NATIONAL POLAR-ORBITING OPERATIONAL ENVIRONMENTAL SATELLITE SYSTEM (NPOESS) PREPARATORY PROJECT (NPP)

CLOUDS AND THE EARTH'S RADIANT ENERGY SYSTEM (CERES) SCIENCE AND DATA PRODUCTS WORKING AGREEMENT

BETWEEN

NPP PROJECT OFFICE
NASA GODDARD SPACE FLIGHT CENTER

AND

CERES PROJECT TEAM
NASA LANGLEY RESEARCH CENTER

Code 429

Effective Date:

Expiration Date:

Check the NPP CCR website at **https://cicero.eos.nasa.gov/npp** to verify that this is the correct version prior to use.

**GODDARD SPACE FLIGHT CENTER
GREENBELT, MARYLAND**

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Goddard Space Flight Center
Greenbelt, Maryland

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1.0   PURPOSE

This working agreement defines the execution/operations phase responsibilities and program milestones of the Investigation Team (IT) for the Clouds and the Earth's Radiant Energy System (CERES) Flight Model 5 (FM5) instrument of the National Polar-orbiting Operational Environment Satellite System (NPOESS) Preparatory Project (NPP). This work includes, but is not limited to, developing and maintaining scientific software to produce standard and special data products from CERES instrument observations; generating standard and special data products; ingesting input data; archiving and distributing standard and special data products; validating the data products; leading the scientific research to support the NPP Science Plan; and providing support for the operation of the instrument.

The activities of the Atmospheric Science Data Center (ASDC), formerly known as the Distributed Active Archive Center (DAAC), at the Langley Research Center (LaRC), in support of NPP is considered part of the IT.

This agreement identifies the responsibilities, deliverable items, and data products to be provided by the IT as well as the resources to be supplied by the Science Data Segment (SDS) located at Goddard Space Flight Center (GSFC). The list of these resources is provided in Section 3.0. The schedule of deliverables is included in Section 6.0.

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2.0   APPLICABLE DOCUMENTS

2.1.   Requirements Documents

The requirements identified in the following documents apply to this working agreement:

Reference #   Title

1.   NPP Science Plan, Document No. 429-00-03-01.
2.   NPP Calibration and Validation Plan, Document No. 429-00-03-02.
3.   NPP SDS Operations Concept, Document No. 429-05-11-02, dated November 28, 2006.
4.   NPP Mission Operations Management Plan, Document No. 429-04-02-29, dated October 5, 2004.
5.   NPP Space Segment Operations Concept, Document No. 429-00-07-04, dated February 7, 2002.
6.   NPP Interface Data Processing Segment (IDPS) to SDS Interface Requirement Document (IRD), Document No. 429-00-02-13.
7.   NPOESS Common Data Format Control book (CDFCB) Volumes 1-7, Document No. D36953-01..07, dated various.
8.   NPP Mission Data Format Control Book (MDFCB), Document No. 429-05-02-42, dated February 28, 2006.
9.   Interface Control Document between the Earth Observing System Data and Information System (EOSDIS) Core System (ECS) and the Science Investigator-led Processing System (SIPS) Volume 0 Interface Mechanisms, Document No. 423-41-57, July 5, 2007.
10.   NPP SDS Requirements Specification, Document No. 429-05-11-01, dated December 18, 2007.
11.   NPP System Engineering Management Plan, Change 01, Document No. 429-03-02-23, dated June 17, 2005.
12.   NPP Working Agreement for the Clouds and the Earth's Radiant Energy System (CERES) between NASA Goddard Space Flight Center and NASA Langley Research Center, Document No. 429-08-01-15, dated May 22, 2008.

Note: All subsequent references to these documents are indicated by the reference #.

2.2.   CERES Documents

Langley documents created in response to NPP requirements have precedence over the above reference documents. The documents below will be placed under CM control after approval. The documents required by this working agreement are:

1.   CERES NPP Science Processing Requirements Document, being written.
2.   CERES NPP Calibration and Validation Plan, being written.
3.   CERES Software Management Plan, being written.
4.   Information Technology Security Plan for the Science Directorate Servers (SDS) Document No. SC-008-M-LRC-1002, dated September 23, 2007.

5.   Information Technology Security Plan for the Science Directorate Computing Environment (SDCE) Document No, SC-011-M-LRC-1001, dated September 24, 2007.
6.   CERES ATBD Instrument Geolocate and Calibrate Earth Radiances, dated June 2, 1997.
7.   CERES ATBD Imager Clear-Sky and Cloud Detection, dated June 2, 1997.
8.   SDS Land PEATE to Earth Radiation Budget Climate Analysis Research System (ERBCARS) Interface Control Document (ICD), being written.
9.   CERES NPP VIIRS Sub-sampling Software Test Plan, being written.
10.   CERES Operations Agreement with the SDS Land PEATE, being written.
11.   CERES Validation Plan Overview, dated October 20, 2000.

3.0   RESOURCES SUPPLIED BY NPP SCIENCE DATA SEGMENT (SDS)

This section describes what will be made available to the CERES IT (at no additional cost) as part of this agreement.

3.1.   CERES Instrument Data

The CERES IT requires the Level-0 CERES FM5 data from the NPP satellite and the corresponding attitude and ephemeris data. The Interface Data Processing Segment (IDPS), located at the National Oceanic and Atmospheric Administration (NOAA) Suitland National Environmental Satellite, Data, and Information Service (NESDIS) Facility, will produce the CERES Raw Data Records (RDRs) containing the Level-0 CERES FM5 data for all CERES Application Process Identifiers (APIDs) and the corresponding attitude and ephemeris data. Three different collections of CERES RDRs are expected with the following short names: CERES-SCIENCE-RDR, CERES-TELEMETRY-RDR, and CERES-DIAGNOSTIC-RDR. The CERES RDR data formats are defined in Reference 7, Volume 2. The Science Data Segment (SDS) Data Depository and Distribution Element (SD3E) subscribes to the Level-0 CERES FM5 Instrument Data, i.e., CERES RDRs from the NESDIS IDPS and will store and forward the data to the SDS Land Product Evaluation and Algorithm Tool Element (PEATE) for subsequent transfer to the ASDC.

3.1.1.   Routine CERES Instrument Data

The SDS Land PEATE will provide CERES instrument data electronically to the ASDC in a routine manner without processing or otherwise modifying the content, in accordance with Reference 3. The NASA Integrated Services Network (NISN) direct network connection with sufficient bandwidth will be used for this data transfer (Section 3.6).

CERES Instrument data processing at the IDPS is expected to begin when FM5 is powered on after launch and prior to the covers opening as described in the GSFC to LaRC Working Agreement for Instrument Activation Plan. The SDS Land PEATE will begin nominally providing CERES instrument data to the ASDC within 24 hours of its receipt of the initial file from the NESDIS IDPS and, thereafter, will provide 90% of the CERES Instrument Data within 24 hours, 95% within 48 hours, and 99% within 1 month. This latency metric for FM5, as well as for the NPP Visible Infrared Imager Radiometer Suite (VIIRS) metric that follows, is summarized in Table 3-1~~Table 3-1~~ and is applied to the data processed by the IDPS. It excludes times when either an instrument is not operating; the military has implemented data denial operations; ground stations or spacecraft preclude data collection by the FM5 or VIIRS instruments; or during maintenance activities that shutdown power, air conditioning or network connectivity in the facility housing the SD3E and SDS Land PEATE. Latencies presented in Table 3-1~~Table 3-1~~ are calculated by averaging latencies in product delivery over a 12-month period. If additional data sets are needed for flight operations planning, gap analysis, or data processing, they will be made available to the ASDC as requested by the CERES IT and negotiated with the SDS elements: SD3E and SDS Land PEATE.

3.1.2.   Missing CERES Instrument Data

In the event that the CERES Instrument data were produced by the IDPS and were not received by the ASDC, the ASDC will reorder the data from the SDS Land PEATE in an agreed upon manner. The SDS Land PEATE will be capable of retrieving the data from the SD3E or from NOAA's National Climate Data Center (NCDC) using the

Comprehensive Large Array-Data Stewardship System (CLASS) and providing it to the ASDC. This applies to both CERES Instrument Data and Sub-Sampled NPP VIIRS Radiance and Geolocation files.

Table 3-1. Data Start, ASDC Initial Receipt, and Latency for Data Products from GSFC

Item	Data Start	ASDC Initial Receipt	Latency Thereafter			
			90%	95%	98%	99%
CERES Instrument Data (RDR)	Power-On	SDS Land PEATE Receipt + 24 hrs	24 hrs	48 hrs	---	1 mo
Sub-sampled NVCD Radiance and Geolocation	Covers Open	Covers Open + 1 mo	48 hrs	72 hrs	1 mo	2 mos
NPP VIIRS Aerosol Optical Thickness	Covers Open	Covers Open + 3 mos	72 hrs	96 hrs	1 mo	2 mos

3.2.   NPP VIIRS for CERES Data

The CERES IT also requires NPP VIIRS imager data sets with consistent radiance calibration that will be used as input for the production of climate-quality CERES data sets. NPP VIIRS data will be provided to the SDS Land PEATE by the IDPS, similarly to the RDRs. The SDS Land PEATE will produce climate-quality NPP VIIRS imager radiance data and aggregate the radiance and geolocation data, in a manner similar to the 5-minute Moderate Resolution Imaging Spectroradiometer (MODIS) granules produced for Terra and Aqua, from the time the NPP VIIRS covers open forward. This aggregate data set will be generated whenever the NPP VIIRS input is available. The quality of the NPP VIIRS data will be monitored and reported to the CERES IT by the NPP Instrument Calibration and Support Team (NICST). The SDS Land PEATE will provide all the computing facilities required by NICST. If the standard VIIRS aerosol optical thickness (AOT) data set does not meet the CERES IT requirements, the SDS Land PEATE will also compute a new VIIRS AOT data set based on the previously described aggregate NPP VIIRS radiance and geolocation data. The collection of these aggregate radiance and geolocation files and the aerosol files are referred to as NPP VIIRS for CERES Data (NVCD).

To ensure the climate integrity of the CERES dataset, the CERES IT will negotiate any and all calibration or algorithm adjustments to the production process for NVCD including the need for reprocessing with the SDS Land PEATE. SDS Land PEATE production of the NVCD will be performed on computer systems added to the Land PEATE exclusively for this sole purpose.

3.3.   Sub-Sampling of NPP VIIRS for CERES Data

The CERES IT will provide the SDS Land PEATE with software to sub-sample the NPP

VIIRS aggregate radiance and geolocation data sets described in Section 3.2. This sub-sampling will reduce the number of channels and pixels within the data set. The format of the NVCD will be described in the CERES Data Product Catalog. The SDS Land PEATE will execute the sub-sampling software and will provide the output to the ASDC. The SDS Land PEATE will provide the complete aerosol data sets in Hierarchical Data Format (HDF) 4 format to the ASDC.

The SDS Land PEATE will begin providing NVCD to the ASDC within one month of NPP VIIRS opening covers and subsequently will provide 90% of sub-sampled NPP VIIRS radiance and geolocation data within 48 hours, 95% within 72 hours, 98% within a month, and 99% within two months. The data temporal coverage needed is from covers open until mission end. This information is summarized in Table 3-1~~Table 3-1~~.

Similarly the SDS Land PEATE will provide aggregate AOT data using NVCD to the ASDC within three months of NPP VIIRS opening covers and subsequently will provide 90% of the NPP VIIRS aerosol data within 72 hours, 95% within 96 hours, 98% within a month, and 99% within two months. The data temporal coverage needed is from covers open until mission end.

3.4.   Missing NPP VIIRS for CERES Data

The ASDC will inform the SDS Land PEATE of missing NVCD records regardless of age. If the data cannot be or cannot easily be reprocessed by the SDS Land PEATE, the CERES IT and SDS Land PEATE will discuss options and negotiate a mutually agreeable ad-hoc solution. The SDS Land PEATE will reprocess the NPP VIIRS data as needed and will provide it to the ASDC.

3.4.1.   Improved NPP VIIRS for CERES Data

If the CERES IT and the SDS Land PEATE agree on a calibration or algorithm change that includes reprocessing, the SDS Land PEATE will reprocess the entire NVCD radiance and AOT data set from covers-opened forward, will sub-sample the data as needed, and will provide it to the ASDC.

3.5.   Ancillary and Auxiliary Data

If ancillary or auxiliary data sets are needed or used, the SD3E will have the capability to make them available to CERES IT via the SDS Land PEATE.

3.6.   Network Communication

The NPP SDS will provide and maintain the network connection between the SDS Land PEATE and the ASDC via the existing MODIS to LaRC NISN connection that meets the CERES data latency requirements. The demarcation point for data delivery is the external service provided router in Building 1201~~2~~ at LaRC.

3.7.   Data Delivery Interface

The SDS Land PEATE stages products required for CERES processing on NPP in the same manner as the MODIS Adaptive Processing System (MODAPS) system stages products from MODIS for CERES processing on Earth Observing System (EOS) Terra and Aqua missions. Specifically, the SDS Land PEATE delivers products to a directory on a GSFC File transfer Protocol (FTP) server and the ASDC pulls products from this server using FTP. The Science Investigator-led Processing System (SIPS) Interface, defined in Reference #9, will be used to transfer data products from the FTP server at GSFC to the ASDC to automate the product delivery process. The delivery process

includes: verifying the integrity of products delivered, retransmitting missing or defective products, and deleting successfully delivered products from the FTP server.

4.0   CERES IT RESPONSIBILITIES

The Earth Radiation Budget Climate Analysis Research System (ERBCARS), a logical element of the SDS, leverages existing processing capabilities and human resources across the CERES Science Team, the CERES Data Management Team (DMT), and the ASDC at LaRC. The Science Team, consisting of the Principal Investigator, the Co-Investigators, and others, derives, maintains, and refines science algorithms to produce climate-quality data products from the CERES FM5 instrument to characterize global climate change and validates the climate-quality data products. The DMT implements these research science algorithms as operational software. The ASDC places the operational software into production; ingests data from external sources; and archives and disseminates the climate-quality data products.

The CERES IT will use a combination of existing and new documents to satisfy any of the documentation delivery requirements if all pertinent information is provided. The CERES IT will update all documents as needed.

4.1.   Scientific Research

The Principal Investigator and the Co-Investigators will carry out scientific investigations leading to the publication of results in proceedings of scientific meetings and refereed scientific journals. The investigators will ensure a citation identifying NPP is contained in each publication resulting from work supported by this funding.

The CERES IT will provide expertise to the scientific community regarding CERES standard and special data products.

4.2.   Algorithm Development, Calibration, and Validation

4.2.1.   Algorithm Theoretical Basis Documents (ATBD)

The IT has written documents providing the theoretical basis for the algorithms used to generate each standard data product. These documents are available on the CERES website http://science.larc.nasa.gov/ceres/ATBD/.

4.2.2.   Calibration

The IT will be responsible for both pre-launch and post-launch calibration activities for CERES.

The IT will support the pre-launch calibration activities of the instrument contractors. The IT will ensure that instrument characteristics and calibration parameters are incorporated into the appropriate production processing software and data tables.

The IT will monitor on-orbit calibration over the life of the instrument and will incorporate needed changes into the calibration software and/or parameters. The IT will archive, in the ASDC archive, correlative or ground-truth observations made in support of the calibration of the instrument and will keep a record in the ASDC archive of any changes in calibration parameters and/or software used during the life of the instrument.

In support of the calibration activity, the IT will develop (or update) the Calibration and Validation Plan for the CERES instrument. The plan will identify the calibration information required from the instrument developer and will describe pre-launch calibration, instrument characterization activities, and the associated schedule. The plan

will describe the planned implementation of long-term calibration and its incorporation into data products and the plans for archiving information related to calibration.

4.2.3.   Science Data Validation

The IT will be responsible for the validation of scientific data generated from the CERES instrument, in conjunction with the overall NPP data validation activities in Reference #2, and in accordance with the scientific investigation objectives and with Level-1 requirements.

The IT-developed science data validation plans for Tropical Rain Measuring Mission (TRMM), Terra, and Aqua will also be used for NPP. These documents are available on the CERES website http://science.larc.nasa.gov/ceres/validation.

These plans:

a. describe the algorithm validation approach that addresses the scientific validity of the algorithms as opposed to the ability of the software to run to completion correctly;

b. describe how the accuracy, precision, and resolution will be confirmed;

c. list those experimental activities that are required for the CERES validation effort (Department of Energy (DOE) Atmospheric Radiation Measurement (ARM), Baseline Surface Radiation Network (BSRN), and Chesapeake Light); and

d. list those operational measurements that are required for the instrument validation.

4.3.   Production Processing Software

4.3.1.   Production Processing Software Development

The IT will develop production processing software, Product Generation Executives (PGEs), and scripts at the Science Computing Facility (SCF) (see Section 4.5) for producing standard CERES data products. This software will be designed to execute at the ASDC. This software will conform to the CERES coding guidelines initiated earlier for TRMM, Terra, and Aqua.

The IT will also be responsible for the development and maintenance of the software that generates metadata and any browse data associated with standard data products.

4.3.2.   Planning Documentation for Software and Data Management

The CERES IT will develop a Software Management Plan that includes both software and data management considerations for FM5. The Software Management Plan will be based on NPR 7150.2, NASA Software Engineering Requirements.   The CERES Software Management Plan will specify the process to be followed for the NPP CERES FM5 software development and data management with appropriate references to the existing CERES process plans and will provide an overview of project schedules, organizations, and resources. This plan includes the following topics:

a. software development;

b. software configuration management;

c. software testing;

d. software maintenance;

e. software assurance;

f. format and content of CERES NPP and non-NPP data sets;

g. destination and retention requirements of all CERES output files created during PGE processing at the ASDC;

h. external data sets;

i. data validation and quality assurance; and

j. data management functions provided by the IT.

4.3.3.   Software Delivery

Software for the standard data products, and test data for this software, will be delivered in separate versions.

The DMT will deliver production processing software to the ASDC that adheres to CERES standards.   The procedures described in the CERES Configuration Management Plan developed for TRMM, Terra, and Aqua will be followed.

Each delivery of software will include:

a. Test Plan;

b. Operator's Manual;

c. CERES DMT point of contact name, e-mail address, and phone number; and

d. Delivery Memorandum.

Each release of software will provide electronically:

a. software source code;

b. compilation and link scripts; and

c. test data sets used to validate the release.

4.3.4.   Software Maintenance

The DMT is responsible for maintaining and updating the production processing software and associated documentation.

4.3.5.   Production Processing Software Integration and Testing

The ASDC will integrate and test the CERES production processing software in the operational production system environment. The DMT will provide support and assistance with this activity. After successful integration and testing, the software will be promoted to operational status. Verification data products will be produced and science acceptance will be obtained before an Edition dataset is started.

4.3.6.   Sub-sampling Software at the SDS Land PEATE

The IT will be responsible for providing the SDS Land PEATE any sub-sampling software for reducing data volume on radiance and geolocation produced from NPP VIIRS data. The format of the NVCD will be described in the CERES Data Product Catalog. A Test Plan will be provided describing how to use the software. Changes to the software will be approved through the CERES Configuration Control Board as defined in the CERES Configuration Management Plan. A copy of the software will be

placed under configuration control at the time of delivery to the SDS Land PEATE.

4.4.   Data Products

4.4.1.   Standard Data Products

The IT will be responsible for producing CERES Climate Data Records (CDRs) that meet CERES accuracy criteria. These products will be generated, archived, and distributed at the ASDC. Before public release, the quality of these data products will be assessed and Data Quality Summaries written and provided to users. Table 4-1 lists the CERES data products that will be made available to the public. Table 4-2 lists the internal CERES data products that are produced but not made publicly available.

The CERES CDRs are dependent on the successful climate-quality calibration of CERES FM5 and NPP VIIRS data. Since CERES data product generation may be dependent on the successful generation of other CERES products, a phased timeline is needed.

4.4.2.   Special Data Products Development

The CERES investigators may develop algorithms and software to produce special data products at the SCF. These special data products may be archived and distributed by the ASDC.

4.4.3.   Data Product Releases

Data products will be released in separate versions as follows.

Alpha Version   This release will demonstrate that the interfaces are working correctly, but may contain little or no scientific content.

Beta Version   This release will generate standard data products with scientific content that is for review but not of publication quality.

Edition1 Version   This release will generate the first set of standard climate-quality data products with scientific content that is of publication quality.

Edition2 Version   This release will generate a second set of standard climate-quality data products with improved scientific quality.

Updated versions as appropriate after the release of Edition2.

Table 4-1. CERES Archival Data Products

Product Code	Product Name	Frequency	Number Of Files
BDS	Bidirectional Scans	Daily	1
ES-8	ERBE-like Instantaneous TOA Estimates	Daily	1
ES-9	ERBE-like Monthly Regional Averages	Monthly	1
ES-4	ERBE-like Monthly Geographical Averages	Monthly	1
SSF	Single Scanner Footprint TOA/Surface Fluxes and Clouds	Hourly	1
CRS	Clouds and Radiative Swath	Hourly	1
FSW	Monthly Gridded Radiative Fluxes and Clouds	Monthly	60
SFC	Monthly Gridded TOA/Surface Fluxes and Clouds	Monthly	36
SYN	Synoptic Radiative Fluxes and Clouds	Monthly	No. of days in month
AVG	Monthly Regional Fluxes and Clouds	Monthly	1
ZAVG	Monthly Zonal and Global Radiative Fluxes and Clouds	Monthly	1
SRBAVG	Monthly TOA/Surface Averages	Monthly	5
ISCCP-D2like-Day	CERES Grid ISCCP-D2like Cloud Properties Day	Monthly	1
ISCCP-D2like-Nit	CERES Grid ISCCP-D2like Cloud Properties Night	Monthly	1
ISCCP-D2like	CERES Grid ISCCP-D2like Cloud Properties from GEO	Monthly	1

Table 4-2. CERES Internal Products

Product Code	Product Name	Frequency	Number Of Files
INSTR	Instrument Production Data Set	Daily	1, 2, or 3
IES	Instrument Earth Scans	Hourly	1
EID-6	ERBE-like Regional Data	Daily	1
CRH	Clear Reflectance History	Hourly	3
SYNI	Synoptic Radiative Fluxes and Clouds Intermediate	Monthly	180
TSI	Time Space Interpolate	Monthly	180
GGEO	Gridded GEO Narrowband Radiances	Monthly	1
MOA	Meteorological, Ozone, and Aerosol Data	Daily	4

4.5.   Science Computing Facility (SCF)

The IT will procure hardware and software as needed for the SCF to support the production processing software development, Integration and Test (I&T), data validation, and generation of special data products for NPP. Measures will be taken to ensure compatibility with production systems planned for NPP. The SCF will have sufficient computing resources (e.g., processors, storage capacity and communication) to accomplish the aforementioned tasks. The IT will be responsible for operating and maintaining the SCF.

For NPP, the IT will be responsible for the integration of the ground support operations planning system software at the SCF and for its use in instrument operations support.

The Information Technology Security Plan for the Science Directorate Servers (SDS), SC-008-M-LRC-1002, and Information Technology Security Plan for the Science Directorate Computing Environment (SDCE), SC-011-M-LRC-1001, will be used to protect computer resources.

4.6.Instrument Operations

The IT will provide support for the operations of the CERES instrument. This activity will include the planning, scheduling, commanding, and monitoring for all instrument activities on-orbit (as described in References #4 and #5). Specifically, this requires the IT to:

a.develop the CERES instrument operations concept;

b.support pre-launch integration and test activities;

c.support the flight operations of CERES;

d.develop and maintain the CERES instrument flight software and documentation;

e.maintain the CERES data in the flight operations Project Data Base;

f.support the NPP Project in the development of the requirements for the NPP Mission Management Center (MMC) at the NOAA Satellite Operations Facility (NSOF), Suitland, MD, ground support, and the network interface; and

g.provide post-launch support for instrument evaluation.

4.7.4.6.   Meetings and Reviews

4.7.1.4.6.1.   NPP Meetings

The CERES IT and the NPP Project Office or NPP Mission Manager will mutually agree on meetings to discuss and resolve any technical and programmatic issues related to production processing software and instrument flight operations.

After the NPP commissioning (~L+90 days) and Operational Handover Review (OHR) is conducted the NPP Satellite Control Authority (SCA) will transition to the IPO.Ninety days after launch, the NASA NPP Project Office will be disbanded and its responsibilities will be assigned to an undetermined office.

4.7.2.4.6.2.   Review

The CERES IT will support mutually agreed upon reviews between them and the NPP Project Office, NPP Mission Manager, or NPP SDS Manager. The CERES IT will plan for an undetermined number of trips for NPP Pre-Mission Support to locations including: Suitland, MD, Greenbelt, MD, Silver Springs, MD, Redondo Beach, CA, and Aurora, CO.

The CERES IT will support the remaining NPP major reviews as identified in the NPP System Engineering Management Plan (SEMP) and listed in Table 6-Table 6-1. The CERES IT will support the SDS Delta Design Review for incorporation of CERES FM5 support within the SDS.

4.7.2.1.4.6.2.1.   Production Processing Software Development Status

The IT will provide the SDS Manager, at least, the following information:

a. progress since the last review;

b. activities planned;

c. short- and long-term schedules;

d. any proposed changes to standard data products and/or input data;

e. current estimates of processing and storage for standard data products;

f. identified risks and plans for their mitigation;

g. issues and concerns; and

h. budget allocation to commitments, obligations, and costs versus actual commitments, obligations, and costs.

4.7.2.2.~~Instrument Flight Operations Status~~
~~The IT will coordinate and provide progress reports on the items listed in Section 4.6 to the NPP Mission Manager.~~

4.7.3.~~4.6.3.~~   Technical Meetings
The IT will support technical exchange meetings and working group activities as needed.

4.7.4.~~4.6.4.~~   Science Team Meetings

a. The IT will hold biannual science team meetings to discuss the status of the CERES project including NPP. During these meetings instrument calibration, algorithm validation, science results, and production accuracy will be presented. The status and plans for computing resources, production, and distribution of CERES products will be presented.

b. The IT will send representatives to the NPP VIIRS science team meetings for calibration and other NPP meetings as appropriate.

4.8.~~4.7.~~   Integration and Test

4.8.1.~~4.7.1.~~   NPP Mission System Integration and Test
The CERES IT will support NPP-level system tests including the Early Engineering Opportunities and remaining NPP Compatibility Tests (NCT). The NCT will test the transfer of data from the instrument through NESDIS IDPS, SD3E, and SDS Land PEATE to the ASDC.

4.8.2.~~4.7.2.~~   NPP SDS Integration and Test
NPP SDS and CERES IT will mutually agree upon formal integration and testing opportunities beneficial to both parties in ensuring interfaces and software have been correctly implemented. This would include demonstrating the transfer of CERES RDRs, sub-sampled NVCD radiance and geolocation data, and NPP VIIRS AOT data between the SDS Land PEATE and the ASDC.

4.7.3.   NPP Mission Readiness Activities
The CERES IT will support NPP-level mission readiness activities: which include mission rehearsal and Operational Readiness Test (ORT) activities. These activities will exercise the full mission system operations team to ensure readiness for operations. The NPP Mission Operations Management Plan (Reference 4) captures the high level objectives that will be refined for each rehearsal under the Mission Operations Working Group (MOWG) and Mission Rehearsal Focus Group (MRFG) with SDS and CERES IT involvement. Additionally, the CERES Mission Operations Agreement covers the instrument operations coordination between the Instrument Operations Team (IOT) and the Mission Operations Team (MOT).

5.0   PERIOD OF PERFORMANCE

The period of performance of this agreement is from July 1, 2008, to NPP Launch plus 5 years, the nominal design life for the NPP mission.

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6.0   DELIVERABLE ITEMS

All items in Table 6-Table 6-1 will be delivered to the NPP Program Office CERES Instrument Manager, Code 421 (except as noted). All delivered documents will be in hard copy or electronic formats. All documents are subject to review and approval by GSFC.

Table 6-1. Deliverable Items

Deliverable Item	Due Date
1. Algorithm Theoretical Basis Document Follow Terra and Aqua ATBDs, see http://science.larc.nasa.gov/ceres/ATBD/	Done
2. Data Validation Plan Follow Terra and Aqua Validation Plan, see http://science.larc.nasa.gov/ceres/validation	Done
3. Software Management Planning Documents (update)	6 mo. after signing of this document
4. Calibration Plan (update)	6 mo. after signing of this document
5. Mission Operations Review (MOR)	L(NPP) - 20 mo.
6. NVCD Sub-Sample Software Test Plan	L(NPP) – 18 mo.
7. Alpha version Instrument and ERBE-like software and test data	L(NPP) - 15 mo.
8. Mission Test Readiness Review (MTRR)	L(NPP) - 14 mo.
9. Beta version Instrument and ERBE-like software and test data	L(NPP) - 8 mo.
10. Operational Readiness Review (ORR)	L(NPP) - 5 mo.
11. Flight Readiness Review (FRR)	L(NPP) – 2 weeks
12. Launch Readiness Review (LRR)	L(NPP) – 2 days
13. Edition1 version Instrument and ERBE-like products available to public	L(NPP) + 12 mo.
14. Edition1 version Instantaneous TOA/Surface Fluxes and Clouds (SSF, ISCCP-D2like-Day, and ISCCP-D2like-Nit) products available to public	L(NPP) + 24 mo.
15. Edition1 version Monthly Gridded TOA/Surface Fluxes and Clouds (SFC, SRBAVG, and ISCCP-D2like) products available to public	L(NPP) + 30 mo.
16. Edition1 version Cloud and Radiative (CRS, FSW, SYN, and AVG) products available to public	L(NPP) + 36 mo.
17. Technical and Financial Reviews	As requested

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7.0   ACRONYMS AND ABBREVIATIONS

-A-
AOT   Aerosol Optical Thickness
APID   Application Process Identifiers
ARM   Atmospheric Radiation Measurement
ASDC   Atmospheric Science Data Center
ATBD   Algorithm Theoretical Basis Document

-B-
BSRN   Baseline Surface Radiation Network

-C-
CDFCB   Common Data Format Control Book
CDR   Climate Data Record
CERES   Clouds and the Earth's Radiant Energy System
CLASS   Comprehensive Large Array-Data Stewardship System

-D-
DAAC   Distributed Active Archive Center
DMT   Data Management Team
DOE   Department of Energy

-E-
ECS   EOSDIS Core System
EOS   Earth Observing System
EOSDIS   Earth Observing System Data and Information System
ERBCARS   Earth Radiation Budget Climate Analysis Research System

-F-
FM5   Flight Model 5
FRR   Flight Readiness Review

-G-
GSFC   Goddard Space Flight Center

-I-
ICD   Interface Control Document
IDPS   Interface Data Processing Segment
IOT   Instrument Operations Team
IT   Investigation Team
I&T   Integration and Test
IRD   Interface Requirements Document

-L-
LaRC   Langley Research Center
LRR   Launch Readiness Review

Check the NPP CCR website at https://cicero.eos.nasa.gov/ccr/npp to verify that this Is the correct version prior to use.

-M-
MMC   Mission Management Center
MODAPS   MODIS Adaptive Processing System
MODIS   Moderate Resolution Imaging Spectroradiometer
MOR   Mission Operations Review
MOT   Mission Operations Team
MOWG   Mission Operations Working Group
MRFG   Mission Rehearsal Focus Group
MTRR   Mission Test Readiness Review

-N-
NASA   National Aeronautics and Space Administration
NESDIS   National Environmental Satellite, Data, and Information Service
NICST   NPP Instrument Calibration and Support Team
NISN   NASA Integrated Services Network
NOAA   National Oceanic and Atmospheric Administration
NPOESS   National Polar-Orbiting Operational Environmental Satellite System
NPP   NPOESS Preparatory Project
NSOF   NOAA Satellite Operations Facility
NVCD   NPP VIIRS for CERES Data

-O-
OHR   Operational Handover Review
ORR   Operations Readiness Review
ORT   Operations Readiness Test

-P-
PEATE   ~~Land~~ Product Evaluation and Algorithm Tool Element
PGE   Product Generation Executive

-R-
RDR   Raw Data Record

-S-
SCA   Satellite Control Authority
SCF   Science Computing Facility
SDS   Science Data Segment
SD3E   SDS Data Depository and Distribution Element
SEMP   System Engineering Management Plan
SIPS   Science Investigator-led Processing System

-T-
TRMM   Tropical Rain Measuring Mission

-V-
VIIRS   Visible Infrared Imager Radiometer Suite