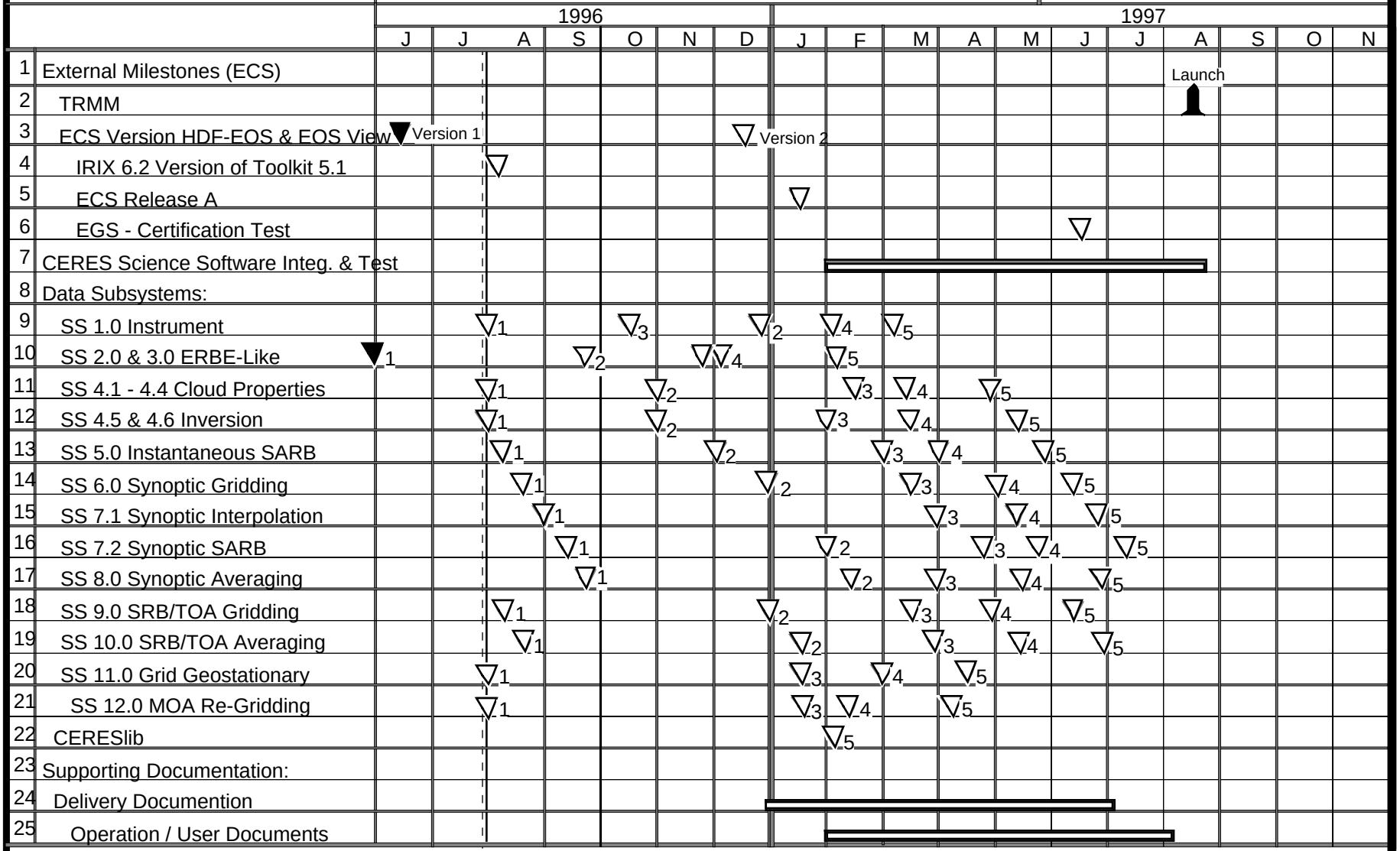
CERES
Release 2 Data Management System Development

LEVEL

ORIGINAL SCHEDULE APPROVAL 6/26/96

LAST SCHEDULE CHANGE _____

STATUS AS OF 7/31/96



1. Data Product Catalog Itemization
2. HDF Implementation/CERESlib I/O Module Delivery
3. Algorithm Freeze Date
4. Working Group Acceptance/Verification
5. DAAC Delivery Date

External Interfaces and Mission Operations

Responsible for:

- **Negotiations with GSFC, EOS, and TRMM Projects**
- **Coordination with Langley CERES Project Office and TRW**
- **TRMM & EOS Instrument monitoring, real time displays, instrument health & status**
- **Software to distribute/analyze H/K data from TRMM IST to LaRC workstations**

TRMM:

- **Prototype software for analyzing TRMM snap files is being finalized**
- **Received test snap files from the TRMM MOC via ftp.**
- **Working with MOC to finalize process for LaRC to receive planning aid products.**
- **Preparing to move ISW to bldg. 1250**
- **Comments on Ops Agreement between the TRMM FOT and the LaRC CERES Instrument Team were sent to GSFC.**

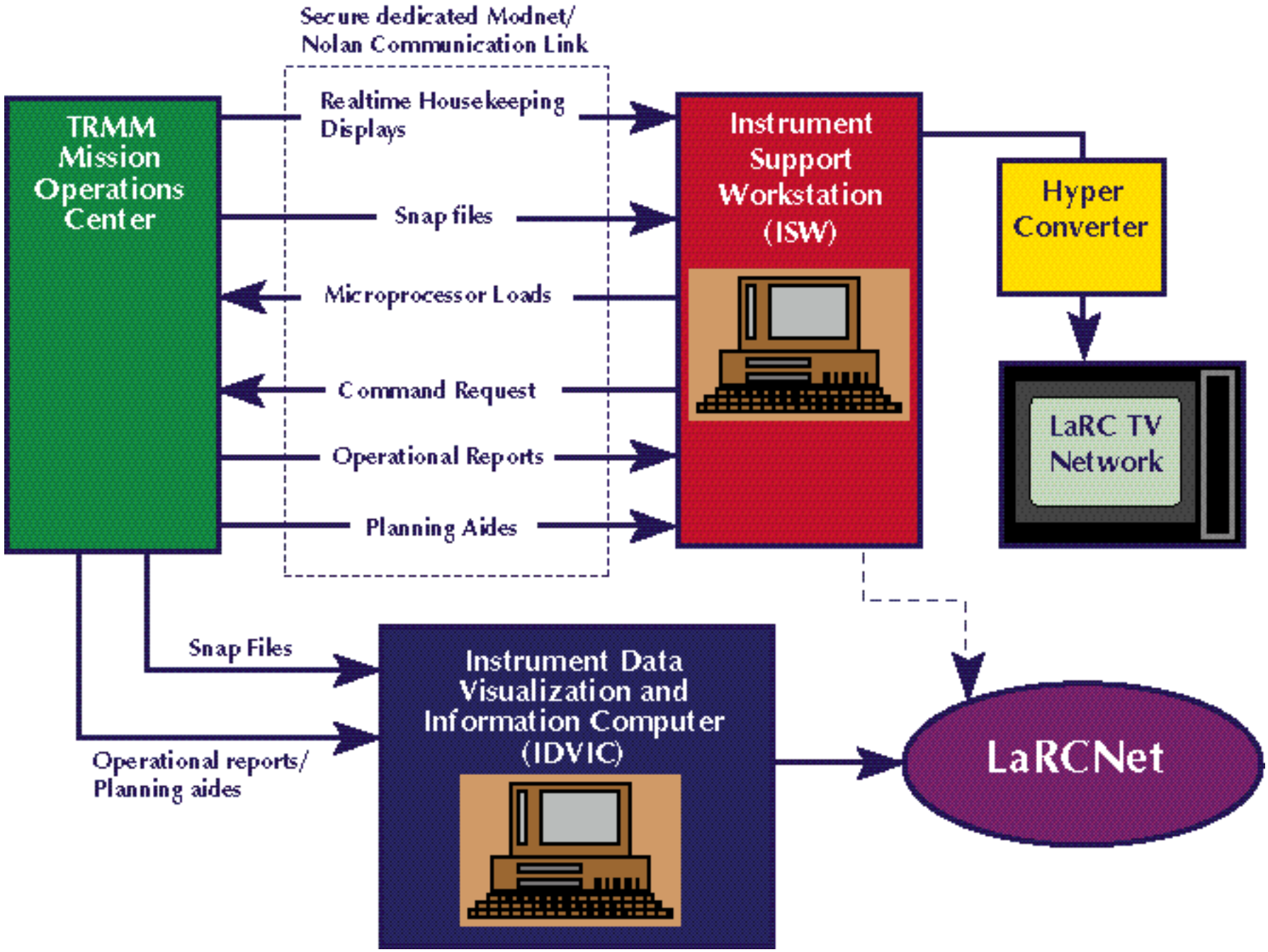
EOS-AM:

- **Participated in EOS AM Instrument Operations Workshop in April at Lockheed-Martin**
- **Revision A of the EOS-AM to CERES Operations ICD is under LaRC review**

Near-term Plans:

- **Participate in TRMM I&T test to be held September 10-12**
- **Participate in TRMM Mission Simulation to be held October 7-9.**
- **Meet with LaRC personnel and receive feedback on TRMM snap file analysis prototype.**
- **Continue to work flight operations details with TRMM and EOS-AM personnel**

LaRC CERES Monitoring and Operations System for TRMM



CERES Instrument Simulator

Flight processor simulation for validation of re-programming and in-flight anomaly investigation

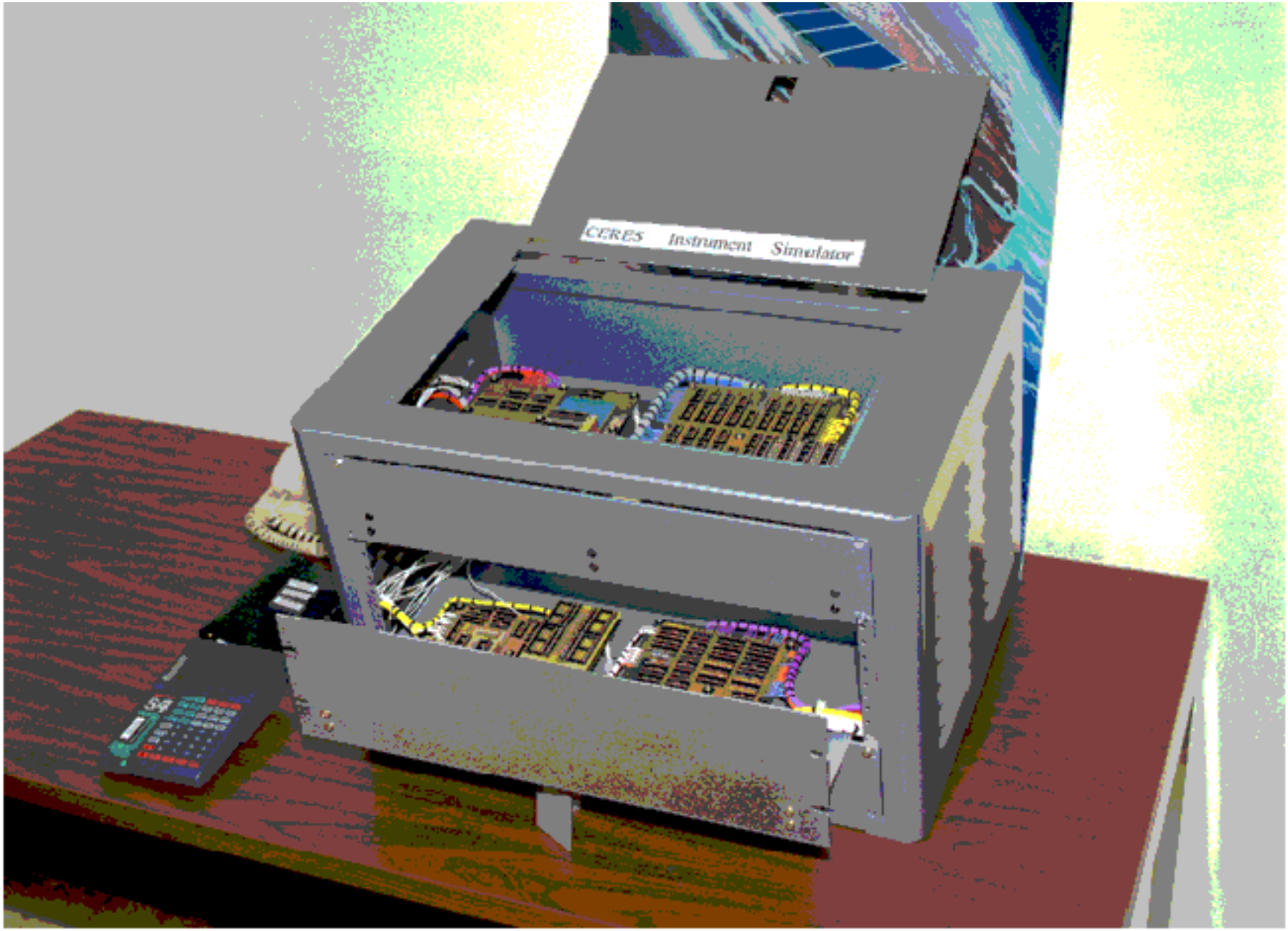
- **Simulator CERES / TRW cards now being integrated into enclosure**
- **SRAM and EPROM memory adapters checked**
- **Digital I/O & Digital I/F, ICP, DAP & SC I/F interface cards integrated into wiring harness**
- **TRW / GSE software installed on new Pentium**
  - **Housekeeping and science data displays**
  - **Matlab / Simulink linear & non-linear models ready**

Current Status:

- **TRW flight code resides in 27C64 EPROMs with good checksums & ready for installation**
- **Host-PC software: Developing rate & position I/O driver to link Matlab / Simulink models**
- **Host-PC cards: I/O cards form Matlab/Simulink I/O link to CERES processor**
- **TRW circuit cards from Cirtech: Integrated on trays in main enclosure with wiring harness**
- **1553 interface : BCU software being adapted for PC uplink to spacecraft interface card**

Near-term Plans:

- **Functional checking of cards and commercial components in enclosure**
- **Connect harness & card power leads to power supplies**
- **Connect terminal strips with miscellaneous components to cards**
- **Insert chips into blank sockets**
- **Boot system and look for signs of intelligent life**


CERES Instrument Simulator

Working Group: Instrument

Responsible for:

- **Subsystem 1 (Instrument Geolocate and Calibrate Earth Radiances)**

Data Products:

- **BDS (Bi-Directional Scan)**
- **IES (Instrument Earth Scan)**

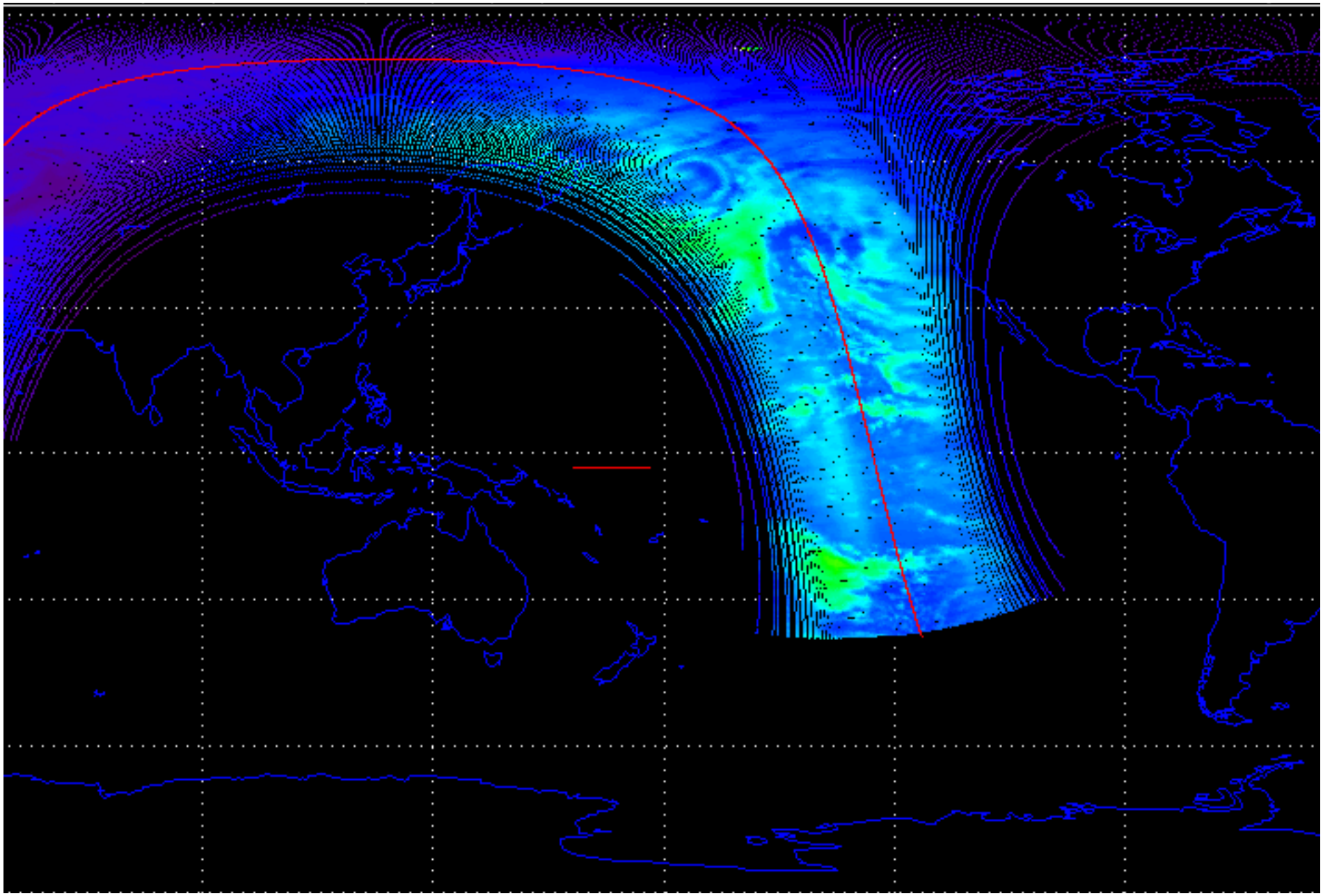
Current Status:

- **Release 2 system architecture defined; development in process**
- **Verification of geolocation functions underway**
- **Level 0 data from TRMM Sensor Data Processing Facility (SDPF) processed and evaluated**

Near-term Plans:

- **Complete verification of geolocation functions for all instrument modes/configurations**
- **Continue processing and analysis of new SDPF data from TRMM mission simulations**
- **Complete implementation of Release 2 requirements into system**

CERES Simulated (Interpolated ERBE) Data for Total Filtered Radiance - Hour 00 10/1/86



TRMM Sensor Data Processing Facility Tests

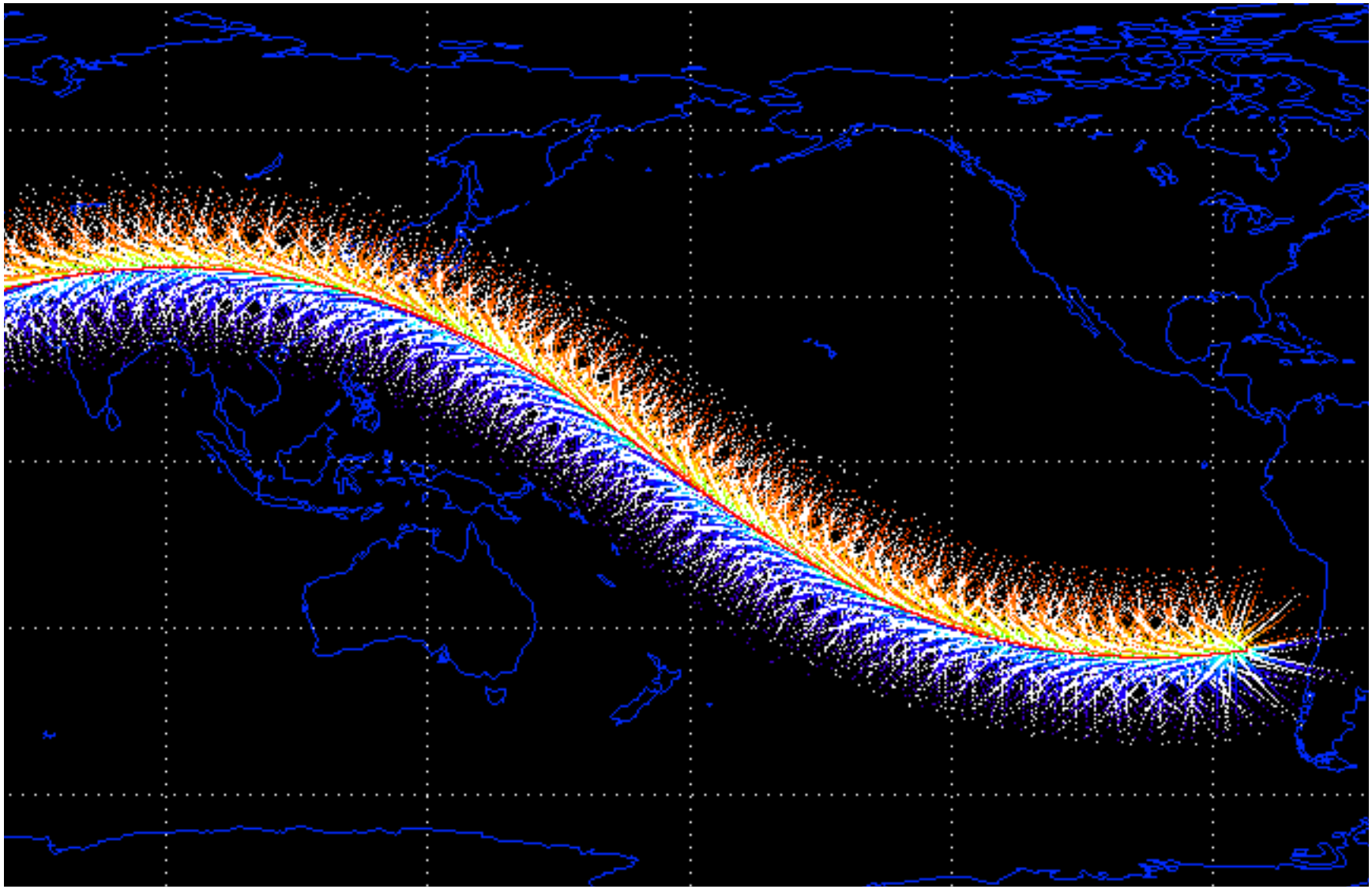
A series of end-to-end mission simulations and tests run by GSFC TRMM/EOSDIS projects.

In May, 1996, one such test resulted in the first real CERES instrument data flow:

- **Commands sent to instrument from TRMM operations center**
- **Instrument operated within the contamination covers (not radiometrically useful)**
- **Data packets collected by spacecraft and transmitted to ground station**
- **Level 0 processing completed at GSFC and results transmitted to LaRC DAAC**
- **Instrument subsystem processed data on Science Computing Facilities**
  - **Used toolkit to retrieve simulated satellite location and attitude**
  - **Clarified packet definitions and geolocation calculations**
  - **Produced BDS and IES data products**

This successful test demonstrates many of the processing steps which must be operational for the TRMM launch!

SDPF Level 0 Footprint(Colatitude and Longitude) Data- Hour 14



Working Group: ERBE-like

Responsible for:

- **Subsystem 2 (ERBE-like Inversion to Instantaneous TOA Fluxes)**
- **Subsystem 3 (ERBE-like Averaging to Monthly TOA Fluxes)**

Data Products:

- **ES-8 (Equivalent to ERBE Instantaneous TOA Estimates)**
- **ES-9 (Monthly Averaged Regional Parameters)**
- **ES-4, ES-4G (Monthly Averaged Regional, Zonal, Global Parameters by region and gridded)**
- **Scene ID Ancillary Input Data, Spectral Correction Ancillary Input Data**
- **Solar Declination values for each year, Albedo Directional Model values**

Current Status:

- **Release 1 Software, supporting data files, and Test Plan were delivered to DAAC (2/15/96).**
- **Testing small (~1000 records) input data set from the Instrument Subsystem.**
- **Updated Appendices for ATBDs.**

Near-term Plans:

- **Prepare ERBE-like Reference Manual.**
- **Continue testing of new ERBE ADM's.**
- **Continue analysis of NOAA-9 and NOAA-10 calibration for potential reprocessing.**
- **Develop operational scenario for and evaluate the feasibility of reprocessing the ERBE scanner data using CERES ERBE-like code.**

Working Group: Clouds

Responsible for:

- **Subsystem 4.1 - 4.3 (Clear/Cloud Detection, Cloud Layers, Optical Properties)**
- **Subsystem 4.4 (Convolution with CERES Footprint)**

Data Products:

- **SURFMAP (Surface Map and Properties)**
- **VIRS & MODIS & AVHRR (Cloud Imager Data)**
- **CRH (Clear Reflectance/Temperature History)**
- **CookieDough, CloudVis, CV_Subset, FOOTPRINTVal**
- **Intermediate SSF (Single Satellite Footprint - Cloud Properties)**

Current Status:

- **F90 Production code running on SCF SGI in 64-bit mode, Irix 6.2**
- **All Release 1 Science Algorithms Integrated:**

  CERES cloud mask - Welch, Baum
  AI cloud classification - Baum
  Cloud layers - Coakley
  Aerosol optical depth - Stowe
  Water droplet cloud properties - Platnick
  Microphysical and optical properties - Minnis
  Surface properties - Rutan

- **Producing hourly data products for October 1986**
- **Subsystem 4.4 testing square-footprint Release 2 algorithms**

Near-term Plans:

- **Release 2 delivery**
- **Support NASA Pathfinder Program - Global layered cloud systems to further develop CERES cloud retrieval algorithms.**

Working Group: Inversion and Surface Estimation

Responsible for:

- **Subsystem 4.5 (CERES Inversion to Instantaneous TOA Fluxes)**
- **Subsystem 4.6 (Estimate Longwave and Shortwave Surface Radiation Budget)**

Data Product:

- **Archival SSF (Single Satellite Footprint, TOA and Surface Flux, Clouds)**

Current Status:

- **Release 1 complete**
- **Release 2 SSF data product defined**
- **Conversion to Release 2 software started**
- **Initial hourly and daily QC reports for subsystem 4.5 available**
- **IDL software to visualize subsystem 4.5 parameters available**

Near-term Plans:

- **Finish converting software to Release 2**
- **Evaluate impact of ECS Release A on subsystem**

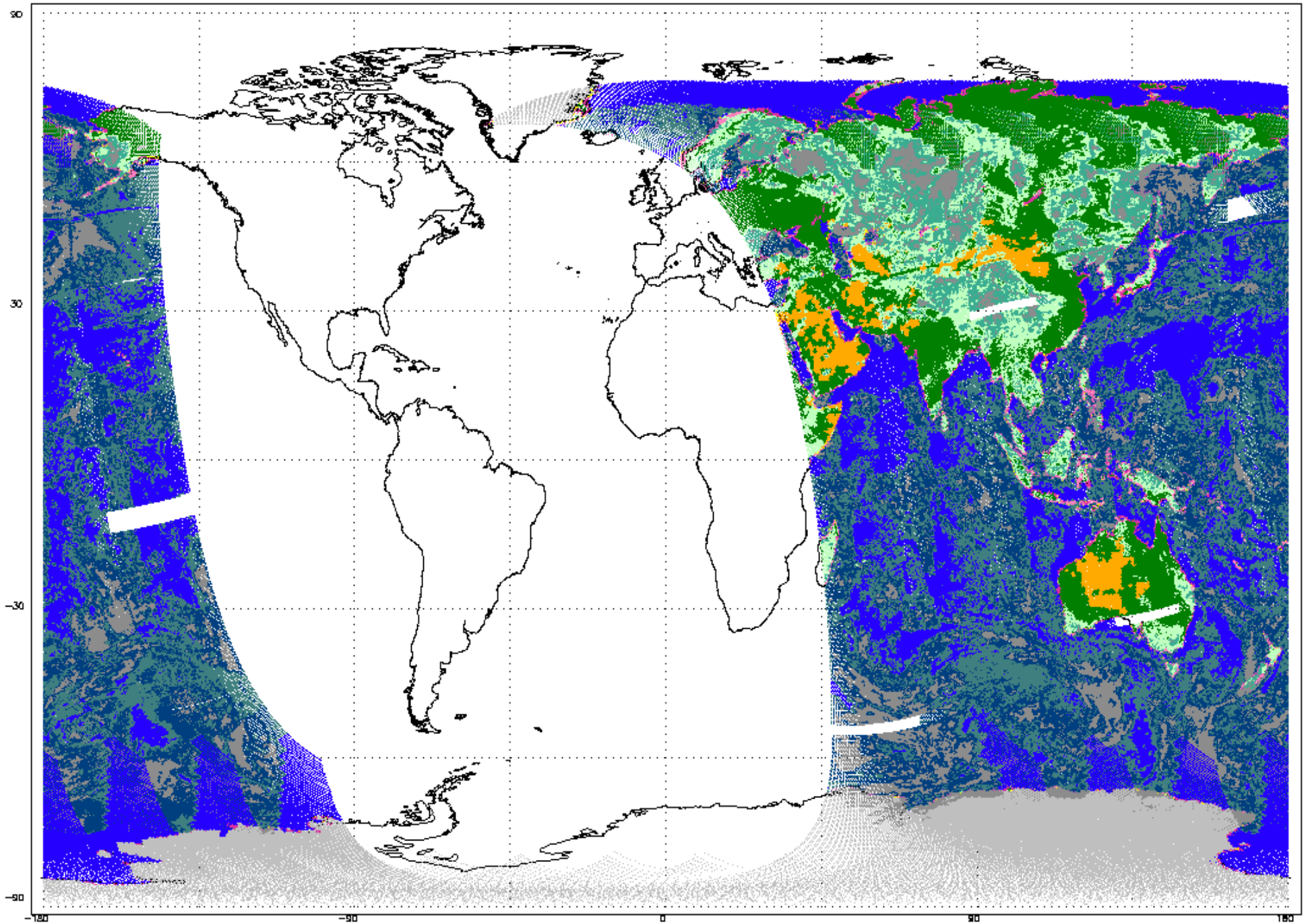
Data Date: 1986-10-15T00:00:07.11

Process Date: temp

SSF
SW Scene ID

Number of Hours: 12

Satellite: NOAA-9



Initial File: /CERES/Inversion/data/scr/Compare/SSF_19861015_00.CMP

Plot Date: Aug 26, 1996 08:39:10

Working Group: SARB - Surface and Atmospheric Radiation Budget

Responsible for:

- **Subsystem 5 (Compute Surface and Atmospheric Fluxes)**
- **Subsystem 7.2 (Synoptic Flux Computation)**
- **Subsystem 12 (Regrid Humidity and Temperature Fields (NCEP))**

Data Products:

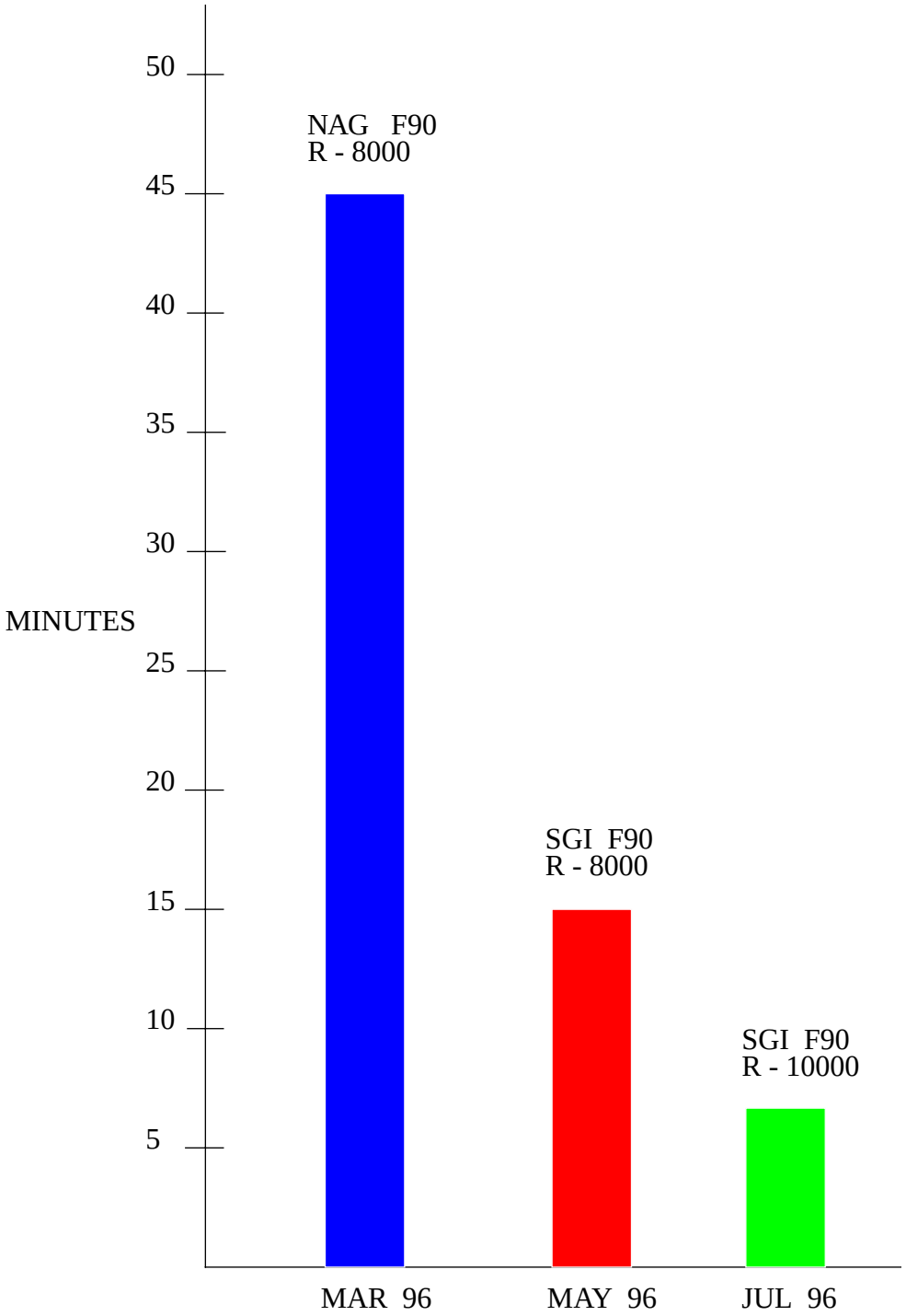
- **CRS (Single Satellite Footprint, and Radiative Fluxes and Clouds)**
- **SYN (Synoptic Radiative Fluxes and Clouds)**
- **MOA (Meteorological, Ozone, and Aerosol)**
- **MWH, APD, GAP, OPD External Ancillary Data Inputs**

Current Status:

- **All subsystems were delivered to the Langley DAAC on time**
- **Architectual Design Documents completed and posted to the web**
- **Developing a new version of the Regrid MOA Subsystem to use the DAO meteorological data, and to regrid the aerosol and ozone data to the same grid as the DAO data**
- **Incorporating Release 2 changes into Subsystems 5 and 7.2**
- **Updating Data Product listings for the MOA, CRS, and SYN**
- **Conducting timing studies on Subsystem 5 in an effort to decrease processing time**

Near-term Plans:

- **Complete version of Subsystem 12 that uses the DAO meteorological data.**
- **Continue incorporating Release 2 changes into Subsystems 5 and 7.2**



SARB TIMING TESTS - 1000 RECORDS

Working Group: TISA - Time Interpolation and Spatial Averaging

Responsible for:

- **Subsystem 6 (Hourly Gridded Single Satellite Fluxes and Clouds)**
- **Subsystem 7.1 (Time Interpolation for Single and Multiple Satellites)**
- **Subsystem 8 (Compute Regional, Zonal and Global Averages)**
- **Subsystem 9 (Grid TOA and Surface Fluxes)**
- **Subsystem 10 (Compute Monthly and Regional TOA and SRB Averages)**
- **Subsystem 11 (Grid Geostationary Narrowband Radiances)**

Data Products:

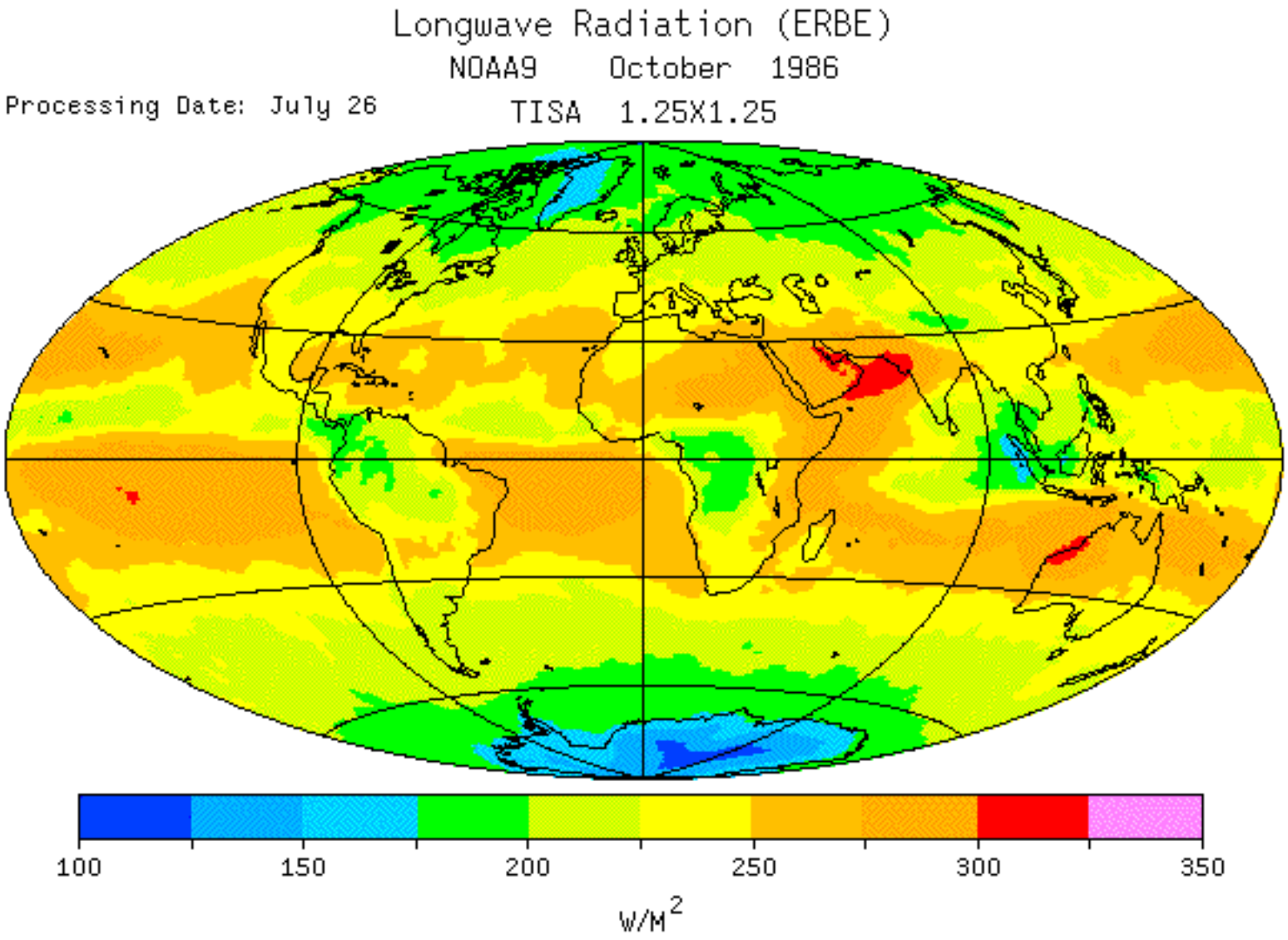
- **FSW - Hourly Gridded Single Satellite Fluxes and Clouds (Subsystem 6)**
- **SYN - Synoptic Radiative Fluxes and Clouds (Subsystem 7)**
- **AVG, ZAVG - Monthly Regional, Zonal and Global Radiative Fluxes and Clouds (Subsystem 8)**
- **SFC - Hourly Gridded Single Satellite TOA and Surface Fluxes (Subsystem 9)**
- **SRBAVG - Monthly Regional TOA and SRB Averages (Subsystem 10)**
- **GGEO - Ancillary Data Product: Gridded Geostationary NB Data (Subsystem 11)**

Current Status:

- **Release 1 DAAC testing nearly complete (5 down and 1 to go)**
- **Completed Architectural Design Documents; Updated Data Product Appendices for ATBD's.**
- **Designing HDF-EOS archival products in 1 degree equal angle grid**
- **Redesigning software code for 'nested grid' technique**
- **Redesigning software code to incorporate 'B1 contributed software', for 4 Geostationary Satellites: GOES-8, GOES-9, GMS, METEOSAT, into Grid Geostationary Narrowband Radiances, Subsystem 11.**

Near-Term Plans:

- **Modify Quality Control Reports for all subsystems to reflect changes in Data Products**
- **Develop validation tools**
- **Add hour overlap logic**
- **Continue Release 2 objectives: HDF-EOS, Metadata, product headers, code refinements and corrections to Release 1, finalize data products, and documentation**
- **NEED: 'footprint smoothing' and 'weighted-column-cloud properties' algorithms for Gridding (SS6 and SS9)**


Longwave Radiation (ERBE)
NOAA9 October 1986
Processing Date: July 26
TISA 1.25X1.25
100
150
200
250
300
350
W/M2

Impact of Grid Change on TISA Products

Subsystem	Product Name	1.25 deg Equal Area			1.00 deg. Equal Angle		
		files/mo	size/file,MB	size/mo,MB	files/mo	size/file,MB	size/mo,MB
6	FSW	144	~39	6,210	180	~69	12,512
7	SYN	248	66	16,368	248	203	34,943
8	AVG/ZAVG	2	733	733	2	1,233	1,233
9	SFC	144	~19	2,736	180	~38	6,847
10	SRBAVG	1	1,129	1,129	1	2,367	2,367
11	GGEO	1	524	524	1	816	816
Total				27,700			58,718

- **Change is approximately 5% increase for all CERES archival products.**
- **HDF-EOS versions will be larger**
- **Minor changes to content still underway**

Largest Processing PGE: TISA Subsystem 7.1

Data Set Name	1.25 deg =area	1 deg =angle
Post-MOA	14.383GB	6.560GB
GGEO	.341GB	.834GB
FSW	6.211GB	15.238GB
TSI	13.466GB	22.930GB
TSI sec.index	.026GB	.064GB
TOTAL File Size	34.427GB	45.626GB

Note: Parameters have changed between the two sets of products

CERES System Engineering Committee

Established May, 1996

Charter: Coordinate solutions to issues which cross working group boundaries

Members: Maria Mitchum (DMO), Sandy Nolan (SAIC), Jill Travers (DAAC)

Items Resolved:

- **Coordinated Release 2 Software Development Schedules for entire system**
- **Organized Release 2 Configuration Management DAAC delivery schedule**
- **Determined Release 2 Development Milestones and Timeline Chart**
- **Standardized Quality Control Report format**

Current Items:

- **Review Science Software Integration and Test Procedures Document**
  - **Agreement between LaRC DAAC and the CERES Instrument Team**
  - **Need detail description of DAAC 'deliverables' and required documentation**
- **Organize DAAC interface guidelines for scripts, environment variables, makefiles**
- **Determine naming conventions for PGE's and data files**
- **Standardize Process Control File product logical id's and file headers**
- **Determine production rules and run time parameters**
- **Obtain clear understanding of EOSDIS requirements for ESDT's and metadata**

Science Computing Facilities

- **Development and testing server configuration**
  - **SGI Power Challenge XL configured to match DAAC as closely as possible**
  - **8 R10000 MIPS processors (upgraded from R8000's - 4 more on order)**
  - **2 Gigabytes of memory (2 GB additional on order)**
  - **Configured 100GB of local disk space**
  - **Upgraded to IRIX 6.2**
  - **Installed SGI & NAG Fortran 90**
  - **Installed 32-bit and 64-bit SDP Toolkit 5.1**
  - **Installed Rational Verdix Ada**
  - **114GB optical jukebox configured (plan upgrade from 1.3GB to 2.6GB per platter)**
  - **Accessing Distributed Mass Storage System (over 5 TB of available storage) through high speed FIDDI connection**

- **Development and analysis workstation configuration**
  - **Sun Workstation OS upgrades from SunOS 4.1.3 to Solaris 2.5 underway**
  - **SGI Workstation OS upgrades from IRIX 5.3 to IRIX 6.2 underway**
  - **Moving from Framemaker version 4 to version 5 for documentation**
  - **Onsite/Offsite network upgrades planned to add a dedicated 10Mbps to each workstation and a dedicated 100Mbps network connection to each server (improved links to DAAC)**
  - **4 Sparc IPC and Sparc 1+ workstations upgraded to 150Mhz 64bit Sun Ultra Sparcs**
  - **2 Sun 330MP servers upgraded to 64 bit Sun Ultra servers**
  - **Majority of our SUN Sparc 2 workstations will be upgraded to SGIs or UltraSparcs**
  - **Configured three tape stackers to back up all workstations**

Validation and Visualization Aids

Develop tools for visualizing CERES data products to assist software development and support production processing and validation - understand the data and identify discrepancies

Features:

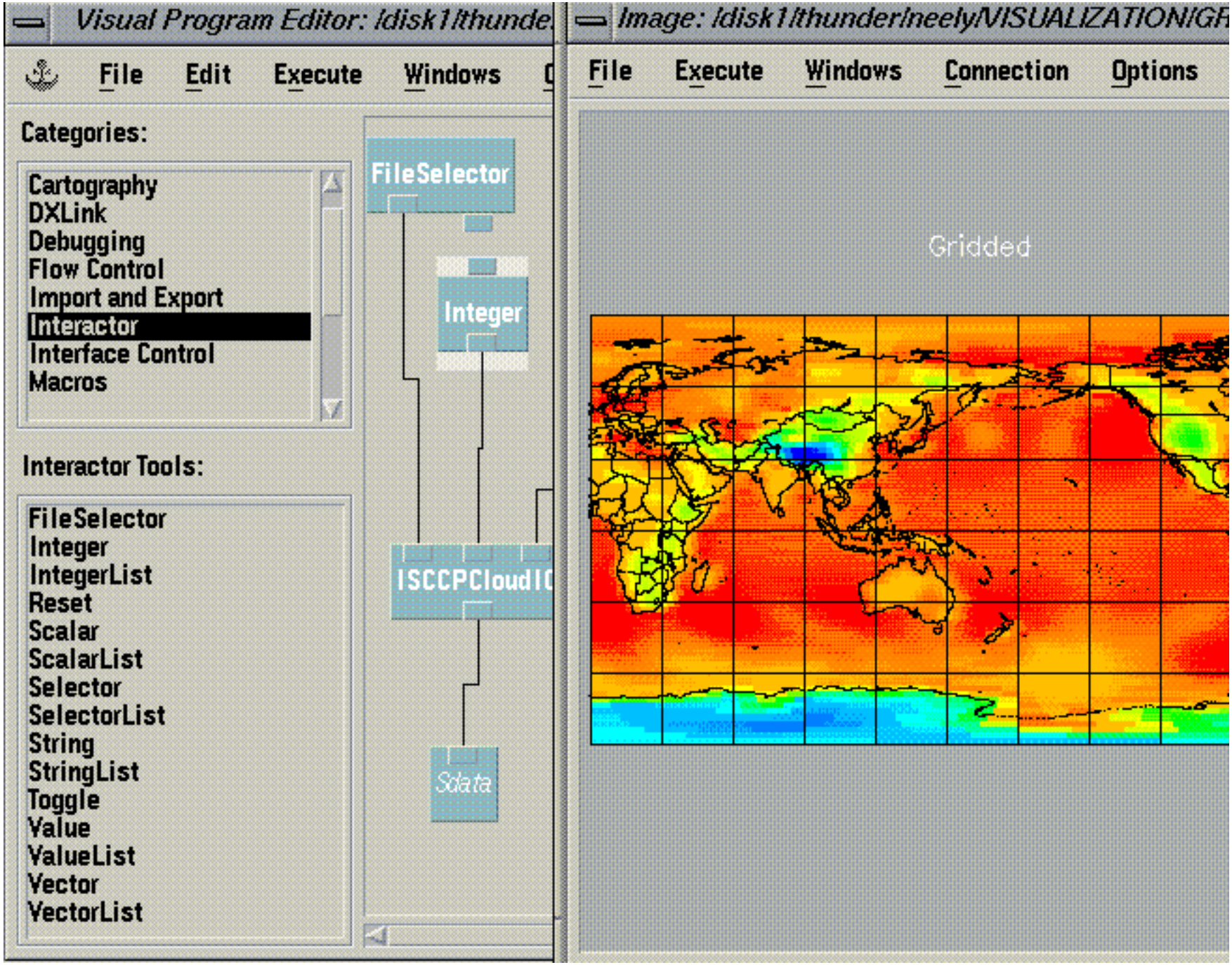
- **INTERACTIVE visualization & analysis**
- **Visualize CERES point, swath, and gridded data**
- **2D strip charts for quick look of 'raw' footprint data**
- **Global map projections (Hammer-Aitoff, Cylindrical Equidistant, Spherical ...)**
- **Isosurface, animation, cutting planes, time varying, contours ...**
- **IBM Data Explorer tools run on Sun and SGI platforms**

Tools & Current Status:

- **Developed FAST swath & gridded visualization modules**
- **Developed IBM Data Explorer point, swath, and grid visualization programs**
- **Developed interactive OpenGL multi-channel strip chart program**
- **Developed GUI Data Selector for Release 1 IES, SSF, and CRS data**
- **IBM Data Explorer interactive view of 24 hrs. of HDF-EOS S-8 data (~ 1.4 M points)**

Near Term Development:

- **Develop IBM Data Explorer Gridded Cloud visualizer**
- **Develop DX I/O Modules to support HDF-EOS point, swath, and gridded data**


Visual Program Editor: /disk1/thunde
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DXLink
Debugging
Flow Control
Import and Export
Interactor
Interface Control
Macros
Interactor Tools:
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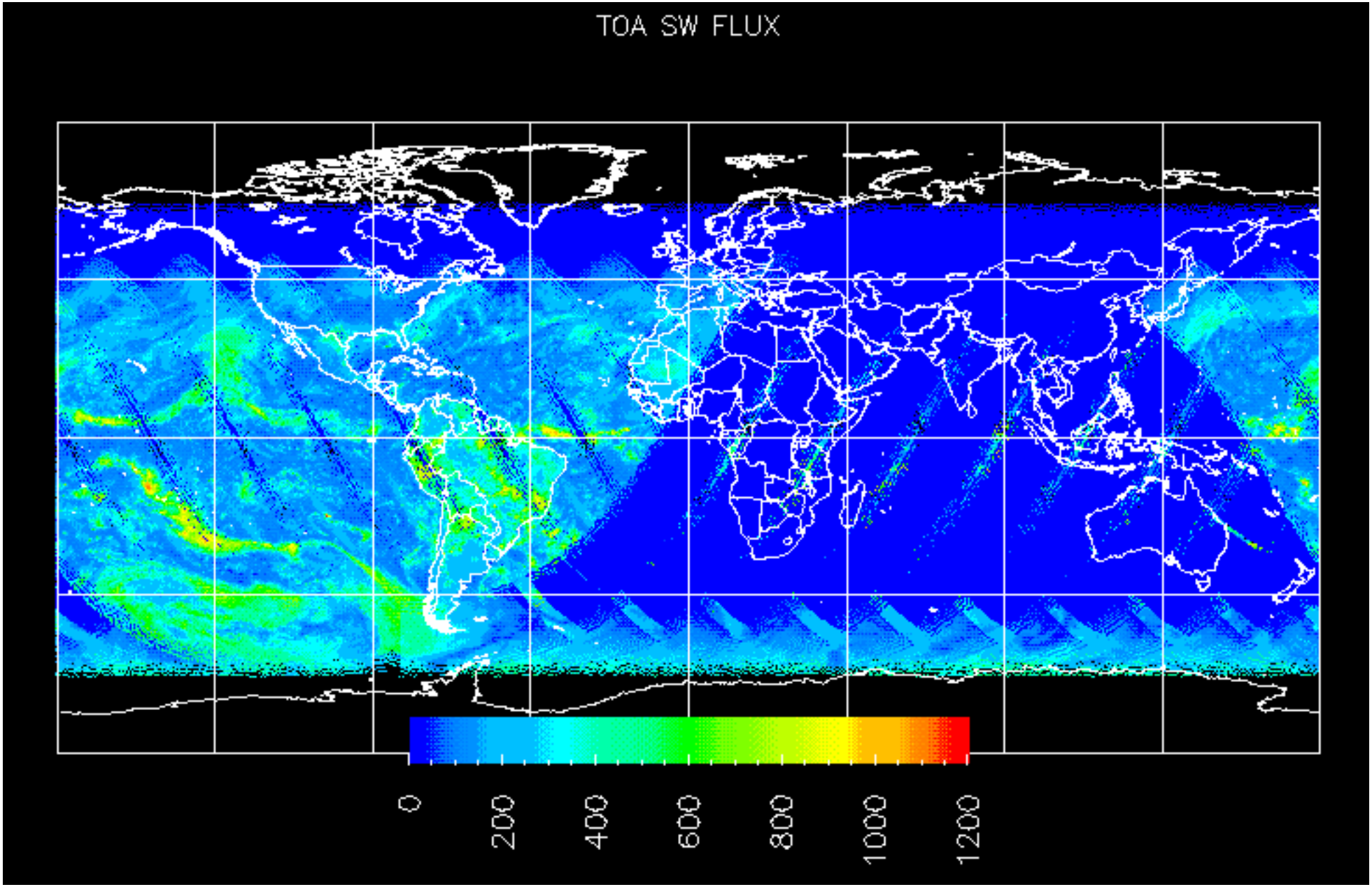
Options
Gridded

ERBE S-8 Converted to HDF-EOS by Hughes and displayed using Data Explorer



PGE Size as Delivered to LaRC DAAC - 9/96

Working Group	SS	PGE	Delivery Date	Software, Bytes				Data, MB	
				Code	Scripts	SMF/ PCF	Misc	Input	Out-put
Instrument	1.0	Instrument	2/16/96	2333040	17459	79149	6062707	.39	3.5
ERBE-like	2.0 & 3.0	Daily and Monthly	2/15/96	1385374	93015	12082	40510	82	632
Clouds	4.1 4.4	Cloud Retrieval Footprint Convolution	3/07/96 3/07/96	2301391 354974	24892 988	14215 14234	0 4594	273 617	115 43
Inversion	4.5	TOA/Surface Fluxes	3/06/96	137563	2123	4445	0	84	42
SARB	5.0 7.2 12.0	Instantaneous SARB Synoptic SARB MOA Regridding	3/21/96 3/28/96 3/01/96	405208 413415 296283	1417 1644 4049	15173 18171 22497	29125 29752 22923	47 76 12	2 66 986
TISA	6.0/6.1 7.1/8/10 7.1/10 9.0/9.1 11.0/11.1	Atmospheric Gridding Regional & Synoptic Avg Postprocess MOA Surface Gridding Grid Geostationary	3/21/96 3/14/96 3/14/96 3/14/96 3/05/96	(ss9) 699674 46121 475224 217806	(ss9) 2105 574 3828 1120	22241 51072 12136 21204 24776	0 337 540 0 0	37 679 986 26 705	12 1161 464 6 452
System		CERESlib & Utilities	2/26/96	739723	0	8061	2694	0	0
System Total				9805696	153214	319456	6193182	3624	3984

Estimated Size of I/O and Archival Products (TRMM) - 9/96

Working Group	Subsystem	I/O Per Run, MB	Archive Per Run, MB	Runs per Month	Archive per Mo., MB	6/95 Est., MB
Instrument	1.0 Geolocate and Calibration	1741	711	31	22039	19437
ERBE-Like	2.0 Inversion to TOA	1062	351	31	10881	8550
	3.0 Averaging to Monthly TOA	956	543	1	543	574
Clouds	4.1 - 4.3 Cloud Property Retrieval	1183		744		10416
	4.3.1 - Update CRH	1219	91	3	273	
Inversion	4.4 Footprint Convolution	882		744		
	4.5 - 4.6 TOA and SRB Estimation	507	238	744	176774	241056
SARB	5.0 Surface and Atmospheric Fluxes	341	48	744	35719	326616
	7.2 Synoptic Flux Computation	3126	145	248	36017	16368
	12.0 Regrid MOA Fields	306	277	31	8593	22320
TISA	6.0 Hourly Fluxes and Clouds, Gridding	302		744		
	6.1 Hourly Fluxes and Clouds, Region Sort	25024	12512	1	12512	6210
	7.1 Single/Mult Satellite Time Interpolation	43550		1		13392
	8.0 Regional, Zonal and Global Averages	32760	1234	1	1234	733
	9.0 TOA and Surface Fluxes, Gridding	247		744		
	9.1 TOA and Surface Fluxes, Region Sort	13694	6847	1	6847	3125
	10.0 Monthly and Regional TOA and SRB	16752	2367	1	2367	1129
	11.0 Grid Geostationary NB Radiances	8416	816	1	816	524
	12.1 Post-process MOA	15278		1		
Total				4816	314615	670450

Estimate assumes that CRS output from 5.0 is reduced to just the SARB-unique parameters.

CERES Release 1 Testing in LaRC DAAC IR-1 Environment: 2/96 - 9/96

Tested Code: 19 separate PGE's as delivered (and re-delivered) to DAAC starting 2/15/96, representing engineering versions of operational code. Not all functionality needed for TRMM launch is included.

Tested Data: ERBE data interpolated to CERES sampling rates and scan pattern, TRMM volume.

IR-1 Test Environment: All tests run by DAAC personnel on Science Processor (SGI Challenge XL). No attempt to run in a single-user dedicated mode, but the system was lightly loaded.

Operating System: IRIX64 6.1
Compilers: NAG F90 v2.1 -O optimization, SGI C v6.1 -O optimization, Rational Ada v623.53.3 default optimization
Libraries: HDF v3.3r4, HDF v4.0r1, SDP DAAC Toolkit v5.0
Hardware:

Processor 0: 75 MHZ IP21 (90Mhz processors also installed but they apparently run only at 75 Mhz if mixed)
CPU: MIPS R8000 Processor Chip Revision: 2.2
FPU: MIPS R8010 Floating Point Chip Revision: 0.1
Data cache size: 16 Kbytes
Instruction cache size: 16 Kbytes
Secondary unified instruction/data cache size: 4 Mbytes
Main memory size: 1024 Mbytes, 4-way interleaved
I/O board, Ebus slot 15: IO4 revision 1
Integral EPC serial ports: 4
Integral Ethernet controller: et0, Ebus slot 15
FDDIXPress controller: ipg0, version 1
EPC external interrupts
Integral SCSI controller 1: Version WD33C95A, differential, revision 0
Disk drive: unit 1 on SCSI controller 1
Integral SCSI controller 0: Version WD33C95A, single ended, revision 0
Integral SCSI controller 4: Version SCIP/WD33C95A, differential
Integral SCSI controller 3: Version SCIP/WD33C95A, differential
Disk drive: unit 1, lun 3 on SCSI controller 3
Disk drive: unit 1, lun 2 on SCSI controller 3
Disk drive: unit 1, lun 1 on SCSI controller 3
Disk drive: unit 1 on SCSI controller 3

CERES Release 1 DAAC Performance Measurements - 9/96

One execution on IR-1 configuration of each PGE at production-level volume expected for TRMM launch.

SS	PGE	Test Date	Time,sec			Block Operations		Peak Memory MB	Disk Storage, MB					Runs per Mnth
			Wall	User	System	Input	Output		Input	Temp	Interm	Arch	Logs	
1.0	Instrument	6/05	50157	36718	2825	42258	21206	40.5	92	0	809	760	7.500	31
2.0	Daily TOA Inversion	4/19	691	298	35	3398	750	3.0	197	197	13	338	.023	31
3.0	Monthly Averaging	5/02	2777	1274	685	6694	13033	14.7	399	410	0	164	2.200	1
4.1	Cloud Retrieval	5/02	10824	9069	1179	1489	103	232.6	205	0	746	0	.020	744
4.4	Footprint Convolution	5/07	12361	11945	134	14435	17	10.2	644	0	246	0	.014	744
4.5	TOA/Surface Fluxes	5/07	357	129	93	2521	115	1.8	287	0	0	246	.008	744
5.0	Instantaneous SARB	5/09	327869	290347	31873	9810	67	1.5	294	0	0	350	.001	744
7.2	Synoptic SARB	8/03	48600	34556	12861	27597	259	29.7	1813	0	26	69	.001	248
12.0	MOA Regridding	4/25	2166	1799	161	80	2922	45.2	12	0	0	986	.011	31
11.0	Grid Geostationary	5/25	7238	6913	206	1710	18	12.6	105	0	72	0	.001	6
11.1	Sort GGEO	6/02	40676	666	4556	44921	4706	1.0	410	0	0	341	.001	1
9.0	Surface Gridding	6/05	9504	9085	159	5808	395	160.3	246	0	7	0	.001	744
9.1	Sort SFC Files	7/25	3039	962	1930	137126	754	226.4	4328	4322	0	4322	.001	1
12.1	Post-process MOA	7/24	27526	1204	9066	3650975	30	2.4	30574	0	14383	0	.001	1
10.0	TOA/SRB Averaging	7/26	22125	12122	2781	1036593	5	144.3	19045	0	0	1183	.001	1
6.0	Atmos. Gridding	6/14	9541	9149	150	8190	494	156.0	350	0	13	0	.001	744
6.1	Sort FSW Files	7/26	3113	102111	1807	266696	757	233.5	8541	8539	0	8539	.001	1
7.1	Synoptic Interpolate	7/31	20053	11527	3374	847012	2	39.5	23263	0	13492	0	.001	1
8.0	Synoptic Averaging	8/29	17700	9698	2225	677610	2	303.0	17159	0	0	9664	.001	1
System Total			289 E6	255 E6	28 E6	46 E6	1.7 E6		2071G	19G	813G	549G	269	4816

System total: multiply each PGE measure by the number of Runs per Data Month for that PGE, then add all PGE's. Some PGE's will require more resources for each instrument on EOS-AM and EOS-PM.

SS 4.1 timing increased by 25% to account for processing nighttime data which is not done in this release.

SS 5 resources scaled from partial test of 45,531 footprints processed out of 186,137 footprints expected.

SS 7.2 resources scaled from partial test of 1591 regions out of 26401 regions expected.

SS 8.0 resources scaled from partial test of 6 3-hour periods out of 248 periods expected.

Items Which Affect Future CERES Performance Estimates

Preliminary testing of SGI Fortran 90 V6.2 compiler on SCF SGI Challenge XL(IRIX64 6.2):

- **SS 4.4 runs about 2 to 2.5 times faster than with NAG F90**
- **SS 5.0 runs about 3 times faster than with NAG F90**

For unknown reasons (perhaps RAID disks?), DAAC IR-1 runs about twice as fast as SCF which is usually fully loaded.

Release 1 code uses a 1.25 degree equal-area grid. This code is being modified to use the EOS 1 degree equal-angle modelling grid to avoid large re-gridding errors. All resource and sizing measurements for SS 6 through 12 should be multiplied by approximately 2.5

Very little effort has been spent optimizing any of the subsystems. We are still figuring out how to do the job at all, then we'll worry about doing it faster.

Performance optimizations are likely to be at least partially offset by completion of the science algorithms. Some mission-essential functions are not tested in Release 1. Examples:

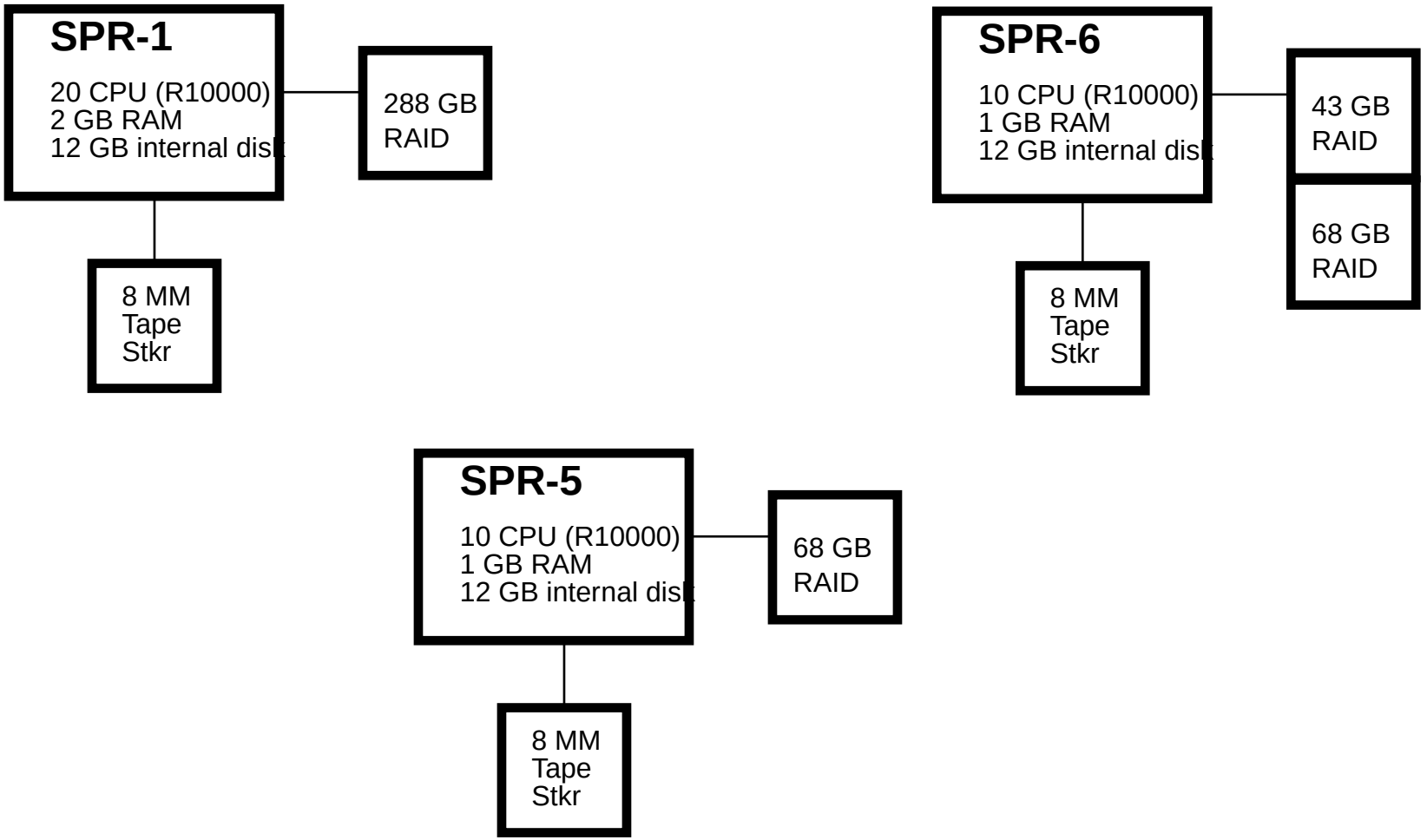
- **Only the normal Earth-scanning mode is processed in Instrument. Calibrations and other operational modes such as rotating azimuth and short scan must be implemented in Release 2.**
- **Only daytime cloud retrievals are performed. Night-time algorithms must be completed.**
- **Monthly interpolation of cloud properties is not included. Shift from ISCCP B3 to B1 ancillary data sets will increase product volume and processing time.**

SCF is upgrading from R8000 to R10000 CPU chips at factor of 2 to 3 speed improvement (requires IRIX64 V6.2)

Convert these measurements to megaflops at your own risk!

Langley Release A Science Processor Configuration

“A.1/B Delivery” (1Q 1997)



Can we run TRMM on the DAAC?

- **Our Release 1 testing showed 289,496,000 seconds of wall clock time to run a month.**
- **Or, 108 months to run a month's worth of data!**
- **However, we pick up about a factor of 2.5 going to SGI compiler and another factor of about 2.5 going to R10000 chips instead of R8000 chips.**
- **This reduces the time to about 17 months to run a month's worth of data.**
- **If we assume that 20 CPU chips are available at TRMM launch, then we can run a month of data in about 0.9 month - Hooray!**
- **Conclusion: we are within hailing distance, but,**
  - **Need Release 2 algorithms => CPU time will go up**
  - **Need optimization of codes to allow margins for down time and reprocessing**
  - **ECS at GSFC is studying SARB now. Others will follow.**

System-Wide Release 2 Issues

Produce all archival data products in Hierarchical Data Format (HDF-EOS)

Finalize required metadata for every data product

Use mandatory SDP Toolkit calls and test new Toolkit releases

Produce realistic measurements of computer system resource requirements

Define and implement QC reports: statistical summaries output from each PGE to convince us things are working or identify problems

Update all documentation and expand as needed

Revise Release 2 DAAC delivery procedures to streamline the process.

Use Release 1 software to verify EOSDIS Release A prior to our Release 2 deliveries

Concern: Evolving EOSDIS production rules, metadata, hardware and software environment causes uncertainty in target production system and may have large impacts on our delivered software.

Release 2 Issues for Each Working Group

Instrument:

- **Planned Release 2 functions:**
  - **Solar calibration processing**
  - **Diagnostic packet processing**
- **Add coastline detection for geolocation validation**
- **Unplanned to account for instrument anomalies:**
  - **'Second time constant' unfiltering**
  - **Azimuth and elevation beam misalignment corrections**

ERBE-Like:

- **Final CERES spectral correction coefficients**
- **New ERBE ADMs**
- **Calibration problems for both NOAA 9 and NOAA 10 (ERBE Reprocessing)**

Clouds:

- **Generate read routines for all input Release 2 Data Sets - test with simulations**
  - **VIRS, MODIS, other ancillary data sets**
- **Use Toolkit functionality where necessary, convenient, or required**
- **Update current science algorithms with new releases**
- **Add new science algorithms with input and output interfaces**
- **Update:**
  - **Data Product Catalog**
  - **Interface Requirements Document for external ancillary data**
  - **Design Documents and User's Guides**

Release 2 Issues for Each Working Group

Inversion:

- **Use final CERES spectral correction coefficients**
- **Update LW surface estimation algorithms as needed**
- **Incorporate Release 2 SSF data product definition changes**
- **Identify and incorporate changes driven by ECS Release A**

SARB:

- **Use the Fu-Liou model with revised correlated-k distributions to simulate the 8-12 micron window flux. (Operational)**
- **As strongly suggested by the Science Team, develop an algorithm that tunes the atmospheric fluxes to the estimated surface flux. (Operational)**
- **Develop a simulation of imager radiances (VIRS, MODIS, AVHRR). This is a research product for validation and quality control.**
- **Subsystem 12.0: The only expected changes for MOA are directly related to any changes in the input products. (likely an ongoing problem...)**

TISA:

- **Add validation requests from Science Team**
- **Add hour overlap logic**
- **Change Geostationary data from B3 to B1**
- **Need: ‘footprint smoothing’ and ‘cubic spline’ flux averaging algorithms**
- **Need: Special averaging for 'weighted-column-averaged-cloud' properties**

Near-Term Plans

- **Mission simulation tests with live CERES data from TRMM**
- **Pin down ATBD-2 changes and publish Data Products Catalog**
- **Continue optimization of CPU-intensive subsystems**
- **Design, coding and testing of Release 2 changes**
- **If TRMM launch date slips, we will consider a round of design and code reviews**