Clouds and the Earth's Radiant Energy System (CERES)

Science Requirements Specification

Version 1

for

National Polar-orbiting Operational Environmental Satellite System (NPOESS) Preparatory Project (NPP)

Science Data Segment (SDS)

Earth Radiation Budget (ERB) Climate Analysis Research System (CARS)

June 2009

CERES
Data Management System

Stakeholder-Commitment Sheet
for the
CERES Science Requirements Specification
for NPP SDS ERB CARS

This Stakeholder-Commitment Sheet is to demonstrate that the relevant stakeholders as identified in the CERES Data Management Plan are aware of and will respond to the requirements specified in the CERES Science Requirements Specification document.

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Document Revision Record

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Document Revision Record

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V0.7	01/20/2009	• Changed “ASDC” to “ERB CARS” • Changed “ERB CARS” to “ASDC” • Changed “Data Management Team” to “DMT”	Sec. 2.1.3 Secs. 2.3.3.1, 2.3.3.2, 2.3.4, 2.3.4.1, & 2.3.4.2 Sec. 2.4.5.1
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Preface

The objective of the ERB CARS, which consists of the CERES Science Team, the CERES DMT, and the ASDC, is to extend the CERES climate record using data from the FM5 instrument on NPP. The CERES DMT works with the CERES Science Team to develop the software necessary to support the science algorithms. The DMS software is released to the Langley ASDC where it is run in the production environment to produce an extensive set of science data products. The DMS consists of 12 subsystems each of which contains one or more PGEs.

The purpose of the CERES Science Requirements Specification is to show the expansion of the CERES Level-4 data management and processing requirements from the NPP SDS Level-3 ERB CARS requirements.

The CERES Data Management Plan provides overall guidance to the CERES DMT.

Acknowledgements

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TABLE OF CONTENTS

Section Page

TABLE OF CONTENTS

Section Page

LIST OF FIGURES

Figure Page

1.0 Introduction

CERES is a key component of EOS and NPP. The first CERES instrument (PFM) flew on TRMM, four instruments are currently operating on the EOS Terra (FM1 and FM2) and Aqua (FM3 and FM4) platforms, and FM5 will fly on the NPP platform currently scheduled for launch in January 2011. CERES measures radiances in three broadband channels: a shortwave channel (0.3 - 5 μm), a total channel (0.3 - 200 μm), and an infrared window channel (8 - 12 μm). The last data processed from the PFM instrument aboard TRMM was March 2000; no additional data are expected. Until June 2005, one instrument on each EOS platform operated in a fixed azimuth scanning mode and the other operated in a rotating azimuth scanning mode; now all are typically operating in the fixed azimuth scanning mode. The NPP platform will carry the FM5 instrument, which will operate in the fixed azimuth scanning mode though it will have the capability to operate in a rotating azimuth scanning mode.

CERES climate data records involve an unprecedented level of data fusion: CERES measurements are combined with imager data (e.g., MODIS on Terra and Aqua, VIIRS on NPP), 4-D weather assimilation data, microwave sea-ice observations, and measurements from five geostationary satellites to produce climate-quality radiative fluxes at the top-of-atmosphere, within the atmosphere and at the surface, together with the associated cloud and aerosol properties.

The CERES project management and implementation responsibility is at NASA Langley. The CERES Science Team is responsible for the instrument design and the derivation and validation of the scientific algorithms used to produce the data products distributed to the atmospheric sciences community. The CERES DMT is responsible for the development and maintenance of the software that implements the science team's algorithms in the production environment to produce CERES data products. The Langley ASDC is responsible for the production environment, data ingest, and the processing, archival, and distribution of the CERES data products.

All acronyms used in this document are defined in Appendix A. They are not defined in the text unless quoted from an external document.

1.1 Purpose

The NPP SDS, in conjunction with CERES, developed the NPP SDS Level-3 requirements for CERES based on the Level-2 requirements on the NPP SDS from the NPP Project Office. The NPP SDS Level-3 requirements have been baselined and are under configuration control at the SDS as the "NPP Science Data Segment Requirements Specification" (see Reference 1).

CERES has analyzed these Level-3 requirements and has further broken them down as Level-4 CERES science requirements. The purpose of the "CERES Science Requirements Specification" is to document both the NPP SDS Level-3 requirements on CERES and the more detailed Level-4 requirements defined by the CERES team.

1.2 Background

The ERB CARS is the FM5 component of CERES. It is an element of the NPP SDS and leverages existing capabilities from the CERES Science Team, the CERES DMT, and the ASDC at LaRC. The SDS interfaces with the IDPS, the ADS, the C3S, and other ancillary data providers as illustrated in Figure 1-1.

Modifications to Terra/Aqua processes to support the FM5 instrument on the NPP spacecraft involve close interactions with the SDS Land PEATE. The Land PEATE passes CERES RDRs directly to the ERB CARS where they are processed to produce Instrument and ERBE-like data products. The Land PEATE subsamples VIIRS radiance and geolocation data using software provided by CERES and sends the files to the ERB CARS.

The VIIRS radiances are used to determine cloud properties that are matched with CERES unfiltered radiances and used to calculate TOA and surface fluxes on the instantaneous SSF. A radiative transfer code is used to determine fluxes at five fixed levels in the atmosphere for the CRS. Parameters from both of these products are placed on a one-degree, equal-angle grid for each hour in the SFC and FSW, respectively. The final step is to time-interpolate and space-average the gridded data to create global and zonal monthly products (SRBAVG, SYN, AVG, and ZAVG). Figure 1-2 illustrates the CERES top-level data flow and products described above.

CERES data products are archived and made available for distribution to the user community along with Data Quality Summaries. User support is provided for all publicly-released CERES data products. Section 3.0 of the CERES Science and Data Products Working Agreement (see Reference 2) contains details on resources provided to CERES by the NPP SDS. The CERES Data Products Catalog (see Reference 3) contains complete parameter listings for the CERES data products.

1.3 Scope

This document applies to the delivery, processing, validation, archiving, and distribution of CERES FM5 data. It is intended to document the Level-3 requirements from the NPP Science Data Segment Requirements Specification (see Reference 1) that apply to the ERB CARS and the expansion of these Level-3 requirements into CERES Level-4 science requirements.

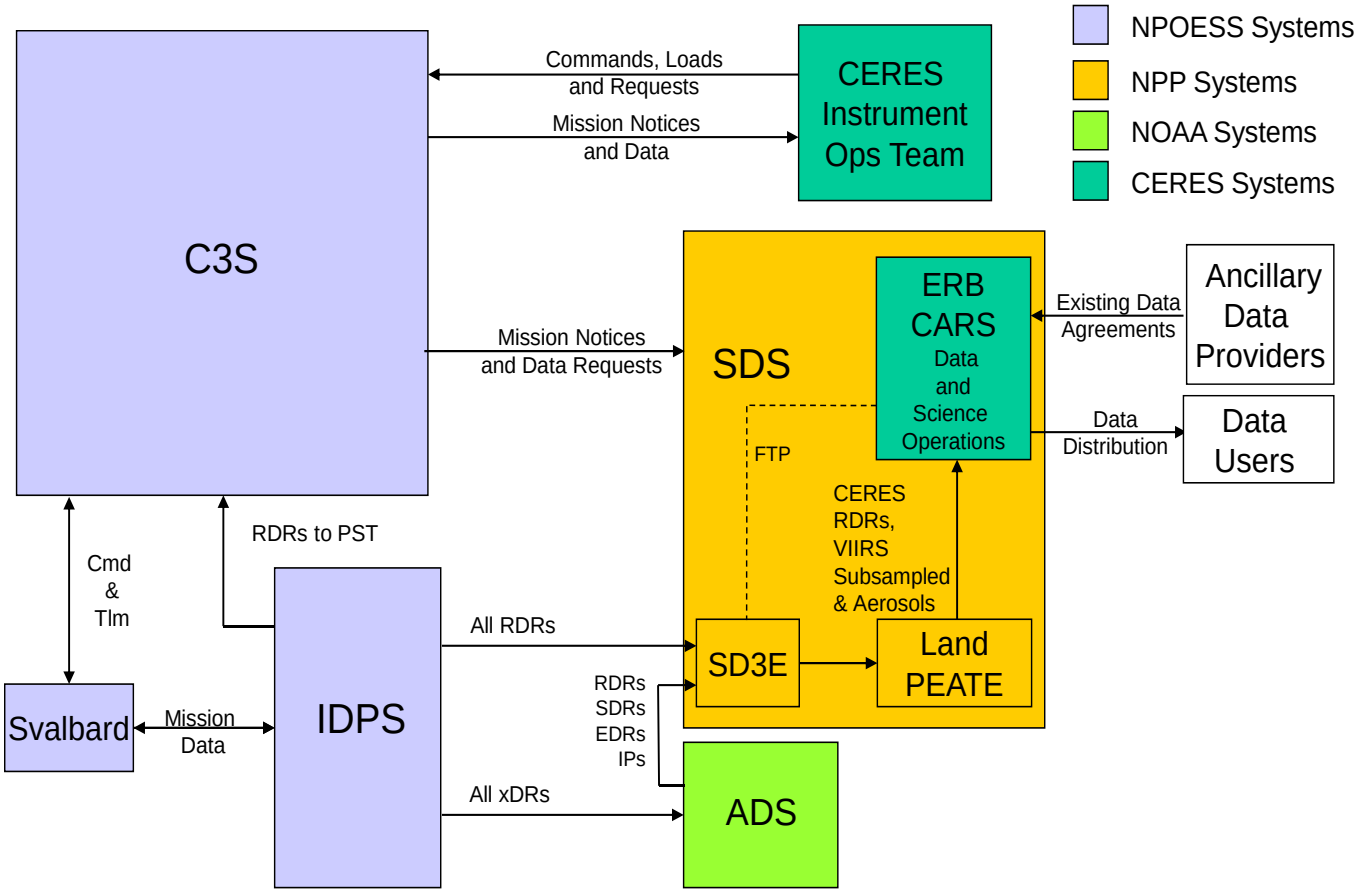

Figure 1-1. NPP CERES Data System Architecture

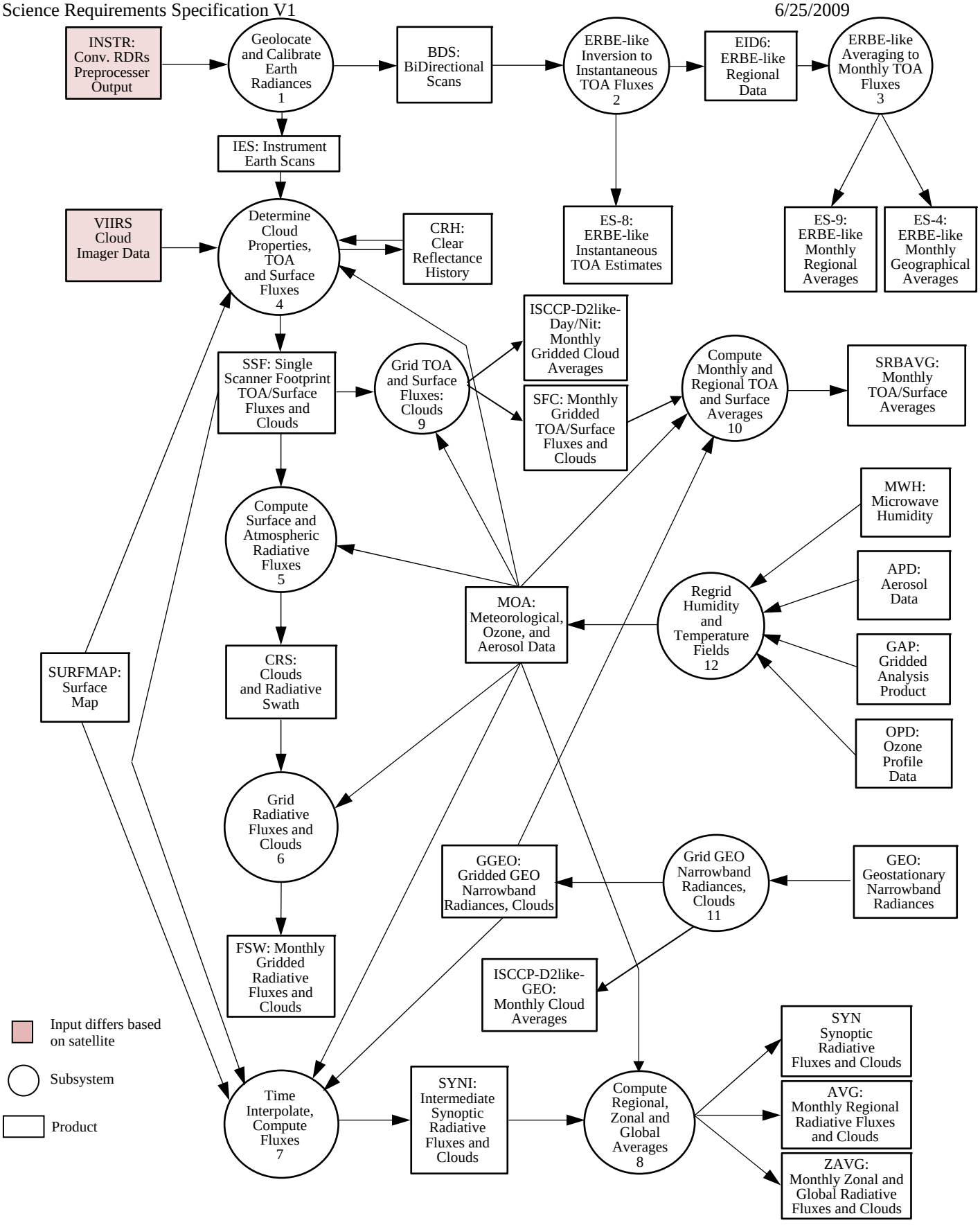

Figure 1-2. CERES top-level data flow diagram with NPP-era inputs

2.0 ERB CARS Requirements Specification

The ERB CARS Level-4 science requirements are derived from SDS Level-3 requirements. They are based on existing processes used to produce CERES data products from the CERES instruments on the Terra and Aqua spacecraft with changes introduced for FM5.

The CERES Science Team derives, maintains, and refines science algorithms to produce CERES data products from the CERES FM5 instrument and validates these 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 makes available the CERES data products upon approval from the CERES Science Team.

The remainder of Section 2 corresponds to Level-3 requirement categories from the NPP Science Data Segment Requirements Specification (see Reference 1). The section titles and associated Level-3 requirements are taken directly from that document. The Level-3 requirements are followed by the requirement number from the NPP Science Data Segment Requirements Specification (see Reference 1). The sub-sections contain the individual Level-3 and Level-4 requirements.

2.1 CERES FM5 Instrument Support

2.1.1 Support for FM5 Instrument Calibration

The ERB CARS shall have the capability of supporting post launch FM5 Instrument calibration for mission life. (Reference 1, Section 3.9.1.1)

The Level-4 requirements follow.

2.1.1.1 The ERB CARS shall be capable of processing instrument calibration data to assess the stability of CERES sensors.
Rationale: Instrument calibration data are required to assess the stability of CERES sensors.

2.1.1.2 The ERB CARS shall be capable of supporting validation studies to evaluate CERES sensor performance.
Rationale: Validation studies are required to evaluate CERES sensor performance.

2.1.1.3 The ERB CARS shall ensure that instrument characteristics and calibration parameters are incorporated into Instrument gains and spectral response functions.
Rationale: Changes in instrument gains and spectral response functions are determined by in-flight calibration data and other validation studies and are needed for CDR (Edition2 and later) processing.

2.1.2 Archive of Correlative Observations

The ERB CARS shall have the capability of archiving correlative and/or ground-truth observations made in support of validating the CERES data products. (Reference 1, Section 3.9.1.2)

The Level-4 requirement follows.

2.1.2.1 The ERB CARS shall be capable of maintaining the CAVE database in support of the validation of CERES data products.
Rationale: Validation of observation data from COVE, ARM, SURFRAD, BSRN, and other surface-based networks is needed to validate CERES data sets.

2.1.3 Archive of Calibration Parameters

The ERB CARS shall maintain a record of any changes in calibration parameters used during the life of the instrument. (Reference 1, Section 3.9.1.3)

The Level-4 requirements follow.

2.1.3.1 The ASDC shall archive instrument gains and spectral response functions.
Rationale: Archiving ensures (storage) media integrity and long-term data availability.

2.1.3.2 The CERES Science Team shall include the calibration discussions in the applicable Data Quality Summaries.
Rationale: Data Quality Summaries provide information regarding CERES data sets to users.

2.2 Interfaces

2.2.1 Land PEATE Interface

The ERB CARS shall have the capability of interfacing with the Land PEATE via the EOSDIS SIPS PDR-PAN interface as described in the SDS Land PEATE to Earth Radiation Budget Climate Analysis Research System (ERB CARS) Interface Control Document (ICD) (Compliance Document C-5) (see Reference 4). (Reference 1, Section 3.9.2.1)

The Level-4 requirement follows.

2.2.1.1 The ASDC shall establish that the interface with the Land PEATE is as described in the ICD.
Rationale: The ICD defines the interface with the Land PEATE.

2.3 Data Receipt

2.3.1 CERES RDR Ingest

The ERB CARS shall ingest CERES RDRs received from the Land PEATE. (Reference 1, Section 3.9.3.1)

The Level-4 requirements follow.

2.3.1.1 The ASDC shall ingest CERES RDRs received from the Land PEATE.
Rationale: Ingest of CERES RDRs is necessary for processing.

2.3.1.2 The ASDC shall validate the integrity of CERES RDRs received from the Land PEATE.
Rationale: Validation of CERES RDRs is necessary for quality data production.

2.3.1.3 The ASDC shall verify receipt of the CERES RDRs received from the Land PEATE.
Rationale: Verifying receipt of CERES RDRs ensures complete data transmission.

2.3.1.4 The ASDC shall make the CERES RDRs available for production.
Rationale: Making CERES RDRs available for production is necessary for further processing.

2.3.1.5 The ASDC shall archive CERES RDRs.
Rationale: Archiving ensures (storage) media integrity and long-term data availability.

2.3.2 VIIRS SDR Ingest

The ERB CARS shall ingest VIIRS VIMD received from the Land PEATE. The VIMD is defined in the CERES Data Products Catalog (Reference 3). (Reference 1, Section 3.9.3.2)

The Level-4 requirements follow.

2.3.2.1 The ASDC shall ingest VIIRS VIMD received from the Land PEATE.
Rationale: Ingest of CERES RDRs is necessary for processing.

2.3.2.2 The ASDC shall validate the integrity of VIIRS VIMD received from the Land PEATE.
Rationale: Validation of VIIRS VIMD is necessary for quality data production.

2.3.2.3 The ASDC shall verify receipt of the VIIRS VIMD received from the Land PEATE.
Rationale: Verifying receipt of VIIRS VIMD ensures complete data transmission.

2.3.2.4 The ASDC shall be capable of making the VIIRS VIMD available for Clouds Subsystem processing.
Rationale: Making the VIIRS VIMD available for production is necessary for Clouds Subsystem processing.

2.3.2.5 The ASDC shall archive VIIRS VIMD.
Rationale: Archiving ensures (storage) media integrity and long-term data availability.

2.3.3 VIIRS EDR Ingest

The ERB CARS shall ingest aggregated VIIRS VAOT received from the Land PEATE. (Reference 1, Section 3.9.3.3)

The Level-4 requirements follow.

2.3.3.1 The ASDC shall ingest aggregated VIIRS VAOT received from the Land PEATE.
Rationale: Ingest of aggregated VIIRS VAOT is necessary for processing.

2.3.3.2 The ASDC shall validate the integrity of aggregated VIIRS VAOT received from the Land PEATE.
Rationale: Validation of aggregated VIIRS VAOT is necessary for quality data production.

2.3.3.3 The ASDC shall verify receipt of the aggregated VIIRS VAOT received from the Land PEATE.
Rationale: Verifying receipt of aggregated VIIRS VAOT ensures complete data transmission.

2.3.3.4 The ASDC shall be capable of making the aggregated VIIRS VAOT available for Clouds Subsystem processing.
Rationale: Making the aggregated VIIRS VAOT available for production is necessary for Clouds Subsystem processing.

2.3.3.5 The ASDC shall archive aggregated VIIRS VAOT.
Rationale: Archiving ensures (storage) media integrity and long-term data availability.

2.3.4 Ancillary Data Ingest

The ERB CARS shall have the capability of ingesting additional ancillary data received from other sources. (Reference 1, Section 3.9.3.5)

The Level-4 requirements follow.

2.3.4.1 The ASDC shall be capable of ingesting the ancillary data received from other sources.
Rationale: Ingest of ancillary data from NOAA/NESDIS, NASA, USGS, JPL, and other sources is necessary for processing.

2.3.4.2 The ASDC shall validate the integrity of ancillary data received from other sources.
Rationale: Validation of ancillary data is necessary for quality data production.

2.3.4.3 The ASDC shall verify receipt of ancillary data received from other sources.
Rationale: Verifying receipt of ancillary data ensures complete data transmission.

2.3.4.4 The ASDC shall be capable of making the ancillary data received from other sources available for processing.
Rationale: Making the ancillary data from NOAA/NESDIS, NASA, USGS, JPL, and other sources available for production is necessary for further processing.

2.3.4.5 The ASDC shall archive ancillary data received from other sources.
Rationale: Archiving of ancillary data from NOAA/NESDIS, NASA, USGS, JPL, and other sources ensures (storage) media integrity and long-term data availability.

2.3.5 Monitoring Ingest

The ERB CARS shall have the capability of monitoring data ingest and report to the data provider missing and corrupted files. (Reference 1, Section 3.9.3.4)

The Level-4 requirements follow.

2.3.5.1 The ASDC shall track the receipt of incoming files.
Rationale: Tracking receipt of incoming files determines missing or corrupted files.

2.3.5.2 The ASDC shall request retransmission of missing or corrupted files received from the data provider.
Rationale: Missing or corrupted files should be replaced to ensure a complete data record.

2.3.5.3 The ASDC shall be capable of notifying the CERES DMT of data gaps that remain unfilled.
Rationale: Notifying the CERES DMT of data gaps that remain unfilled allows the DMT and Science to decide how best to proceed.

2.4 Data Products

2.4.1 CERES Bi-Directional Scan (BDS)

The ERB CARS shall have the capability of producing the CERES BDS L1b data product. (Reference 1, Section 3.9.4.1)

The Level-4 requirements follow.

2.4.1.1 The CERES DMT shall generate production-quality pre-processor software which reads the CERES RDRs and creates the Level-0, attitude, and ephemeris files.
Rationale: Pre-processor software is needed to arrange data in a format expected by the Instrument Subsystem and to drastically reduce the changes needed to accommodate processing FM5 through the Instrument Subsystem.

2.4.1.2 The CERES DMT shall deliver the Instrument Subsystem pre-processor software to the ASDC.
Rationale: The ASDC runs the software in the production environment.

2.4.1.3 The ASDC shall verify the operational readiness of Instrument Subsystem pre-processor software provided by the CERES DMT.
Rationale: Verification of the pre-processor software is necessary to ensure that the software runs properly in the production environment.

2.4.1.4 The ASDC shall integrate the Instrument Subsystem pre-processor software into the production environment.
Rationale: Integration of the pre-processor software is necessary for data production.

2.4.1.5 The ASDC shall be capable of executing the Instrument Subsystem pre-processor software to generate CERES Level-0, attitude, and ephemeris data.

Rationale: Execution of the pre-processor software is necessary to create the inputs expected by the Instrument Subsystem.

2.4.1.6 The CERES DMT shall modify the Instrument Subsystem main-processor software to support processing of NPP-era data.
Rationale: Modification of the Instrument Subsystem main-processor software is necessary for supporting FM5 data processing.

2.4.1.7 The CERES DMT shall deliver the modified main-processor software to the ASDC.
Rationale: The ASDC runs the software in the production environment.

2.4.1.8 The ASDC shall verify the operational readiness of the Instrument Subsystem main-processor software provided by the CERES DMT.
Rationale: Verification of the main-processor software is necessary to ensure that the software runs properly in the production environment.

2.4.1.9 The ASDC shall integrate the Instrument Subsystem main-processor software into the production environment.
Rationale: Integration of the main-processor software is necessary for data production.

2.4.1.10 The ASDC shall be capable of processing the Level-0, attitude, and ephemeris data created by the Instrument Subsystem pre-processor software through the main-processor software to produce the BDS and other Instrument Subsystem output data products.
Rationale: Execution of the Instrument Subsystem main processor is necessary to create the BDS and other Instrument Subsystem output data products.

2.4.1.11 The ASDC shall archive Level-0, attitude, ephemeris, and BDS data products.
Rationale: Archiving all critical outputs of a CERES Subsystem ensures (storage) media integrity and long-term data availability.

2.4.1.12 The CERES DMT shall be capable of maintaining and providing configuration management for all Instrument Subsystem production software.
Rationale: All Instrument Subsystem production software must be able to run in the ASDC production environment until CERES reprocessing ceases.

2.4.2 CERES ERBE-like Instantaneous TOA Estimates (ES-8)

The ERB CARS shall have the capability of producing the CERES ES-8 L2 data product. (Reference 1, Section 3.9.4.2)

The Level-4 requirements follow.

2.4.2.1 The CERES DMT shall modify the ERBE-like Inversion processor software to support processing of NPP-era data.
Rationale: Modification of the ERBE-like Inversion processing software is necessary for supporting FM5 data processing.

2.4.2.2 The CERES DMT shall deliver the modified ERBE-like Inversion processor software to the ASDC.
Rationale: The ASDC runs the software in the production environment.

2.4.2.3 The ASDC shall verify the operational readiness of the ERBE-like Inversion processor software provided by the CERES DMT.
Rationale: Verification of the ERBE-like Inversion processor software is necessary to ensure that the software runs properly in the production environment.

2.4.2.4 The ASDC shall integrate the ERBE-like Inversion processor software into the production environment.
Rationale: Integration of the ERBE-like Inversion processing software is necessary for data production.

2.4.2.5 The ASDC shall be capable of processing the preES-8 created by the Instrument Subsystem main-processor software through the ERBE-like Inversion processor to produce the ES-8 and other ERBE-like Inversion Subsystem output data products.
Rationale: Processing the preES-8 is necessary for creating the ES-8 and other ERBE-like Inversion Subsystem output data products.

2.4.2.6 The ASDC shall archive ES-8 data products.
Rationale: Archiving all critical outputs of a CERES Subsystem ensures (storage) media integrity and long-term data availability.

2.4.2.7 The CERES DMT shall be capable of maintaining and providing configuration management for the ERBE-like Inversion Subsystem production software.
Rationale: All ERBE-like Inversion Subsystem production software must be able to run in the ASDC production environment until CERES reprocessing ceases.

2.4.3 CERES ERBE-like Monthly Regional (ES-9) and Geographical (ES-4) Averages

The ERB CARS shall have the capability of producing the CERES ES-9 and ES-4 L3 monthly data products. (Reference 1, Section 3.9.4.3)

The Level-4 requirements follow.

2.4.3.1 The CERES DMT shall modify the ERBE-like TSA processor software to support processing of NPP-era data.
Rationale: Modification of the ERBE-like TSA processing software is necessary for supporting FM5 data processing.

2.4.3.2 The CERES DMT shall deliver the modified ERBE-like TSA processor software to the ASDC.
Rationale: The ASDC runs the software in the production environment.

2.4.3.3 The ASDC shall verify the operational readiness of the ERBE-like TSA processor software provided by the CERES DMT.
Rationale: Verification of the ERBE-like TSA processor software is necessary to ensure that the software runs properly in the production environment.

2.4.3.4 The ASDC shall integrate the ERBE-like TSA processor software into the production environment.
Rationale: Integration of the ERBE-like TSA processing software is necessary for data production.

2.4.3.5 The ASDC shall be capable of processing the EID-6 created by the ERBE-like Inversion processor software to produce the ES-9 and ES-4 data products.
Rationale: Processing the EID-6 is necessary for creating the ES-9 and ES-4 output data products.

2.4.3.6 The ASDC shall archive CERES ES-9 and ES-4 data products.
Rationale: Archiving all critical outputs of a CERES Subsystem ensures (storage) media integrity and long-term data availability.

2.4.3.7 The CERES DMT shall be capable of maintaining and providing configuration management for the ERBE-like TSA Subsystem production software.
Rationale: All ERBE-like TSA Subsystem production software must be able to run in the ASDC production environment until CERES reprocessing ceases.

2.4.4 Fused CERES Climate Data Records

The ERB CARS shall have the capability of producing fused CERES CDRs 1-2 years after launch. (Reference 1, Section 3.9.4.5)

The Level-4 requirements follow.

2.4.4.1 The CERES DMT shall modify the software needed to generate the fused CERES CDRs to use NPP-era data as input.
Rationale: Modification of the fused CERES CDR processing software is necessary for producing NPP-era SSF, SFC, CRS, FSW, SRBAVG, SYN, AVG, and ZAVG, and other data products.

2.4.4.2 The CERES DMT shall deliver the modified software needed to generate the fused CERES CDRs to the ASDC.
Rationale: The ASDC runs the software in the production environment.

2.4.4.3 The ASDC shall verify the operational readiness of software needed to generate the fused CERES CDRs.
Rationale: Verification of the fused CERES CDR processor software is necessary to ensure that the software runs properly in the production environment.

2.4.4.4 The ASDC shall integrate the software needed to generate fused CERES CDRs into the production environment.
Rationale: Integration of the processing software is necessary for data production.

2.4.4.5 The ASDC shall be capable of executing the software needed to generate the fused CERES CDRs as requested by the CERES DMT.
Rationale: Executing the software is necessary for creating the fused CERES CDRs.

2.4.4.6 The ASDC shall archive the fused CERES CDRs as well as all related outputs designated for archival.
Rationale: Archiving all critical outputs of a CERES Subsystem ensures (storage) media integrity and long-term data availability.

2.4.4.7 The CERES DMT shall be capable of maintaining and providing configuration management for all the software needed to generate the fused CERES CDRs.
Rationale: All fused CERES CDR production software must be able to run in the ASDC production environment until CERES reprocessing ceases.

2.4.5 CERES Data Distribution and User Support

The ERB CARS shall have the capability of disseminating CERES publicly-released data products and providing user support for those products. (Reference 1, Section 3.9.4.6)

The Level-4 requirements follow.

2.4.5.1 The CERES Science Team and DMT shall be capable of validating CERES data products.
Rationale: Validation of CERES data products is necessary for producing climate-quality data.

2.4.5.2 The CERES Science Team shall write Data Quality Summaries for validated data products expected to be publicly released.
Rationale: Data Quality Summaries document the quality of CERES data products and alert users to all known problems.

2.4.5.3 The CERES Science Team shall provide Data Quality Summaries to the ASDC.
Rationale: Data Quality Summaries must be provided to the ASDC as users must agree that they were informed of the accuracy of the selected data product(s).

2.4.5.4 The CERES DMT shall create sample read packages for validated data products expected to be publicly released.
Rationale: Sample read packages include necessary information such as documentation that describes the data file, a sample data set, an ASCII dump of the sample data set, HDF examples of each data type contained in the file, and a README file that explains how to compile the read software and documents to which data sets the package applies.

2.4.5.5 The CERES DMT shall provide sample read packages for validated data products to the ASDC.
Rationale: Sample read packages are provided with CERES data orders.

2.4.5.6 The ASDC shall release validated data products to the public.
Rationale: After validation is completed, the CERES DMT requests that the CERES data products be released to the public.

2.4.5.7 The ASDC shall make the Data Quality Summaries available to users.
Rationale: Users must agree that they were informed of the accuracy of the selected data product(s).

2.4.5.8 The ASDC shall include the sample read package in the filled order.
Rationale: Sample read packages provide needed information to the user.

2.4.5.9 The ASDC shall be capable of providing user support for all publicly-available CERES data products.
Rationale: User support provides a single, initial point of contact to field all questions.

2.4.6 CERES Data Distribution to Science Team

The ERB CARS shall have the capability of disseminating CERES data products to the CERES Science Team and its designees. (Reference 1, Section 3.9.4.7)

The Level-4 requirements follow.

2.4.6.1 The ASDC shall be capable of providing CERES data products to the Science Team and its designees.
Rationale: The CERES Science Team is responsible for evaluating CERES data sets.

2.4.6.2 The ASDC shall be capable of providing user data-access support.
Rationale: The ASDC is responsible for providing help as needed to access data stored in the archive.

2.5 Sub-sampler Software

2.5.1 Sub-sampler Software Development

The ERB CARS shall provide sub-sampling software to the Land PEATE. This software will input aggregated VIIRS VMAE, VIAE, and VDNE files and create a new product named VIIRS VIMD as defined in the CERES Data Products Catalog (Reference 3). (Reference 1, Section 3.9.5.1)

The Level-4 requirements follow.

2.5.1.1 The CERES DMT shall develop sub-sampling software for the Land PEATE.
Rationale: Sub-sampling software is used to sub-sample the VIIRS VMAE, VIAE, and VDNE radiance and geolocation files to produce VIMD output. This greatly reduces the volume of data transmitted from the Land PEATE to the ASDC.

2.5.1.2 The CERES DMT shall deliver sub-sampling software to the Land PEATE.
Rationale: The Land PEATE runs the software in the production environment.

2.5.1.3 The CERES DMT shall be capable of verifying that sub-sampled VIIRS radiance and geolocation files are as expected at the Land PEATE.
Rationale: Working with the Land PEATE to verify the files ensures that the sub-sampling software executes properly and produces the correct output.

2.5.2 Sub-sampler Software Maintenance

The ERB CARS shall provide maintenance and configuration management for the sub-sampling software. (Reference 1, Section 3.9.5.2)

The Level-4 requirement follows.

2.5.2.1 The CERES DMT shall be capable of providing maintenance and configuration management for the sub-sampling software.
Rationale: Although run at the Land PEATE, CERES remains responsible for the maintenance and configuration management of the sub-sampling software ensures software integrity.

3.0 References

1. NPP Science Data Segment Requirements Specification, GSFC 429-05-11-20 (URL not yet available)
2. CERES Science and Data Products Working Agreement, GSFC 429-08-01-16 (http://science.larc.nasa.gov/ceres/NPP/index.html)
3. CERES Data Products Catalog (http://science.larc.nasa.gov/ceres/DPC/DPC_current/index.html)
4. SDS Land Peate to Earth Radiation Budget Climate Analysis Research System (ERB CARS) Interface Control Document (ICD), GSFC 429-09-11-07 (URL not yet available)

Appendix A
Acronyms

ADS	Archive and Distribution Segment
ARM	Atmospheric Radiation Measurement
ASCII	American Standard Code for Information Interchange
ASDC	Atmospheric Science Data Center
AVG	Monthly Regional Radiative Fluxes and Clouds (data product)
BDS	Bi-Directional Scan (data product)
BSRN	Baseline Surface Radiation Network
C3S	Command, Control, and Communications Segment
CARS	Climate Analysis and Research System
CDR	Climate Data Record
CERES	Clouds and the Earth's Radiant Energy System
CAVE	CERES ARM Validate Experiment
COVE	CERES Ocean Validation Experiment
CRS	Clouds and Radiation Swath (data product)
DMS	Data Management System
DMT	Data Management Team
EDR	Environmental Data Record
EID-6	ERBE-like Regional Data (data product)
EOS	Earth Observing System
EOSDIS	Earth Observing System Data and Information System
ERB	Earth Radiation Budget
ERBE	Earth Radiation Budget Experiment
ES-4	ERBE-like Monthly Geographic Averages (data product)
ES-8	ERBE-like Instantaneous TOA Estimates (data product)
ES-9	ERBE-like Monthly Regional Averages (data product)
FM	Flight Model
FSW	Monthly Gridded Single Satellite Fluxes and Clouds (data product)
FTP	File Transfer Protocol
GSFC	Goddard Space Flight Center
HDF	Hierarchical Data Format

ICD	Interface Control Document
IDPS	Interface Data Processing Segment
IP	Intermediate Products
JPL	Jet Propulsion Laboratory
LaRC	Langley Research Center
MODIS	Moderate Resolution Imaging Spectroradiometer
NASA	National Aeronautics and Space Administration
NESDIS	National Environmental Satellite, Data, and Information Service
NOAA	National Oceanic and Atmospheric Administration
NPOESS	National Polar Orbiting Environmental Satellite System
NPP	NPOESS Preparatory Project
PAN	Production Acceptance Notification
PDR	Product Subscription Request
PEATE	Product Evaluation and Analysis Tool Element
PFM	Prototype Flight Model
PGE	Product Generation Executive
PST	Project Science Team
RDR	Raw Data Record
SD3E	SDS Data Distribution and Depository Element
SDR	Sensor Data Record
SDS	Science Data Segment
SFC	Hourly Gridded Single Satellite TOA/Surface Fluxes and Clouds (data product)
SIPS	Science Investigator-led Processing System
SRBAVG	Monthly TOA and SRB Averages (data product)
SSAI	Science Systems and Applications, Inc.
SSF	Single Satellite Footprint, TOA and Surface Flux, Clouds (data product)
SURFRAD	Surface Radiation (Network)
SYN	Synoptic Radiative Fluxes and Clouds (data product)
TOA	Top-of-the-Atmosphere
TRMM	Tropical Rainfall Measuring Mission
TSA	Time/Space Averaging (subsystem)
USGS	United States Geological Survey

VAOT	VIIRS Aerosol Optical Thickness
VDNE	VIIRS Day/Night EDR (Note: VDNE is actually an SDR)
VIAE	VIIRS Imagery All bands EDR (Note: VIAE is actually an SDR)
VIIRS	Visible Infrared Imager Radiometer Suite
VIMD	VIIRS Imagery, Moderate, and Day/Night Band
VMAE	VIIRS Moderate All bands EDR (Note: VMAE is actually an SDR)
ZAVG	Monthly Zonal and Global Radiative Fluxes and Clouds (data product)