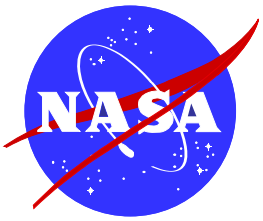
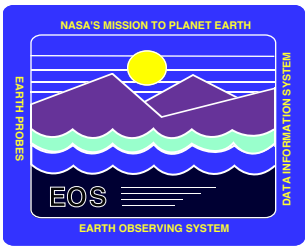


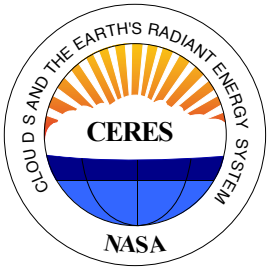
National Aeronautics and
Space Administration

Langley Research Center
Hampton, Virginia 23681-2199



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

Data Products Catalog



Release 3
July 1998

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

Data Management System

Data Products Catalog

Release 3
Version 1

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Preface

The Clouds and the Earth's Radiant Energy System (CERES) Data Management System supports the data processing needs of the CERES Science Team research to increase understanding of the Earth's climate and radiant environment. The CERES Data Management Team works with the CERES Science Team to develop the software necessary to support the science algorithms. This software, being developed to operate at the Langley Distributed Active Archive Center (DAAC), produces an extensive set of science data products.

The Data Management System consists of 12 subsystems; each subsystem represents one or more stand-alone executable programs. Each subsystem executes when all of its required input data sets are available and produces one or more archival science products.

This Data Products Catalog is intended to give an overview of the archival, internal, and ancillary data products which are used or produced by the Data Management System. Additional details are given in the Collection Guide for each archival data product.

Acknowledgment is given to Denise L. Cooper for her Data Products CASE Tool support and to Yvonne M. Seaman and Waldena Banks of Science Applications International Corporation for their support in the preparation of this document.

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1.0 Introduction

The Clouds and the Earth's Radiant Energy System (CERES) is a key component of the Earth Observing System (EOS) program. The CERES instrument provides radiometric measurements of the Earth's atmosphere from three broadband channels: a shortwave channel (0.3 - 0.5 micrometers), a total channel (0.3 - 100 micrometers), and an infrared window channel (8.2 - 11.8 micrometers). The CERES instruments are improved models of the Earth Radiation Budget Experiment (ERBE) scanner instruments, which operated from 1984 through 1990 on the National Aeronautics and Space Administration's (NASA) Earth Radiation Budget Satellite (ERBS) and on the National Oceanic and Atmospheric Administration's (NOAA) operational weather satellites NOAA-9 and NOAA-10. The strategy of flying instruments on Sun-synchronous, polar orbiting satellites, such as NOAA-9 and NOAA-10, simultaneously with instruments on satellites that have precessing orbits in lower inclinations, such as ERBS, was successfully developed in ERBE to reduce time sampling errors. CERES continues that strategy by flying instruments on the polar orbiting EOS platforms simultaneously with an instrument on the Tropical Rainfall Measuring Mission (TRMM) spacecraft, which has an orbital inclination of 35 degrees. In addition, to reduce the uncertainty in data interpretation and to improve the consistency between the cloud parameters and the radiation fields, CERES includes cloud imager data and other atmospheric parameters. The CERES instruments fly on the TRMM spacecraft, on the EOS-AM platforms and on the EOS-PM platforms. The TRMM satellite carries one CERES instrument while the EOS satellites carry two CERES instruments, one operating in a fixed azimuth plane scanning (FAPS) mode and the other operating in a rotating azimuth plane scanning (RAPS) mode.

A high-level view of the CERES Data Management System (DMS) is illustrated by the CERES Top Level Data Flow Diagram shown in Figure 1.0-1. Circles in the diagram represent algorithm processes called subsystems. Subsystems are a logical collection of algorithms which together convert input data products into output data products. Boxes represent archival data products. Two parallel lines represent data stores which are designated as nonarchival or temporary data products. Boxes or data stores with arrows entering a circle are input data sources for the subsystem, while boxes or data stores with arrows exiting the circles are output data products.

The CERES DMS produces science data products for use by the CERES Science Team, the Data Management Team, and for archival at the Langley Distributed Active Archive Center (DAAC). This document describes the data products that are shown in Figure 1.0-1. Various conditions control the production rate of each product. For example, some are produced for each instrument, some are produced for both instruments on a given satellite, and some are produced for the entire CERES mission. Table 1.0-1 lists each of these scenarios and assigns a one-letter key to identify them. The CERES products are written using one of three types of data structures: Hierarchical Data Format (HDF), binary format, or Hierarchical Data Format-Earth Observing System (HDF-EOS) format, which are described in Table 1.0-2 with corresponding one-letter keys. All data products distributed to external users are archived in HDF or HDF-EOS. The binary files are used within the CERES DMS and are not distributed.

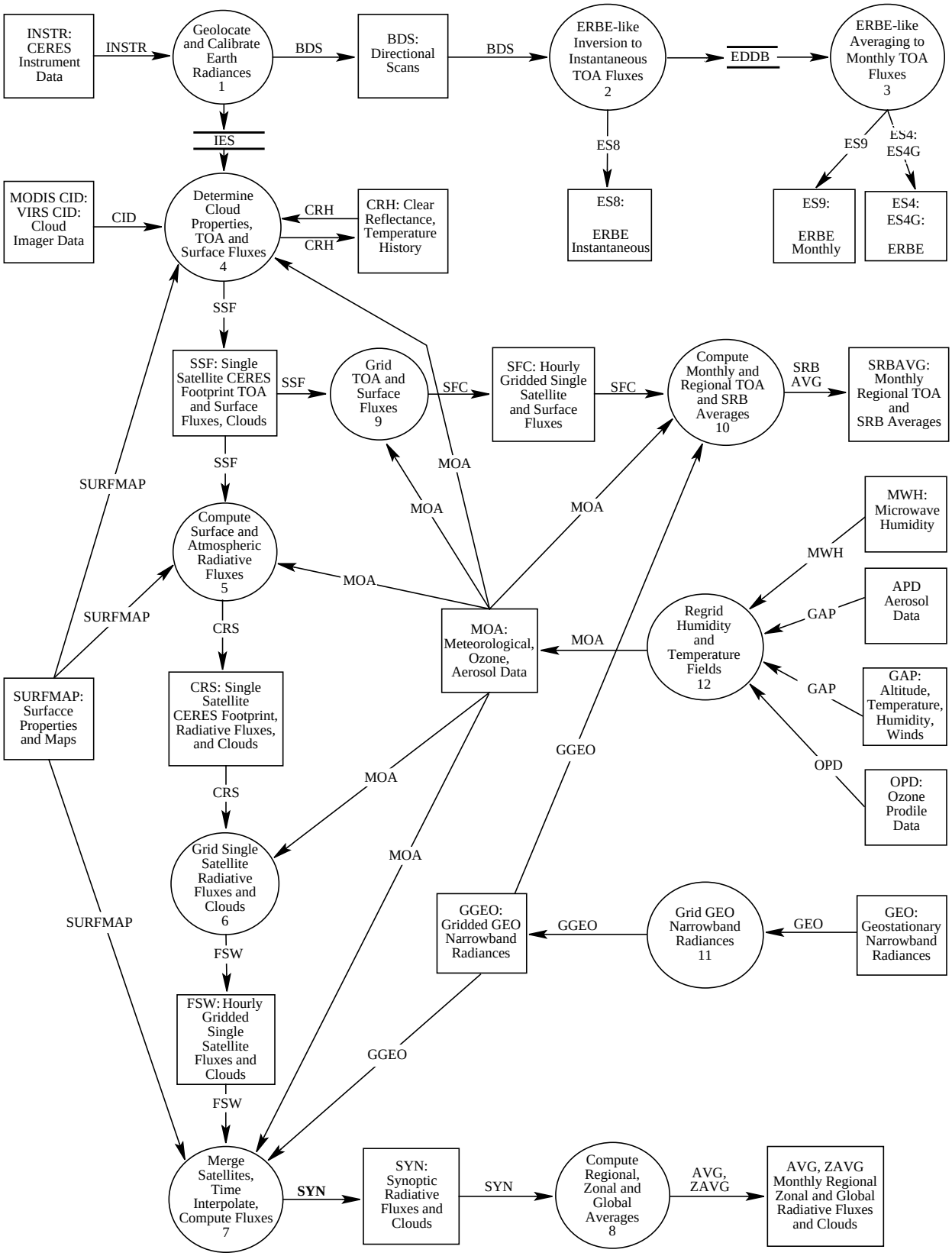


Figure 1.0-1. CERES Top Level Data Flow Diagram

Table 1.0-1. Scenario Key

Key	Scenario (Production Rate)
A	One per each instrument operating in fixed azimuth scan mode
B	One per each instrument operating in either azimuth scan mode (fixed or rotating)
C	One per each satellite (regardless of the number of instruments)
D	One per each instrument in fixed azimuth scan mode plus all instruments combined
E	One per mission (regardless of the number of instruments and satellites)
F	One per TRMM satellite (VIRS imager data)
G	One per EOS satellite (MODIS imager data)

Table 1.0-2. File Format Key

Format Key	Description
B	File written using binary file structure
E	File written using HDF_EOS structures
H	File written using HDF structures

There are three categories of products as listed in the summary Table 1.0-3 through Table 1.0-5.

Table 1.0-3: Archival Products: Output products which are permanently stored by the Earth Observing System Data and Information System (EOSDIS). Only products formatted in HDF or HDF-EOS format are available for distribution to the scientific community.

Table 1.0-4: Internal Products: Output products which are temporarily stored by EOSDIS (the storage duration may range from days to years) and are not available for distribution to the scientific community

Table 1.0-5: Ancillary Products: Input products which contain non-CERES data needed to interpret the CERES measurements

Each summary table lists the number of the subsystem which produces or uses the product, the CERES and EOSDIS product identification codes, a descriptive product name, the temporal production frequency, the size of one instance of the product, the total size of a full month of one instance of the product, a scenario key as described in Table 1.0-1, and a format key as described in Table 1.0-2. The total data volume for a given product can be derived from the monthly size and the scenario. The file sizes do not account for HDF overhead information.

The following sections of the catalog describe products from each of the three categories listed above. Each product description consists of a summary narrative followed by a listing of the parameters in the product. Appendix A provides a list of Acronyms and Unit Definitions; Appendix B describes the metadata that are written to all CERES HDF products.

Table 1.0-3. Archival Products Summary

Sub Sys	Product Codes		Name	Frequency	Size, MB	Monthly Size, MB	Key	
	CERES	EOSDIS					Scenario	Format
HDF or HDF_EOS Archival Products Available for distribution								
1	BDS	CER01	Bidirectional Scan	1/Day	843.0	26133	B	H
2	ES-8	CER02	ERBE-like Instantaneous TOA	1/Day	468.2	14514	B	E
3	ES-9	CER03	ERBE-like Monthly Regional Averages	1/Month	1033.2	1033	D	H
3	ES-4	CER13	ERBE-like Monthly Geographical Averages	1/Month	25.4	25	D	E
4	SSF	CER11	Single Satellite Footprint, TOA and Surface Flux, Clouds	1/Hour	255.6	190166	B	H
5	CRS	CER04	Clouds and Radiative Swath	1/Hour	317.4	236146	B	H
6	FSW	CER05	Monthly Gridded Single Satellite Fluxes and Clouds	1/Month	11587.9	11588	A	H
7	SYN	CER07	Synoptic Radiative Fluxes and Clouds	1/Day	636.7	19738	D	E
8	AVG	CER08	Monthly Regional Radiative Fluxes and Clouds	1/Month	1188.5	1189	D	E
8	ZAVG	CER15	Monthly Zonal and Global Radiative Fluxes and Clouds	1/Month	3.3	3	D	E
9	SFC	CER12	Monthly Gridded Single Satellite TOA and Surface Fluxes/Clouds	1/Month	5842.4	5842	A	H
10	SRBAVG	CER06	Monthly TOA and SRB Averages	1/Month	2286.2	2286	D	E
Binary Archival Products for the CERES Data Management System Only								
1	INSTR	CERX00	Instrument Production Data Set	1/Day	88.9	2756	B	B
4	CRH	CER16	Clear Reflectance History	1/Day	35.6	1135	C	B
11	GGEO	CERX14	Gridded GEO Narrowband Radiances	1/Month	541.3	541	E	B
12	MOA	CERX06	Meteorological, Ozone, and Aerosol Data	1/Hour	12.5	9300	E	B

Table 1.0-4. Internal Products Summary

Sub Sys	Product Code		Name	Frequency	Size, MB	Monthly Size, MB	Key	
	CERES	EOSDIS					Scenario	Format
1	IES	CER09	Instrument Earth Scans	1/Hour	30.6	22766	B	H
2	EDDB/ EID6	CERX02	ERBE-like Daily Data Base Data	1/Day	17.2	533	A	B

Table 1.0-5. Ancillary Products Summary

Sub Sys	Product Code		Name	Frequency	Size, MB	Monthly Size, MB	Key	
	CERES	EOSDIS					Scenario	Format
4	CID_MODIS	CERX04	MODIS Cloud Imager Data	1/5mins	338.1	3018378	G	H
4	CID_VIRS	CERX05	VIRS Cloud Imager Data	1/Hour	57.4	42706	F	H
4	SURFMAP	CERX07	Surface Map	Variable	28.8	162	E	B
11	GEO	CERX09	Geostationary Narrowband Radiances	8/Day/ Satellite	7.7	7600	E	B
12	APD	CERX10	Aerosol Profile Data	1/Month	.4	.4	E	B
12	GAP	CERX12	Altitude, Temperature, Humidity	4-8/Day	18.0	4474	E	B
12	MWH	CERX13	Microwave Humidity	1/Day	2.1	65	E	B
12	OPD	CERX11	Ozone Profile Data	1/Day	2.4	74	E	B

2.0 Archival Data Products

This section describes the CERES data products which are permanently archived at the Langley DAAC. Each subsection contains a brief overview of the purpose and content of the data product followed by one or more tables which list every parameter contained in the product. The following data attributes are described in the overview sections:

- Level - The EOS data products are defined in terms of "levels"[1]
- Type - Data type (Archival, Internal, or Ancillary)
- Frequency - How often the product is received or produced
- Time Interval Covered -

  File - Time period covered within this file
  Record - Time period covered within one record of this file
- Portion of Globe Covered -

  File - Portion of the globe covered within this file
  Record - Portion of the globe covered within a record of this file
- Portion of Atmosphere Covered -

  File - Portion of the atmosphere covered within this file (Surface, Top-of-the-Atmosphere (TOA), etc.)

Additional tables may contain the following attributes for each parameter:

- Description - A textual description of the parameter
- Parameter Number - Arbitrary number assigned to the parameter
- Units - Units of the parameter value
- Range - Range of values for the parameter
- Elements/Record - Elements per record for this parameter (array definition)
- Bits/Element - Number of bits used to describe this parameter
- Elem Num - Element Number, a numbering of each element in the file/record

Total file sizes are also provided. The bolded entries within the file are names for the group of parameters which follow.

---

[1] **Level 0:** raw instrument data at full sensor resolution.
Level 1A: raw instrument data at full sensor resolution, time-referenced, and annotated with ancillary information (including radiometric calibration coefficients and geolocation parameters such as platform ephemeris) computed and appended but not applied to the Level 0 data.
Level 1B: Level 1A data processed to sensor units and geolocated.
Level 2: derived geophysical variables at the same resolution and location as the Level 1 source data.
Level 3: geophysical variables mapped on uniform space-time grids, usually with some completeness and consistency.
Level 4: model output or results from analyses of lower level data, e.g., variables derived from multiple measurements.

2.1 Bidirectional Scans (BDS)

EOSDIS Product Code: CER01

The Bidirectional Scan (BDS) data product is an archival product containing Level-1b CERES scanner data obtained for a 24-hour period. All science scan modes are in the BDS. This includes the fixed and rotating azimuth scan modes that perform normal Earth scans, internal calibration, and short scan elevation profiles. The BDS product includes samples taken at all scan elevation positions (including space-looks and internal calibration views).

The BDS includes the raw (unconverted) science and instrument data from the Level 0 input file (excluding Level 0 header and footer data) as well as the geolocated converted science and instrument data. The BDS also contains additional data not found in the Level 0 input file, including converted satellite position and velocity data, celestial data, converted digital status data, and parameters used in the radiance count conversion equations.

All of the BDS data use Hierarchical Data Format (HDF) structures such as Vdata and Scientific Data Sets (SDSs). See the HDF User's Guide for additional information (Reference 1). Metadata for the BDS is implemented using the ECS Toolkit metadata routines (Reference 2), which are based on HDF Annotations.

The general composition of a BDS in terms of HDF components is as follows:

Data Structure	**HDF Component**
1. Metadata	HDF Vdata
2. Unconverted Science Data	HDF SDSs
3. Unconverted Engineering Data	HDF Vdata
4. Instrument Status Data	HDF SDS
5. Converted Science Data	HDF SDSs
6. Converted Engineering Data	HDF Vdata
7. Satellite-Celestial Data	HDF Vdata
8. Calibration Parameters	HDF SDSs and Vdata

A more detailed listing of the data parameters for this product can be found in the BDS Collection Guide (Reference 3).

Level: 1b
Type: Archival
Frequency: 1/Day

Portion of Globe Covered
File: Satellite Swath
Record: N/A

Time Interval Covered
File: 24 Hours
Record: Single 6.6-Second Scans

Portion of Atmosphere Covered
File: Satellite Altitude

BDS Metadata

The BDS has several kinds of metadata and contains information which need only be recorded once per product. Table 2.1-1 summarizes the BDS metadata.

Table 2.1-1. BDS Metadata Summary

HDF Name	Description Table	Records	Number of Fields
CERES Baseline Header Metadata	Table B-1	1	36
CERES_metadata Vdata	Table B-2	1	14
BDS Product-specific Metadata	Table 2.1-2	1	9

The CERES metadata are listed in Tables B-1 and B-2 in Appendix B. Table B-1 lists the CERES Baseline Header Metadata and Table B-2 list the parameters in the Vdata Metadata Table. Note that the Vdata Metadata is a subset of the CERES Baseline Header Metadata. In addition, there are BDS specific metadata parameters that are listed in Table 2.1-2.

Table 2.1-2. BDS Product-specific Metadata

Item	Parameter Name	Units	Range	Data Type
1	ScanMode	N/A	RapsOnly, FapsOnly, Raps/Faps, XtrtOnly, Raps/Faps/Xtrt, Xtrt/Raps, Xtrt/Faps	s(14)
2	Second Time Constant Mode	N/A	Off, On	s(3)
3	Ephemeris Data Used	N/A	Real, Pred, Sim	s(4)
4	Attitude Data Used	N/A	Real, Sim	s(4)
5	Percent Total Channel Bad	N/A	0.0 .. 100.0	F11.6
6	Percent Window Channel Bad	N/A	0.0 .. 100.0	F11.6
7	Percent Short Wave Channel Bad	N/A	0.0 .. 100.0	F11.6
8	Percent FAPS	N/A	0.0 .. 100.0	F11.6
9	Percent RAPS	N/A	0.0 .. 100.0	F11.6
10	Percent Transitional	N/A	0.0 .. 100.0	F11.6
11	Percent Crosstrack	N/A	0.0 .. 100.0	F11.6
12	TOA_Model_Used	N/A	CERES-TOA or WGS 84	s(9)
13	Number Input Files	N/A	1 .. n	U32Int

BDS Scientific Data Sets

Every Scientific Data Set (SDS) in the BDS file represents a time ordered collection of data where each row in the SDS corresponds to a packet of data, and each column corresponds to a single sample within a packet. Most of the SDSs have 660 samples per packet of a single parameter arranged as shown in Figure 2.1-1.

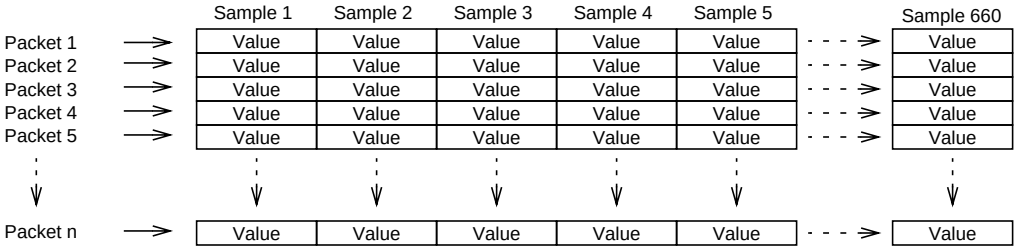


Figure 2.1-1. BDS SDS Schematic

(Note: n = the number of packets processed)

Table 2.1-3 summarizes the contents of each SDS contained within the BDS file.

Table 2.1-3. BDS SDS Summary (1 of 2)

SDS Name	HDF Rank	Number of Rows	Number of Columns	Data Type	Range	Units	Nominal Size (MB)*
Shortwave Detector Output	2	n	660	U16 Integer	0 .. 4095	count	16.48
Total Detector Output	2	n	660	U16 Integer	0 .. 4095	count	16.48
Window Detector Output	2	n	660	U16 Integer	0 .. 4095	count	16.48
Elevation Position Count	2	n	660	U16 Integer	0 .. 4095	count	16.48
Azimuth Position Count	2	n	660	U16 Integer	0 .. 4095	count	16.48
Raw Instrument Status Data	2	n	185	U16 Integer	Reference 3	N/A	4.62
CERES SW Filtered Radiance, Upwards	2	n	660	32-Bit Float	-10.0 .. 510.0	$Wm^{-2}sr^{-1}$	32.96
CERES TOT Filtered Radiance, Upwards	2	n	660	32-Bit Float	0.0 .. 700.0	$Wm^{-2}sr^{-1}$	32.96
CERES WN Filtered Radiance, Upwards	2	n	660	32-Bit Float	0.0 .. 50.0	$Wm^{-2}sr^{-1}$	32.96
Colatitude of CERES FOV at Surface	2	n	660	32-Bit Float	0.0 .. 180.0	deg	32.96
Longitude of CERES FOV at Surface	2	n	660	32-Bit Float	0.0 .. 360.0	deg	32.96
CERES Viewing Zenith at Surface	2	n	660	32-Bit Float	0.0 .. 90.0	deg	32.96
CERES Solar Zenith at Surface	2	n	660	32-Bit Float	0.0 .. 180.0	deg	32.96
CERES Relative Azimuth at Surface	2	n	660	32-Bit Float	0.0 .. 360.0	deg	32.96
Colatitude of CERES FOV at TOA	2	n	660	32-Bit Float	0.0 .. 180.0	deg	32.96
Longitude of CERES FOV at TOA	2	n	660	32-Bit Float	0.0 .. 360.0	deg	32.96
CERES Viewing Zenith at TOA - Geocentric	2	n	660	32-Bit Float	0.0 .. 90.0	deg	32.96
CERES Solar Zenith at TOA - Geocentric	2	n	660	32-Bit Float	0.0 .. 180.0	deg	32.96
CERES Relative Azimuth at TOA - Geocentric	2	n	660	32-Bit Float	0.0 .. 360.0	deg	32.96
Converted Elevation Angles	2	n	660	32-Bit Float	0.0 .. 260.0	deg	32.96
Converted Azimuth Angles	2	n	660	32-Bit Float	0.0 .. 360.0	deg	32.96
Radiance and Mode Flags	2	n	660	U32 Integer	Table 3.1-6	N/A	32.96
Ancillary QA Flags, Set 1	2	n	660	U32 Integer	Reference 3	N/A	32.96
Ancillary QA Flags, Set 2	2	n	660	U32 Integer	Reference 3	N/A	32.96
Julian Date and Time	2	n	2	64-Bit Float	N/A	day	0.20
Cone Angles	2	n	660	32-Bit Float	0.0 .. 90.0	deg	32.96
Clock Angles	2	n	660	32-Bit Float	0.0 .. 360.0	deg	32.96
Cone Angle Rates	2	n	660	32-Bit Float	-100.0 .. 100.0	deg sec^{-1}	32.96
Clock Angle Rates	2	n	660	32-Bit Float	-10.0 .. 10.0	deg sec^{-1}	32.96
SW Spaceclamp Values	2	n	2	32-Bit Float	N/A	count	0.1

Table 2.1-3. BDS SDS Summary (2 of 2)

SDS Name	HDF Rank	Number of Rows	Number of Columns	Data Type	Range	Units	Nominal Size (MB)*
WN Spaceclamp Values	2	n	2	32-Bit Float	N/A	count	0.1
TOT Spaceclamp Values	2	n	2	32-Bit Float	N/A	count	0.1
Count Conversion SW Sample Offsets	2	4	660	32-Bit Float	N/A	count	0.01
Count Conversion WN Sample Offsets	2	4	660	32-Bit Float	N/A	count	0.01
Count Conversion Total Sample Offsets	2	4	660	32-Bit Float	N/A	count	0.01
SDS TOTAL SIZE (* assumes n = 13091 and does not include HDF overhead)							**812.67**

BDS Vdata

The BDS contains eight Vdatas which are collections of records containing one or more fields. Each of the eight Vdatas contains *n* records of packet level data, and there is a one-to-one correspondence of the Vdatas record numbers to the row numbers of the BDS SDSs. Table 2.1-4 summarizes each of the Vdatas contained within the BDS file. Reference 3 provides detailed descriptions of the parameters in each Vdata.

Table 2.1-4. BDS Vdata Summary

Vdata Name	Records	Number of Fields	Nominal Size (MB)
Temperature Counts	n	39	5.62
Voltage and Torque Counts	n	24	2.25
Position Counts	n	12	6.6
Converted Temperatures	n	35	8.84
Converted Voltages and Torques	n	23	4.35
Satellite-Celestial Data	n	11	1.6
Converted Instrument Status Data	n	25	1.1
Count Conversion Constants	1	9	~0.0
Vdata TOTAL SIZE			**30.36**

2.2 Instrument Production Data Set (INSTR)

EOSDIS Product Code: CERX00a

The Instrument Production Data Set (INSTR) is the Level 0 raw data from the CERES Scanner. It is structured into packets by the onboard software as programmed by the instrument developer, TRW. The packets are formatted according to Consultative Committee for Space Data Systems (CCSDS) standards. Although the CERES output is the same on each satellite, the packets contain ancillary information which is unique to a particular spacecraft. There are seven basic pieces of information contained in a normal CERES data packet (i.e., science output format):

1. Packet Header - Same format for all instruments
2. Time (secondary header) - formats specified by platform's selected CCSDS option
3. Radiometric Detector Outputs
4. Instrument Elevation and Azimuth Position Data
5. Instrument Analog Engineering Data (e.g., Temperatures and Voltages)
6. Instrument Digital Engineering Data

There are five types of packets currently defined for the CERES instrument - Science, Diagnostic Memory, Diagnostic Processor, Diagnostic Gimbal, and Diagnostic Fixed Pattern. Each of these packet types corresponds to a particular operation of the CERES instrument.

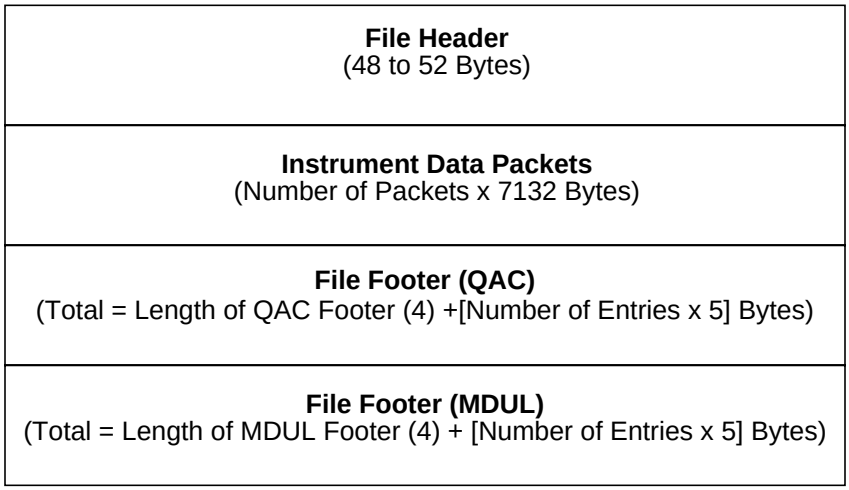
For processing purposes, packets are grouped into Level 0 files which typically represent data collected from the CERES instrument over a 24-hour period. The TRMM Level 0 file format is illustrated in Figure 2.2-1 and the EOS-AM1 Level 0 file format is illustrated in Figure 2.2-2. Table 2.2-1 lists the parameters for each packet type.

Level: 0
Type: Archival
Frequency: 1/Day

Time Interval Covered
File: 1 Day
Record: Single 6.6-Second Scans

Portion of Globe Covered
File: Satellite Swath
Record: N/A

Portion of Atmosphere Covered
File: N/A



(Minimum number of QAC entries is always = 1)

QAC - List of packet IDs known to be corrupted or unusable;
MDUL - List of packet IDs missing;

Figure 2.2-1. TRMM Level 0 File Format

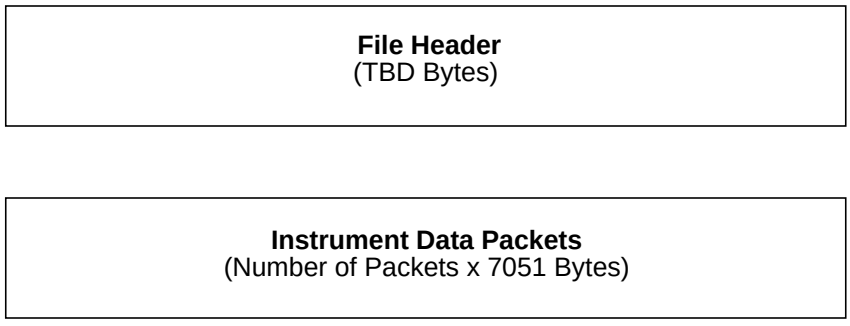


Figure 2.2-2. EOS Level 0 File Format

Table 2.2-1. Instrument Production Data Set (INSTR) (1 of 3)

Description	Parameter Number	Units	Range	Elements/ Record	Bits/ Elem	Elem Num
INSTR_PDS						
INSTR_PDS File Header (TRMM)						
Spacecraft ID		N/A	N/A	1	16	
Spacecraft Clock (first packet)		N/A	N/A	1	72	
Spare		N/A	N/A	1	8	
Spacecraft Clock (last packet)		N/A	N/A	1	72	
Spare		N/A	N/A	1	8	
Number of Packets in file		N/A	N/A	1	32	
Processing Options		N/A	N/A	1	8	
Data Type Flag		N/A	N/A	1	8	
Time of Receipt at Originating Node		N/A	N/A	1	56	
Spare		N/A	N/A	1	24	
Select Options		N/A	N/A	1	8	
Number of APIDs		N/A	N/A	1	8	
APIDs		N/A	N/A	1 to 3	16	
Spare		N/A	N/A	1	8	
Number of QAC lists in file		N/A	N/A	1	8	
Offset to QAC List		N/A	N/A	1	32	
INSTR_PDS File Header (EOS)		N/A	N/A		TBD	
Contents TBD						
INSTR_PDS Data is Array[13091] of:						
INSTR_PDS_Data_Packet						
INSTR_PDS_Data_Packet_Header is selection of						
INSTR_Packet_Hdr (TRMM)						
INSTR_Packet_Header_Data						
Version Number	1	N/A	N/A	1	3	1
Type	2	N/A	N/A	1	1	2
Secondary Header Flag	3	N/A	N/A	1	1	3
APID	4	N/A	N/A	1	11	4
Sequence Flags	5	N/A	N/A	1	2	5
Packet Sequence Count	6	N/A	N/A	1	14	6
Packet Length	7	N/A	N/A	1	16	7
INSTR_Packet_Secondary_Hdr (TRMM)						
Time Data	8	N/A	N/A	1	64	8
INSTR_Packet_Status (TRMM)						
Spare 1	9	N/A	N/A	1	16	9
Timecode ID	10	N/A	N/A	1	1	10
Quicklook Flag	11	N/A	N/A	1	1	11
Instrument ID	12	N/A	N/A	1	5	12
Data Version	13	N/A	N/A	1	5	13
Data Indicator	14	N/A	N/A	1	4	14
Packet Counter	15	N/A	0..65535	1	16	15
Spare 2	16	N/A	N/A	1	16	16
Spare 3	17	N/A	N/A	1	16	17
INSTR_Packet_Hdr (EOS)						
INSTR_Packet_Header_Data						
Version Number	1	N/A	N/A	1	3	1
Type	2	N/A	N/A	1	1	2
Secondary Header Flag	3	N/A	N/A	1	1	3
APID	4	N/A	N/A	1	11	4

Table 2.2-1. Instrument Production Data Set (INSTR) (2 of 3)

Description	Parameter Number	Units	Range	Elements/ Record	Bits/ Elem	Elem Num
Segment Flags	5	N/A	N/A	1	2	5
Source Sequence Count	6	N/A	N/A	1	14	6
Packet Length	7	N/A	N/A	1	16	7
INSTR_Secondary_Hdr (EOS)						
Time Data	9	N/A	N/A	1	72	8
Quick Look Flag	10	N/A	N/A	1	8	9
INSTR_Packet_Status (EOS)						
Spare 1	11	N/A	N/A	1	8	10
Timecode ID	12	N/A	N/A	1	1	11
Quicklook Flag	13	N/A	N/A	1	1	12
Instrument ID	14	N/A	N/A	1	5	13
Data Version	15	N/A	N/A	1	5	14
Data Indicator	16	N/A	N/A	1	4	15
Packet Counter	17	N/A	N/A	1	16	16
Spare 2	18	N/A	N/A	1	16	17
Spare 3	19	N/A	N/A	1	16	18
INSTR_Measurement_Data is selection of						
INSTR_Science_Data is Array[660] of:						
INSTR_Science_Record						
Azimuth Position Count	19	count	0..65535	660	16	21
Elevation Position Count	20	count	0..65535	660	16	681
Total Detector Output	21	count	0..4095	660	12	1341
SW Detector Output	22	count	0..4095	660	12	2001
Window Detector Output	23	count	0..4095	660	12	2661
Instrument Analog Data - See Reference 3 for details	24	-	-	660	12	3321
INSTR_Diagnostic_Memory_Data is Array[660] of:						
INSTR_Memory_Record						
Azimuth Position Count	19	count	0..65535	660	16	21
Elevation Position Count	20	count	0..65535	660	16	681
DAP Memory Dump Data	21	N/A	0..65535	660	16	1341
ICP Memory Dump Data	22	N/A	0..65535	660	16	2001
Fill Data	23	N/A	0..15	660	4	2661
Instrument Analog Data - See Reference 3 for details	24	-	-	660	12	3321
INSTR_Diagnostic_Gimbal_Operation_Data is Array[660] of:						
INSTR_Gimbal_Record						
Azimuth Position Count	19	count	0..65535	660	16	21
Elevation Position Count	20	count	0..65535	660	16	681
Elevation Error	21	count	0..65535	660	16	1341
Azimuth Error	22	count	0..65535	660	16	2001
Fill Data	23	N/A	0..15	660	4	2661
Instrument Analog Data - See(Reference 3 for details	24	-	-	660	12	3321
INSTR_Diagnostic_Processor_Operation_Data is Array[660] of:						
INSTR_Processor_Op_Record						
Azimuth Position Count	19	count	0..65535	660	16	21
Elevation Position Count	20	count	0..65535	660	16	681
DAP Timing	21	N/A	0..65535	660	16	1341
ICP Timing	22	N/A	0..65535	660	16	2001
Fill Data	23	N/A	0..15	660	4	2661
Instrument Analog Data - See Reference 3 for details	24	-	-	660	12	3321

Table 2.2-1. Instrument Production Data Set (INSTR) (3 of 3)

Description	Parameter Number	Units	Range	Elements/ Record	Bits/ Elem	Elem Num
INSTR_Diagnostic_Fixed_Pattern_Data is Array[660] of:						
INSTR_Fixed_Record						
Fixed Pattern in Elevation Field	19	N/A	0..65535	660	16	21
Fixed Pattern for Azimuth Field	20	N/A	0..65535	660	16	681
Fixed Pattern for Total Channel Field	21	N/A	0..4095	660	12	1341
Fixed Pattern for Window Channel Field	22	N/A	0..4095	660	12	2001
Fixed Pattern for Shortwave Channel Field	23	N/A	0..4095	660	12	2661
Fixed Pattern for Analog Field	24	N/A	0..4095	660	12	3321
INSTR_Data						
INSTR_Digital_Status_Block is						
Instrument Digital Status - See Reference 3 for details	25	-	-	1	2960	3322
INSTR_Ancillary_Data is selection of						
INSTR-EOS_Ancillary_Data						
Ancillary Time Stamp	26	count	0..1.84x10^{19}	1	64	3323
GPS/UTC Time Conversion	27	count	0..4.29x10^{9}	1	32	3324
Solar Array Current	28	count	0..255	1	8	3325
Mag Coil Current X	29	count	0..255	1	8	3326
Mag Coil Current Y	30	count	0..255	1	8	3327
Mag Coil Current Z	31	count	0..255	1	8	3328
Satellite Position (X) Count	32	count	0..4.29x109	1	32	3329
Satellite Position (Y) Count	33	count	0..4.29x109	1	32	3330
Satellite Position (Z) Count	34	count	0..4.29x109	1	32	3331
Satellite Velocity (X) Count	35	count	0..4.29x109	1	32	3332
Satellite Velocity (Y) Count	36	count	0..4.29x109	1	32	3333
Satellite Velocity (Z) Count	37	count	0..4.29x109	1	32	3334
Satellite Attitude (Roll) Count	38	count	0..65535	1	16	3335
Satellite Attitude (Pitch) Count	39	count	0..65535	1	16	3336
Satellite Attitude (Yaw) Count	40	count	0..65535	1	16	3337
Satellite Attitude Rate (Roll) Count	41	count	0..65535	1	16	3338
Satellite Attitude Rate (Pitch) Count	42	count	0..65535	1	16	3339
Satellite Attitude Rate (Yaw) Count	43	count	0..65535	1	16	3340
Solar X Position	44	count	0..255	1	8	3341
Solar Y Position	45	count	0..255	1	8	3342
Solar Z Position	46	count	0..255	1	8	3343
Lunar X Position	47	count	0..255	1	8	3344
Lunar Y Position	48	count	0..255	1	8	3345
Lunar Z Position	49	count	0..255	1	8	3346
INSTR_Fill_Data is selection of						
TRMM	50	N/A	N/A	1	1104	3347
EOS	50	N/A	N/A	1	592	3347
INSTR_PDS File Footer (TRMM Only)						
INSTR_PDS_File_Footer is						
QAC List	N/A	N/A	N/A	1	32	
QAC Entries	N/A	N/A	N/A	variable	16	
MDUL	N/A	N/A	N/A	1	32	
MDU	N/A	N/A	N/A	variable	16	
Total Header Bits/File:	**416**					
Total Data Bits/Record:	**57056**					
Total Records/File:	**13091**					
Total Data Bits/File:	**746920096**					
Total Bits/File:	**745873296**					

2.3 ERBE-like Instantaneous TOA Estimates (ES-8)

EOSDIS Product Code: CER02

The ES-8 archival data product is created as an HDF-EOS Swath data structure. The product contains a 24-hour, single-satellite, instantaneous view of scanner fluxes at the top-of-atmosphere reduced from spacecraft altitude unfiltered radiances using the ERBE scanner Inversion algorithms and the ERBE shortwave (SW) and longwave (LW) angular distribution models (ADMs). The ES-8 also includes the SW, LW, and window (WN) channel radiometric data; SW, LW, and WN unfiltered radiance values; and the ERBE scene identification for each measurement. These data are organized according to the CERES 3.3-second scan into 6.6-second records. As long as there is one valid scanner measurement within a record, the ES-8 record will be generated. A complete listing of metadata and science parameters are listed in Table 2.3-1 through Table 2.3-4.

Specifically, the ES-8 contains the following kinds of information:

1. Scan-level Data (Vdata Structures)

    a) Time of Observation (Julian date and time)
    b) Earth-Sun distance
    c) Satellite position and velocity and Sun position

2. Measurement-level Data (Scientific Data Sets (SDSs))

    a) Instrument Field-of-View (colatitude and longitude)
    b) Radiometric data (total, shortwave, and window channels)
    c) Satellite and Sun geometry (viewing zenith, solar zenith, and relative azimuth)
    d) Unfiltered radiances (shortwave, longwave, and window)
    e) TOA fluxes (shortwave and longwave)
    f) ERBE scene identification

(1) clear ocean	(5) clear coastal	(9) mostly cloudy ocean
(2) clear land	(6) partly cloudy ocean	(10) mostly cloudy land-desert
(3) clear snow	(7) partly cloudy land-desert	(11) mostly cloudy coastal
(4) clear desert	(8) partly cloudy coastal	(12) overcast

Level: 2
Type: Archival
Frequency: 1/Day

Portion of Globe Covered
File: Satellite Swath
Record: N/A

Time Interval Covered
File: 24 Hours
Record: 6.6-Seconds

Portion of Atmosphere Covered
File: Satellite Altitude and TOA

ES-8 Metadata

Table 2.3-1 gives an overview of the ES-8 product. The metadata structures contain information which need only be recorded once per daily product. The CERES metadata are listed in Appendix B. Table B-1 shows the CERES Baseline Header Metadata and Table B-2 shows the parameters in the CERES_metadata Vdata. Note that the CERES_metadata Vdata is a subset of the CERES Baseline Header Metadata. As explained in Appendix B, the CERES Baseline Header Metadata includes either the bounding rectangle or GRing attributes. The spatial boundaries of the ES-8 are defined with the bounding rectangle. The ES-8 also contains Product Specific Metadata, which are shown in Table 2.3-2.

Table 2.3-1. ES-8 Product Summary

HDF Name	Description	Number of Parameters	Nominal Size (MBytes)
CERES Baseline Header Metadata	See Table B-1	35	
CERES_metadata Vdata	See Table B-2	14	
ES-8 Product Specific Metadata	See Table 2.3-2	1	
ES-8 Vdata Summary	See Table 2.3-3	20	1.1
ES-8 SDS Summary	See Table 2.3-4	20	467.1
ES-8 TOTAL SIZE (MB/Day)			468.2*

*Counting overhead, each ES-8 is about 480 MB.

Table 2.3-2. ES-8 Product Specific Metadata

Item	Parameter Name	Records	Units	Range	Data Type
1	NumOfCrosstrackRecords	1	N/A	0 .. 13091	Integer
2	NumOfRAPSRecords	1	N/A	0 .. 13091	Integer
3	NumOfAlongtrackRecords	1	N/A	0 .. 13091	Integer
4	NumOfTransitionalRecords	1	N/A	0 .. 13091	Integer

ES-8 Vdata Structures

The ES-8 contains 22 record-level parameters written by HDF-EOS as HDF Vdata structures. These structures may be thought of as one-dimensional arrays with a maximum dimension that corresponds to the maximum number of 6.6-second data records contained in one day or 13,091. Each of these arrays contains one of the parameters listed in Table 2.3-3.

Table 2.3-3. ES-8 Vdata Summary

Parameter Name (Vdata Name)	Units	Range	Maximum Number of Vdata Elements	Bits per Element	Maximum Vdata Size (KB)
Time of Observation	day	2449353 .. 999999999	13091	64	102.27
Earth-Sun distance at record start	AU	$-8x10^6$ .. $102x10^6$	13091	64	102.27
X component of satellite position at record start	m	$-8x10^6$ .. $8x10^6$	13091	32	51.14
X component of satellite position at record end	m	$-8x10^6$ .. $8x10^6$	13091	32	51.14
Y component of satellite position at record start	m	$-8x10^6$ .. $8x10^6$	13091	32	51.14
Y component of satellite position at record end	m	$-8x10^6$ .. $8x10^6$	13091	32	51.14
Z component of satellite position at record start	m	$-8x10^6$ .. $8x10^6$	13091	32	51.14
Z component of satellite position at record end	m	$-8x10^6$ .. $8x10^6$	13091	32	51.14
X component of satellite velocity at record start	m/sec	$-1x10^4$ .. $1x10^4$	13091	32	51.14
X component of satellite velocity at record end	m/sec	$-1x10^4$ .. $1x10^4$	13091	32	51.14
Y component of satellite velocity at record start	m/sec	$-1x10^4$ .. $1x10^4$	13091	32	51.14
Y component of satellite velocity at record end	m/sec	$-1x10^4$ .. $1x10^4$	13091	32	51.14
Z component of satellite velocity at record start	m/sec	$-1x10^4$ .. $1x10^4$	13091	32	51.14
Z component of satellite velocity at record end	m/sec	$-1x10^4$ .. $1x10^4$	13091	32	51.14
Colatitude of satellite nadir at record start	deg	0 .. 180	13091	32	51.14
Colatitude of satellite nadir at record end	deg	0 .. 180	13091	32	51.14
Longitude of satellite nadir at record start	deg	0 .. 360	13091	32	51.14
Longitude of satellite nadir at record end	deg	0 .. 360	13091	32	51.14
Colatitude of Sun at observation	deg	0 .. 180	13091	32	51.14
Longitude of Sun at observation	deg	0 .. 360	13091	32	51.14
Total Vdata Size (KB)					**1125.06**
Total Vdata Size (MB)					**1.10**

ES-8 Scientific Data Sets

The ES-8 contains 20 SDSs which are 2-dimensional arrays of time ordered records where the first dimension corresponds to the maximum number of 6.6-second data contained in one day or 13,091. For measurement level data, other than flag words, the second dimension corresponds to the maximum number of measurements or footprints contained on a 6.6-second data record or 660. There are 22 measurement-level, 32 bit flag words that contain a flag value in each of the right-most 30 bits (22words x 30bits/word = 660 bits). For these measurement-level flag words, the second dimension is 22. For the single radiance flag word, the second dimension is 3.

Table 2.3-4 summarizes the contents and sizes of each SDS contained within the ES-8 file.

Table 2.3-4. ES-8 SDS Summary

Parameter Name (SDS Name)	Units	Range	Maximum Number of SDS Elements	Bits per Element	Maximum SDS Size (KB)
Colatitude of CERES FOV at TOA	deg	0 .. 180	13091 x 660	32	33750.23
Longitude of CERES FOV at TOA	deg	0 .. 360	13091 x 660	32	33750.23
CERES TOT filtered radiance	W/(m^2 sr)	0 .. 700	13091 x 660	32	33750.23
CERES SW filtered radiance	W/(m^2 sr)	-10 .. 510	13091 x 660	32	33750.23
CERES WN filtered radiance	W/(m^2 sr)	0 .. 50	13091 x 660	32	33750.23
CERES viewing zenith at TOA	deg	0 .. 90	13091 x 660	32	33750.23
CERES solar zenith at TOA	deg	0 .. 180	13091 x 660	32	33750.23
CERES relative azimuth at TOA	deg	0 .. 360	13091 x 660	32	33750.23
CERES SW unfiltered radiance	W/(m^2 sr)	-10 .. 510	13091 x 660	32	33750.23
CERES LW unfiltered radiance	W/(m^2 sr)	0 .. 200	13091 x 660	32	33750.23
CERES WN unfiltered radiance	W/(m^2 sr)	0 .. 50	13091 x 660	32	33750.23
CERES SW flux at TOA	W/m^2	0 .. 1400	13091 x 660	32	33750.23
CERES LW flux at TOA	W/m^2	50 .. 400	13091 x 660	32	33750.23
ERBE scene identification at observation	N/A	0 .. 12.4	13091 x 660	32	33750.23
TOT channel flag words	N/A	N/A	13091 x 22	32	1125.01
SW channel flag words	N/A	N/A	13091 x 22	32	1125.01
WN channel flag words	N/A	N/A	13091 x 22	32	1125.01
Scanner FOV flag words	N/A	N/A	13091 x 22	32	1125.01
Rapid retrace flag words	N/A	N/A	13091 x 22	32	1125.01
Scanner operations flag word	N/A	N/A	13091 x 3	32	153.41
Total SDS Size (KB)					**478281.68**
Total SDS Size (MB)					**467.07**

Maximum Meta Bits:
Maximum Data Bits*: **3927300000**
Maximum Bits: **3927300000**
Maximum Product Size (MB)*: **468.2**

* Note: Maximum sizes are based on 13,091 total 6.6-sec data records.

2.4 ERBE-like Monthly Regional Averages (ES-9)

NOTE: The final design of the ES-9 HDF Product is still under consideration. This entry will reflect the final design upon completion.

EOSDIS Product Code: CER03

The ES-9 archival data product is created as HDF Scientific Data Sets (SDSs) and contains data for each 2.5-degree region observed during a month. There are 10,368 possible regions; a given region is viewed by the scanner several times as the spacecraft passes overhead. For each region, data are stored by the hour for each hour of each day in the month. Stored data include the mean estimates of shortwave and longwave radiant flux at the TOA, the standard deviations of these estimates, the maximum and minimum estimate, and scene information or cloud condition. Similar parameters are determined for those scanner measurements that are identified as viewing clear-sky areas. Daily, monthly hourly, and monthly averages are also stored. A complete listing of parameters for this data product can be found in Tables 2.4-3 through 2.4-9.

Level: 3
Type: Archival
Frequency: 1/Month

Portion of Globe Covered
File: Global
Record: Regional

Time Interval Covered
File: 1 Month
Record: Hourbox Data

Portion of Atmosphere Covered
File: TOA

ES-9 Metadata

The contents of the ES-9 is summarized in Table 2.4-1. The metadata structures contain information which need only be recorded once per monthly product. The CERES metadata are listed in Appendix B. Table B-1 shows the CERES Baseline Header Metadata, and Table B-2 shows the parameters in the CERES_metadata Vdata. Note that the CERES_metadata Vdata is a subset of the CERES Baseline Header Metadata. As explained in Appendix B, the CERES Baseline Header Metadata includes either the bounding rectangle or GRing attributes. The spatial boundaries of the ES-9 are defined with the bounding rectangle. The ES-9 Product Specific Metadata is shown in Table 2.4-2.

Table 2.4-1. ES-9 Product Summary

HDF Name	Description	Records	Number of Fields	Nominal Size (MB)
CERES Baseline Header Metadata	See Table B-1	1	35	
CERES_metadata Vdata	See Table B-2	1	14	
ES-9 Product Specific Metadata	See Table 2.4-2	1	1	
ES-9 SDS Summary	See Table 2.4-3	1	6	1033.2
ES-9 TOTAL SIZE (MB/Month)				**1033.2**

Table 2.4-2. ES-9 Product Specific Metadata

Item	Parameter Name	Records	Units	Range	Data Type
1	ES9BinaryProductionDate	1	N/A	N/A	ASCII string

ES-9 Scientific Data Sets

The ES-9 contains science parameters written as HDF Scientific Data Sets (SDSs) which are 2- or 3-dimensional arrays of spatially ordered records. An overview of each of these SDSs is given in Table 2.4-3.

Table 2.4-3. ES-9 SDS Summary

SDS Name	Description	SDS Size	Bits per Element	Maximum SDS Size (MB)
RegionalSummary_Data	See Table 2.4-4	10368[a] x 8[b]	32	0.3
Monthly_Data from Daily_Data	See Table 2.4-5	10368[a] x 27[b]	32	1.1
Monthly_Data from MonthlyHourly_Data	See Table 2.4-6	10368[a] x 27[b]	32	1.1
Daily_Data	See Table 2.4-7	10368[a] x 31 x 26[b]	32	31.8
MonthlyHourly_Data	See Table 2.4-8	10368[a] x 24 x 34[b]	32	32.3
HourBox_Data	See Table 2.4-9	(10368 x 744)[c] x 33[b]	32	971.1
Total SDS size (MB)				**1,037.7**

a. The actual first dimension of the SDS will equal the number of 2.5-degree regions contained on the ES-9.
b. This dimension represents the number of parameters contained in the SDS.
c. The actual first dimension of this SDS is equal to the sum of the number of hourboxes per region over all the regions actually contained on this ES-9, or it is equal to the sum of all parameter 7 values from the RegionalSummary_Data SDS (Table 0.1-4). 10,368 is the maximum number of 2.5-degree regions, and 744 is the maximum number of hourboxes per region, so the maximum size of the first dimension for this SDS is 10,368 x 744 = 7,713,792.

Tables 2.4-4 through 2.4-9 list the parameters contained in each ES-9 SDS.

The RegionalSummary_Data SDS is in the form of a “n” by 8 array, where n ranges from 1 to 10,368 depending on the number of 2.5-degree regions contained on the ES-9, and 8 is the number of parameters in the SDS. Table 2.4-4 gives the index number, units, and range for each of the 8 parameters in this SDS.

Table 2.4-4. SDS “RegionalSummary_Data”

Parameter Name	Parameter Index	Units	Range
Region Number	1	N/A	1 .. 10368
Geographic scene type	2	N/A	1 .. 5
Scene fraction histogram (1)	3	N/A	0 .. M[a]
Scene fraction histogram (2)	4	N/A	0 .. M[a]
Scene fraction histogram (3)	5	N/A	0 .. M[a]
Scene fraction histogram (4)	6	N/A	0 .. M[a]
Number of hourboxes	7	N/A	1 .. 744
Start position of HourBox_Data	8	N/A	0 .. N[b]
Total SDS size (bits) = 10368 x 8 x 32 bits =			**2,654,208**
Total SDS size (MB)			**0.316**

a. The Scene fraction histogram ranges from 0 to M where M is the number of hourboxes (parameter 7) for each region.
b. The Start position of HourBox_Data ranges from 0 to N where N is the first dimension of the HourBox_Data SDS (Table 0.1-9) minus the number of hourboxes in the last region.

The Monthly_Data from Daily_Data SDS is in the form of a “n” by 27 array, where n ranges from 1 to 10,368 depending on the number of 2.5-degree regions contained on the ES-9, and 27 is the number of parameters in the SDS. Table 2.4-5 gives the index number, units, and range for each of the 27 parameters in this SDS.

Table 2.4-5. SDS “Monthly_Data from Daily_Data”

Parameter Name	Parameter Index	Units	Range
Region number	1	N/A	1 .. 10368
SW flux	2	W/m^2	0 .. 1400
SW flux minimum value	3	W/m^2	0 .. 1400
SW flux maximum value	4	W/m^2	0 .. 1400
SW flux standard deviation	5	W/m^2	0 .. 1400
SW flux # of days w/at least one sample	6	day	0 .. 31
LW flux	7	W/m^2	50 .. 400
LW flux minimum value	8	W/m^2	50 .. 400
LW flux maximum value	9	W/m^2	50 .. 400
LW flux standard deviation	10	W/m^2	0 .. 350
LW flux # of days w/at least one sample	11	day	0 .. 31
Albedo	12	N/A	0 .. 1
Net flux	13	W/m^2	-200 .. 200
Monthly total integrated solar incidence	14	N/A	0 .. 500000
Clear sky SW flux	15	W/m^2	0 .. 1400
Clear sky SW flux minimum value	16	W/m^2	0 .. 1400
Clear sky SW flux maximum value	17	W/m^2	0 .. 1400
Clear sky SW flux standard deviation	18	W/m^2	0 .. 1400
Clear sky SW flux # of days with at least 1 sample	19	day	0 .. 31
Clear sky LW flux average flux	20	W/m^2	50 .. 400
Clear sky LW flux minimum value	21	W/m^2	50 .. 400
Clear sky LW flux maximum value	22	W/m^2	50 .. 400
Clear sky LW flux standard deviation	23	W/m^2	0 .. 350
Clear sky LW flux # of days with at least 1 sample	24	day	0 .. 31
Clear sky albedo	25	N/A	0 .. 1
Clear sky net radiant flux	26	W/m^2	-200 .. 200
Clear sky solar incidence	27	N/A	0 .. 500000
Total SDS size (bits) = 10368 x 27 x 32 bits =			**8,957,952**
Total SDS size (MB)			**1.068**

The Monthly_Data from MonthlyHourly_Data SDS is in the form of a “n” by 27 array, where n ranges from 1 to 10,368 depending on the number of 2.5-degree regions contained on the ES-9, and 27 is the number of parameters in the SDS. Table 2.4-6 gives the index number, units, and range for each of the 27 parameters in this SDS.

Table 2.4-6. SDS “Monthly_Data from MonthlyHourly_Data”

Parameter Name	Parameter Index	Units	Range
Region number	1	N/A	1 .. 10368
SW flux	2	W/m^2	0 .. 1400
SW flux minimum value	3	W/m^2	0 .. 1400
SW flux maximum value	4	W/m^2	0 .. 1400
SW flux standard deviation	5	W/m^2	0 .. 1400
SW flux # of hours w/at least one sample	6	day	0 .. 24
LW flux	7	W/m^2	50 .. 400
LW flux minimum value	8	W/m^2	50 .. 400
LW flux maximum value	9	W/m^2	50 .. 400
LW flux standard deviation	10	W/m^2	0 .. 350
LW flux # of hours w/at least one sample	11	day	0 .. 24
Albedo	12	N/A	0 .. 1
Net flux	13	W/m^2	-200 .. 200
Solar incidence	14	N/A	0 .. 500000
Clear sky SW flux	15	W/m^2	0 .. 1400
Clear sky SW flux minimum value	16	W/m^2	0 .. 1400
Clear sky SW flux maximum value	17	W/m^2	0 .. 1400
Clear sky SW flux standard deviation	18	W/m^2	0 .. 1400
Clear sky SW flux # of hours with at least 1 sample	19	day	0 .. 24
Clear sky LW flux	20	W/m^2	50 .. 400
Clear sky LW flux minimum value	21	W/m^2	50 .. 400
Clear sky LW flux maximum value	22	W/m^2	50 .. 400
Clear sky LW flux standard deviation	23	W/m^2	0 .. 350
Clear sky LW flux # of hours with at least 1 sample	24	day	0 .. 24
Clear sky albedo	25	N/A	0 .. 1
Clear sky net radiant flux	26	W/m^2	-200 .. 200
Clear sky solar incidence	27	N/A	0 .. 500000
Total SDS size (bits) = 10368 x 27 x 32 bits =			**8,957,952**
Total SDS size (MB)			**1.068**

The Daily_Data SDS is in the form of a “n” by 31 by 26 array, where n ranges from 1 to 10,368 depending on the number of 2.5-degree regions contained on the ES-9, 31 is the maximum number of days in a month, and 26 is the number of parameters in the SDS. Table 2.4-7 gives the index number, units, and range for each of the 26 parameters in this SDS.

Table 2.4-7. SDS “Daily_Data”

Parameter Name	Parameter Index	Units	Range
Day number	1	N/A	1 .. 31
Region number	2	N/A	1 .. 10368
Solar constant, distance corrected	3	W/m^2	1300 .. 1450
SW flux	4	W/m^2	0 .. 1400
SW flux minimum value	5	W/m^2	0 .. 1400
SW flux maximum value	6	W/m^2	0 .. 1400
SW flux standard deviation	7	W/m^2	0 .. 1400
SW flux # of hours with at least one sample	8	day	0 .. 24
LW flux	9	W/m^2	50 .. 400
LW flux minimum value	10	W/m^2	50 .. 400
LW flux maximum value	11	W/m^2	50 .. 400
LW flux standard deviation	12	W/m^2	0 .. 350
LW flux # of hours with at least one sample	13	day	0 .. 24
Albedo	14	N/A	0 .. 1
Solar incidence	15	N/A	0 .. 500000
Clear sky SW flux	16	W/m^2	0 .. 1400
Clear sky SW flux minimum value	17	W/m^2	0 .. 1400
Clear sky SW flux maximum value	18	W/m^2	0 .. 1400
Clear sky SW flux standard deviation	19	W/m^2	0 .. 1400
Clear sky SW flux # of hours with at least 1 sample	20	day	0 .. 24
Clear sky LW flux	21	W/m^2	50 .. 400
Clear sky LW flux minimum value	22	W/m^2	50 .. 400
Clear sky LW flux maximum value	23	W/m^2	50 .. 400
Clear sky LW flux standard deviation	24	W/m^2	0 .. 350
Clear sky LW flux # of hours with at least 1 sample	25	day	0 .. 24
Clear sky albedo	26	N/A	0 .. 1
Total SDS size (bits) = 10368 x 26 x 31 x 32 bits =			**267,411,456**
Total SDS size (MB)			**31.878**

The MonthlyHourly_Data SDS is in the form of a "n" by 24 by 34 array, where n ranges from 1 to 10,368 depending on the number of 2.5-degree regions contained on the ES-9, 24 is the maximum number of hours in a day, and 34 is the number of parameters in the SDS. Table 2.4-8 gives the index number, units, and range for each of the 34 parameters in this SDS.

Table 2.4-8. SDS "MonthlyHourly_Data"

Parameter Name	Parameter Index	Units	Range
Hour number	1	N/A	1 .. 744
Region number	2	N/A	1 .. 10368
SW flux	3	W/m^2	0 .. 1400
SW flux minimum value	4	W/m^2	0 .. 1400
SW flux maximum value	5	W/m^2	0 .. 1400
SW flux standard deviation	6	W/m^2	0 .. 1400
SW flux # of days with at least 1 sample	7	day	0 .. 31
SW sum of estimates	8	W/m^2	0 .. 45000
SW sum of estimates squared	9	W^2/m^4	0 .. $50x10^6$
LW flux	10	W/m^2	50 .. 400
LW flux minimum value	11	W/m^2	50 .. 400
LW flux maximum value	12	W/m^2	50 .. 400
LW flux standard deviation	13	W/m^2	0 .. 350
LW flux # of days with at least one sample	14	day	0 .. 31
LW flux sum of estimates	15	W/m^2	0 .. 15000
LW sum of estimates squared	16	W^2/m^4	0 .. $5x10^6$
Albedo	17	N/A	0 .. 1
Solar incidence	18	N/A	0 .. 500000
Clear sky SW flux	19	W/m^2	0 .. 1400
Clear sky SW flux minimum value	20	W/m^2	0 .. 1400
Clear sky SW flux maximum value	21	W/m^2	0 .. 1400
Clear sky SW flux standard deviation	22	W/m^2	0 .. 1400
Clear sky SW flux # of days with at least 1 sample	23	day	0 .. 31
Clear sky SW sum of estimates	24	W/m^2	0 .. 45000
Clear sky SW sum of estimates squared	25	W^2/m^4	0 .. $50x10^6$
Clear sky LW flux	26	W/m^2	50 .. 400
Clear sky LW flux minimum value	27	W/m^2	50 .. 400
Clear sky LW flux maximum value	28	W/m^2	50 .. 400
Clear sky LW flux standard deviation	29	W/m^2	0 .. 350
Clear sky LW flux # of days with at least 1 sample	30	day	0 .. 31
Clear sky LW sum of estimates	31	W/m^2	0 .. 15000
Clear sky LW sum of estimates squared	32	W^2/m^4	0 .. $5x10^6$
Clear sky albedo	33	W/m^2	0 .. 1
Clear sky solar incidence	34	W/m^2	0 .. 1450
Total SDS size (bits) = 10368 x 24 x 34 x 32 bits =			**270,729,216**
Total SDS size (MB)			**32.273**

The HourBox_Data SDS is in the form of an “n” by 33 array, where n ranges from 1 to 7,713,792 (10,368 x 744) depending on the number of 2.5-deg regions (10,368 maximum) and the number of hourboxes per 2.5-degree region (744 maximum) that contain data during the month. The second dimension of the array, 33, is the number of parameters contained in the SDS. Table 2.4-9 gives the index number, units, and range for each of the 33 parameters in this SDS.

Table 2.4-9. SDS “HourBox_Data”

Parameter Name	Parameter Index	Units	Range
Region Number	1	N/A	1 .. 10368
Number of hourboxes	2	N/A	1 .. 744
Hourbox Number	3	N/A	1 .. 744
Whole part of Julian date	4	day	2449353 .. 2458500
Fractional part of Julian day	5	day	0 .. 1
Scene fraction (1)	6	N/A	0 .. 1
Scene fraction (2)	7	N/A	0 .. 1
Scene fraction (3)	8	N/A	0 .. 1
Scene fraction (4)	9	N/A	0 .. 1
Albedo vector (1)	10	N/A	0 .. 1
Albedo vector (2)	11	N/A	0 .. 1
Albedo vector (3)	12	N/A	0 .. 1
Albedo vector (4)	13	N/A	0 .. 1
Cosine of the solar zenith angle	14	N/A	0 .. 1
Satellite zenith angle	15	deg	0 .. 90
Azimuth angle	16	deg	0 .. 360
Solar incidence	17	W/m^2	0 .. 1450
SW flux	18	W/m^2	0 .. 1400
SW flux minimum value	19	W/m^2	0 .. 1400
SW flux maximum value	20	W/m^2	0 .. 1400
SW flux standard deviation	21	W/m^2	0 .. 1400
SW flux number	22	N/A	TBD
LW flux	23	W/m^2	50 .. 400
LW flux minimum value	24	W/m^2	50 .. 400
LW flux maximum value	25	W/m^2	50 .. 400
LW flux standard deviation	26	W/m^2	0 .. 350
LW flux number	27	N/A	TBD
SW flux maximum difference	28	W/m^2	TBD
LW flux maximum difference	29	W/m^2	TBD
Clear sky albedo	30	N/A	0 .. 1
Clear sky LW flux	31	W/m^2	50 .. 400
Clear sky LW flux standard deviation	32	W/m^2	0 .. 350
Clear sky LW flux number	33	N/A	TBD
Total SDS size (bits) = 10368 x 33 x 744 x 32 bits =			**8,145,764,352**
Total SDS size (MB)			**971.051**

Maximum Meta Bits:	**TBD**
Maximum Data Bits:	**8,704,475,136**
Maximum Bits:	**8,704,475,136**
Maximum Product Size (MB):	**1,037.7**

Note: Sizing estimates shown in this table assume that all 2.5-deg regions and all hourboxes contain data. The sizing estimates per platform are

Product Size (TRMM):	66.0 MB
Product Size (EOS-AM):	170.0 MB
Product Size (EOS-PM):	175.2 MB

The sizing estimate for the ES-9 in the "Archival Products Summary" Table is for EOS-PM.

2.5 ERBE-like Monthly Geographical Averages (ES-4)

EOSDIS Product Code: CER13

The ES-4 archival data product was created as an HDF-EOS Grid Structure and contains regional, zonal, and global averages. The instantaneous scanner estimates at the TOA are arranged hourly, daily, and monthly. They are averaged spatially to regions, latitude zones, and the globe. The ES-4 product contains seven HDF Vgroups corresponding to regional, nested regional, zonal, and global averages (see Table 2.5-3). There are 10,368 2.5-degree regions for the ERBE-like data; therefore, there is a maximum of 10,368 records in the 2.5-degree regional data set. The second set of data is the 2.5-degree nested to 5.0-degree regional data, which constitutes a maximum of 2,592 records. The third set of data is the 5.0-degree nested to 10.0-degree regional data, which constitutes up to 648 records. The fourth, fifth, and sixth sets of data are the 2.5-, 5.0-, and 10.0-degree zonally averaged data which constitute 72, 36, and 18 records, respectively. The last set is the global data, which constitutes three records. A complete listing of parameters for this data product can be found in Table 2.5-1.

Level: 3
Type: Archival
Frequency: 1/Month

Time Interval Covered
File: Month
Record: Month

Portion of Globe Covered
File: Regional, Zonal, Global
Record: Regional, Zonal, Global

Portion of Atmosphere Covered
File: TOA

ES-4 Metadata

The content of the ES-4 is summarized in Table 2.5-1. The metadata structures contain information which need only be recorded once per monthly product. The CERES metadata are listed in Appendix B. Table B-1 shows the CERES Baseline Header Metadata and Table B-2 shows the parameters in the CERES_metadata Vdata. Note that the CERES_metadata Vdata is a subset of the CERES Baseline Header Metadata. As explained in Appendix B, the CERES Baseline Header Metadata includes either the bounding rectangle or GRing attributes. The spatial boundaries of the ES-4 are defined with a bounding rectangle. The ES-4 Product Specific Metadata is shown in Table 2.5-2.

Table 2.5-1. ES-4 Product Summary

HDF Name	Description Table	Number of Parameters	Nominal Size (MBytes)
CERES Baseline Header Metadata	See Table B-1	35	
CERES_metadata Vdata	See Table B-2	14	
ES-4 Product Specific Metadata	See Table 2.5-2	1	
ES-4 Vgroup Summary	See Table 2.5-3	7	25.38
ES-4 TOTAL SIZE (MB/Month)			**25.38**[a]

a. Counting overhead, each ES-4 is about .26 MB.

Table 2.5-2. ES-4 Product Specific Metadata

Item	Parameter Name	Records	Units	Range	Data Type
1	ES4BinaryProductionDate	1	N/A	N/A	ASCII string

Table 2.5-3. ES-4 Vgroup Summary

Vgroup Number	Vgroup Name	Description	Number of Records	Total Size (MB)
1	2.5-degree Regional (2.5R)	See Table 2.5-4	10368 (72 x 144)	19.15
2	5.0-degree Nested Regional (5NR)	See Table 2.5-5	2592 (36 x 72)	4.79
3	10.0-degree Nested Regional (10NR)	See Table 2.5-6	648 (18 x 36)	1.20
4	2.5-degree Zonal (2.5Z)	See Table 2.5-7	72	0.13
5	5.0-degree Zonal (5Z)	See Table 2.5-8	36	.07
6	10.0-degree Zonal (10Z)	See Table 2.5-9	18	.03
7	Global (G)	See Table 2.5-10	3	.01
Total Product Size (MB)				**25.38**

ES-4 Scientific Data Sets

The ES-4 contains science parameters written by HDF-EOS as HDF Scientific Data Sets (SDSs) which are 2- or 3-dimensional arrays of time ordered records where the first dimension corresponds to the maximum number of regions in a monthly product.

Table 2.5-4 lists the SDSs contained in the 2.5-degree Regional Vgroup. The number of elements in each SDS is determined by the number of 2.5-degree colatitudinal zones (72) and 2.5-degree longitudinal zones (144), and may also be a function of the number of days in the month (31) or the number of hours in a day (24).

Table 2.5-4. 2.5-degree Regional (1 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Solar Incidence for Monthly Averages by Day (2.5R)	Wh/m^2	0 .. 500000	72 x 144	32	40.5
Monthly net radiant flux by day (2.5R)	W/m^2	-200 .. 200	72 x 144	32	40.5
Clear-sky net radiant flux, monthly by day (2.5R)	W/m^2	-200 .. 200	72 x 144	32	40.5
Clear-sky solar incidence, monthly by day (2.5R)	W/m^2	0 .. 500000	72 x 144	32	40.5
Monthly net radiant flux by hour (2.5R)	W/m^2	-200 .. 200	72 x 144	32	40.5
Solar incidence, monthly by hour (2.5R)	Wh/m^2	0 .. 500000	72 x 144	32	40.5
Clear-sky net radiant flux, monthly by hour (2.5R)	W/m^2	-200 .. 200	72 x 144	32	40.5
Clear-sky solar incidence, monthly by hour (2.5R)	Wh/m^2	0 .. 500000	72 x 144	32	40.5
Daily solar incidence (2.5R)	Wh/m^2	0 .. 500000	31 x 72 x 144	32	1255.5
Hourly solar incidence (2.5R)	Wh/m^2	0 .. 500000	24 x 72 x 144	32	972.0
Clear-sky solar incidence (2.5R)	Wh/m^2	0 .. 500000	24 x 72 x 144	32	972.0
Longwave flux (2.5R)	W/m^2	50 .. 400	72 x 144	32	40.5
Shortwave flux (2.5R)	W/m^2	0 .. 1400	72 x 144	32	40.5
Monthly mean albedo (2.5R)	N/A	0 .. 1	72 x 144	32	40.5
Clear-sky longwave flux (2.5R)	W/m^2	50 .. 400	72 x 144	32	40.5
Clear-sky shortwave flux (2.5R)	W/m^2	0 .. 1400	72 x 144	32	40.5
Monthly mean Clear-sky albedo (2.5R)	N/A	0 .. 1	72 x 144	32	40.5
Longwave flux by the hour (2.5R)	W/m^2	50 .. 400	72 x 144	32	40.5
Shortwave flux by the hour (2.5R)	W/m^2	0 .. 1400	72 x 144	32	40.5
Monthly average albedo by the hour (2.5R)	N/A	0 .. 1	72 x 144	32	40.5
Clear-sky longwave flux by the hour (2.5R)	W/m^2	50 .. 400	72 x 144	32	40.5
Clear-sky shortwave flux by the hour (2.5R)	W/m^2	0 .. 1400	72 x 144	32	40.5
Clear-sky Monthly averaged albedo by the hour (2.5R)	N/A	0 .. 1	72 x 144	32	40.5
Longwave flux, daily (2.5R)	W/m^2	50 .. 400	31 x 72 x 144	32	1255.5
Shortwave flux, daily (2.5R)	W/m^2	0 .. 1400	31 x 72 x 144	32	1255.5
Monthly mean albedo, daily (2.5R)	N/A	0 .. 1	31 x 72 x 144	32	1255.5
Clear-sky longwave flux, daily (2.5R)	W/m^2	50 .. 400	31 x 72 x 144	32	1255.5
Clear-sky shortwave flux, daily (2.5R)	W/m^2	0 .. 1400	31 x 72 x 144	32	1255.5
Monthly mean Clear-sky albedo, daily (2.5R)	N/A	0 .. 1	31 x 72 x 144	32	1255.5
Longwave flux, hourly (2.5R)	W/m^2	50 .. 400	24 x 72 x 144	32	972.0
Shortwave flux, hourly (2.5R)	W/m^2	0 .. 1400	24 x 72 x 144	32	972.0
Monthly average albedo, hourly (2.5R)	N/A	0 .. 1	24 x 72 x 144	32	972.0
Clear-sky longwave flux, hourly (2.5R)	W/m^2	50 .. 400	24 x 72 x 144	32	972.0
Clear-sky shortwave flux, hourly (2.5R)	W/m^2	0 .. 1400	24 x 72 x 144	32	972.00
Clear-sky Monthly averaged albedo, hourly (2.5R)	N/A	0 .. 1	24 x 72 x 144	32	972.00

Table 2.5-4. 2.5-degree Regional (2 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Number of observations for LW, daily (2.5R)	hour	0 .. 24	31 x 72 x 144	8	313.87
Number of observations for SW, daily (2.5R)	hour	0 .. 24	31 x 72 x 144	8	313.87
Number of observations for Clear-sky LW, daily (2.5R)	hour	0 .. 24	31 x 72 x 144	8	313.87
Number of observations for Clear-sky SW, daily (2.5R)	hour	0 .. 24	31 x 72 x 144	8	313.87
Number of observations for LW, hourly (2.5R)	day	0 .. 31	24 x 72 x 144	8	243.00
Number of observations for SW, hourly (2.5R)	day	0 .. 31	24 x 72 x 144	8	243.00
Number of observations for Clear-sky LW, hourly (2.5R)	day	0 .. 31	24 x 72 x 144	8	243.00
Number of observations for Clear-sky SW, hourly (2.5R)	day	0 .. 31	24 x 72 x 144	8	243.00
Geotype (2.5R)	N/A	N/A	72 x 144	8	10.13
Total SDS Size (KB)					**19612.11**
Total SDS Size (MB)					**19.15**

The following table lists the SDSs contained in the 5.0-degree Nested Regional Vgroup. The number of elements in each SDS is determined by the number of 5.0-degree colatitudinal zones (36) and 5.0-degree longitudinal zones (72), and may also be a function of the number of days in the month (31) or the number of hours in a day (24).

Table 2.5-5. 5.0-degree Nested Regional (1 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Solar Incidence for Monthly Averages by Day (5NR)	Wh/m^2	0 .. 500000	36 x 72	32	10.13
Monthly net radiant flux by day (5NR)	W/m^2	-200 .. 200	36 x 72	32	10.13
Clear-sky net radiant flux, monthly by day (5NR)	W/m^2	-200 .. 200	36 x 72	32	10.13
Clear-sky solar incidence, monthly by day (5NR)	W/m^2	0 .. 500000	36 x 72	32	10.13
Monthly net radiant flux by hour (5NR)	W/m^2	-200 .. 200	36 x 72	32	10.13
Solar incidence, monthly by hour (5NR)	Wh/m^2	0 .. 500000	36 x 72	32	10.13
Clear-sky net radiant flux, monthly by hour (5NR)	W/m^2	-200 .. 200	36 x 72	32	10.13
Clear-sky solar incidence, monthly by hour (5NR)	Wh/m^2	0 .. 500000	36 x 72	32	10.13
Daily solar incidence (5NR)	Wh/m^2	0 .. 500000	31 x 36 x 72	32	313.87
Hourly solar incidence (5NR)	Wh/m^2	0 .. 500000	24 x 36 x 72	32	243.0
Clear-sky solar incidence (5NR)	Wh/m^2	0 .. 500000	24 x 36 x 72	32	243.0
Longwave flux (5NR)	W/m^2	50 .. 400	36 x 72	32	10.13
Shortwave flux (5NR)	W/m^2	0 .. 1400	36 x 72	32	10.13
Monthly mean albedo (5NR)	N/A	0 .. 1	36 x 72	32	10.13
Clear-sky longwave flux (5NR)	W/m^2	50 .. 400	36 x 72	32	10.13
Clear-sky shortwave flux (5NR)	W/m^2	0 .. 1400	36 x 72	32	10.13
Monthly mean Clear-sky albedo (5NR)	N/A	0 .. 1	36 x 72	32	10.13
Longwave flux by the hour (5NR)	W/m^2	50 .. 400	36 x 72	32	10.13
Shortwave flux by the hour (5NR)	W/m^2	0 .. 1400	36 x 72	32	10.13
Monthly average albedo by the hour (5NR)	N/A	0 .. 1	36 x 72	32	10.13
Clear-sky longwave flux by the hour (5NR)	W/m^2	50 .. 400	36 x 72	32	10.13
Clear-sky shortwave flux by the hour (5NR)	W/m^2	0 .. 1400	36 x 72	32	10.13
Clear-sky Monthly averaged albedo by the hour (5NR)	N/A	0 .. 1	36 x 72	32	10.13
Longwave flux, daily (5NR)	W/m^2	50 .. 400	31 x 36 x 72	32	313.87

Table 2.5-5. 5.0-degree Nested Regional (2 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Shortwave flux, daily (5NR)	W/m^2	0 .. 1400	31 x 36 x 72	32	313.87
Monthly mean albedo, daily (5NR)	N/A	0 .. 1	31 x 36 x 72	32	313.87
Clear-sky longwave flux, daily (5NR)	W/m^2	50 .. 400	31 x 36 x 72	32	313.87
Clear-sky shortwave flux, daily (5NR)	W/m^2	0 .. 1400	31 x 36 x 72	32	313.87
Monthly mean Clear-sky albedo, daily (5NR)	N/A	0 .. 1	31 x 36 x 72	32	313.87
Longwave flux, hourly (5NR)	W/m^2	50 .. 400	24 x 36 x 72	32	243.00
Shortwave flux, hourly (5NR)	W/m^2	0 .. 1400	24 x 36 x 72	32	243.00
Monthly average albedo, hourly (5NR)	N/A	0 .. 1	24 x 36 x 72	32	243.00
Clear-sky longwave flux, hourly (5NR)	W/m^2	50 .. 400	24 x 36 x 72	32	243.00
Clear-sky shortwave flux, hourly (5NR)	W/m^2	0 .. 1400	24 x 36 x 72	32	243.00
Clear-sky Monthly averaged albedo, hourly (5NR)	N/A	0 .. 1	24 x 36 x 72	32	243.00
Number of observations for LW, daily (5NR)	hour	0 .. 24	31 x 36 x 72	8	78.47
Number of observations for SW, daily (5NR)	hour	0 .. 24	31 x 36 x 72	8	78.47
Number of observations for Clear-sky LW, daily (5NR)	hour	0 .. 24	31 x 36 x 72	8	78.47
Number of observations for Clear-sky SW, daily (5NR)	hour	0 .. 24	31 x 36 x 72	8	78.47
Number of observations for LW, hourly (5NR)	day	0 .. 31	24 x 36 x 72	8	60.75
Number of observations for SW, hourly (5NR)	day	0 .. 31	24 x 36 x 72	8	60.75
Number of observations for Clear-sky LW, hourly (5NR)	day	0 .. 31	24 x 36 x 72	8	60.75
Number of observations for Clear-sky SW, hourly (5NR)	day	0 .. 31	24 x 36 x 72	8	60.75
Geotype (5NR)	N/A	N/A	36 x 72	8	2.53
Total SDS Size (KB)					**4903.1**
Total SDS Size (MB)					**4.79**

The following table lists the SDSs contained in the 10.0-degree Nested Regional Vgroup. The number of elements in each SDS is determined by the number of 10.0-degree colatitudinal zones (18) and 10.0-degree longitudinal zones (36), and may also be a function of the number of days in the month (31) or the number of hours in a day (24).

Table 2.5-6. 10.0-degree Nested Regional (1 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Solar Incidence for Monthly Averages by Day (10NR)	Wh/m^2	0 .. 500000	18 x 36	32	2.53
Monthly net radiant flux by day (10NR)	W/m^2	-200 .. 200	18 x 36	32	2.53
Clear-sky net radiant flux, monthly by day (10NR)	W/m^2	-200 .. 200	18 x 36	32	2.53
Clear-sky solar incidence, monthly by day (10NR)	W/m^2	0 .. 500000	18 x 36	32	2.53
Monthly net radiant flux by hour (10NR)	W/m^2	-200 .. 200	18 x 36	32	2.53
Solar incidence, monthly by hour (10NR)	Wh/m^2	0 .. 500000	18 x 36	32	2.53
Clear-sky net radiant flux, monthly by hour (10NR)	W/m^2	-200 .. 200	18 x 36	32	2.53
Clear-sky solar incidence, monthly by hour (10NR)	Wh/m^2	0 .. 500000	18 x 36	32	2.53
Daily solar incidence (10NR)	Wh/m^2	0 .. 500000	31 x 18 x 36	32	78.47
Hourly solar incidence (10NR)	Wh/m^2	0 .. 500000	24 x 18 x 36	32	60.75
Clear-sky solar incidence (10NR)	Wh/m^2	0 .. 500000	24 x 18 x 36	32	60.75
Longwave flux (10NR)	W/m^2	50 .. 400	18 x 36	32	2.53
Shortwave flux (10NR)	W/m^2	0 .. 1400	18 x 36	32	2.53

Table 2.5-6. 10.0-degree Nested Regional (2 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Monthly mean albedo (10NR)	N/A	0 .. 1	18 x 36	32	2.53
Clear-sky longwave flux (10NR)	W/m^2	50 .. 400	18 x 36	32	2.53
Clear-sky shortwave flux (10NR)	W/m^2	0 .. 1400	18 x 36	32	2.53
Monthly mean Clear-sky albedo (10NR)	N/A	0 .. 1	18 x 36	32	2.53
Longwave flux by the hour (10NR)	W/m^2	50 .. 400	18 x 36	32	2.53
Shortwave flux by the hour (10NR)	W/m^2	0 .. 1400	18 x 36	32	2.53
Monthly average albedo by the hour (10NR)	N/A	0 .. 1	18 x 36	32	2.53
Clear-sky longwave flux by the hour (10NR)	W/m^2	50 .. 400	18 x 36	32	2.53
Clear-sky shortwave flux by the hour (10NR)	W/m^2	0 .. 1400	18 x 36	32	2.53
Clear-sky Monthly averaged albedo by the hour (10NR)	N/A	0 .. 1	18 x 36	32	2.53
Longwave flux, daily (10NR)	W/m^2	50 .. 400	31 x 18 x 36	32	78.47
Shortwave flux, daily (10NR)	W/m^2	0 .. 1400	31 x 18 x 36	32	78.47
Monthly mean albedo, daily (10NR)	N/A	0 .. 1	31 x 18 x 36	32	78.47
Clear-sky longwave flux, daily (10NR)	W/m^2	50 .. 400	31 x 18 x 36	32	78.47
Clear-sky shortwave flux, daily (10NR)	W/m^2	0 .. 1400	31 x 18 x 36	32	78.47
Monthly mean Clear-sky albedo, daily (10NR)	N/A	0 .. 1	31 x 18 x 36	32	78.47
Longwave flux, hourly (10NR)	W/m^2	50 .. 400	24 x 18 x 36	32	60.75
Shortwave flux, hourly (10NR)	W/m^2	0 .. 1400	24 x 18 x 36	32	60.75
Monthly average albedo, hourly (10NR)	N/A	0 .. 1	24 x 18 x 36	32	60.75
Clear-sky longwave flux, hourly (10NR)	W/m^2	50 .. 400	24 x 18 x 36	32	60.75
Clear-sky shortwave flux, hourly (10NR)	W/m^2	0 .. 1400	24 x 18 x 36	32	60.75
Clear-sky Monthly averaged albedo, hourly (10NR)	N/A	0 .. 1	24 x 18 x 36	32	60.75
Number of observations for LW, daily (10NR)	hour	0 .. 24	31 x 18 x 36	8	19.62
Number of observations for SW, daily (10NR)	hour	0 .. 24	31 x 18 x 36	8	19.62
Number of observations for Clear-sky LW, daily (10NR)	hour	0 .. 24	31 x 18 x 36	8	19.62
Number of observations for Clear-sky SW, daily (10NR)	hour	0 .. 24	31 x 18 x 36	8	19.62
Number of observations for LW, hourly (10NR)	day	0 .. 31	24 x 18 x 36	8	15.19
Number of observations for SW, hourly (10NR)	day	0 .. 31	24 x 18 x 36	8	15.19
Number of observations for Clear-sky LW, hourly (10NR)	day	0 .. 31	24 x 18 x 36	8	15.19
Number of observations for Clear-sky SW, hourly (10NR)	day	0 .. 31	24 x 18 x 36	8	15.19
Geotype (10NR)	N/A	N/A	18 x 36	8	0.63
Total SDS Size (KB)					**1225.76**
Total SDS Size (MB)					**1.20**

Table 2.5-7 lists the SDSs contained in the 2.5-degree Zonal Vgroup. The number of elements in each SDS is determined by the number of colatitudinal zones (72), and may also be a function of the number of days in the month (31) or the number of hours in a day (24).

Table 2.5-7. 2.5-degree Zonal (1 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Solar Incidence for Monthly Averages by Day (2.5Z)	Wh/m^2	0 .. 500000	72	32	0.28
Monthly net radiant flux by day (2.5Z)	W/m^2	-200 .. 200	72	32	0.28
Clear-sky net radiant flux, monthly by day (2.5Z)	W/m^2	-200 .. 200	72	32	0.28

Table 2.5-7. 2.5-degree Zonal (2 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Clear-sky solar incidence, monthly by day (2.5Z)	W/m^2	0 .. 500000	72	32	0.28
Monthly net radiant flux by hour (2.5Z)	W/m^2	-200 .. 200	72	32	0.28
Solar incidence, monthly by hour (2.5Z)	Wh/m^2	0 .. 500000	72	32	0.28
Clear-sky net radiant flux, monthly by hour (2.5Z)	W/m^2	-200 .. 200	72	32	0.28
Clear-sky solar incidence, monthly by hour (2.5Z)	Wh/m^2	0 .. 500000	72	32	0.28
Daily solar incidence (2.5Z)	Wh/m^2	0 .. 500000	31 x 72	32	8.72
Hourly solar incidence (2.5Z)	Wh/m^2	0 .. 500000	24 x 72	32	6.75
Clear-sky solar incidence (2.5Z)	Wh/m^2	0 .. 500000	24 x 72	32	6.75
Longwave flux (2.5Z)	W/m^2	50 .. 400	72	32	0.28
Shortwave flux (2.5Z)	W/m^2	0 .. 1400	72	32	0.28
Monthly mean albedo (2.5Z)	N/A	0 .. 1	72	32	0.28
Clear-sky longwave flux (2.5Z)	W/m^2	50 .. 400	72	32	0.28
Clear-sky shortwave flux (2.5Z)	W/m^2	0 .. 1400	72	32	0.28
Monthly mean Clear-sky albedo (2.5Z)	N/A	0 .. 1	72	32	0.28
Longwave flux by the hour (2.5Z)	W/m^2	50 .. 400	72	32	0.28
Shortwave flux by the hour (2.5Z)	W/m^2	0 .. 1400	72	32	0.28
Monthly average albedo by the hour (2.5Z)	N/A	0 .. 1	72	32	0.28
Clear-sky longwave flux by the hour (2.5Z)	W/m^2	50 .. 400	72	32	0.28
Clear-sky shortwave flux by the hour (2.5Z)	W/m^2	0 .. 1400	72	32	0.28
Clear-sky Monthly averaged albedo by the hour (2.5Z)	N/A	0 .. 1	72	32	0.28
Longwave flux, daily (2.5Z)	W/m^2	50 .. 400	31 x 72	32	8.72
Shortwave flux, daily (2.5Z)	W/m^2	0 .. 1400	31 x 72	32	8.72
Monthly mean albedo, daily (2.5Z)	N/A	0 .. 1	31 x 72	32	8.72
Clear-sky longwave flux, daily (2.5Z)	W/m^2	50 .. 400	31 x 72	32	8.72
Clear-sky shortwave flux, daily (2.5Z)	W/m^2	0 .. 1400	31 x 72	32	8.72
Monthly mean Clear-sky albedo, daily (2.5Z)	N/A	0 .. 1	31 x 72	32	8.72
Longwave flux, hourly (2.5Z)	W/m^2	50 .. 400	24 x 72	32	6.75
Shortwave flux, hourly (2.5Z)	W/m^2	0 .. 1400	24 x 72	32	6.75
Monthly average albedo, hourly (2.5Z)	N/A	0 .. 1	24 x 72	32	6.75
Clear-sky longwave flux, hourly (2.5Z)	W/m^2	50 .. 400	24 x 72	32	6.75
Clear-sky shortwave flux, hourly (2.5Z)	W/m^2	0 .. 1400	24 x 72	32	6.75
Clear-sky Monthly averaged albedo, hourly (2.5Z)	N/A	0 .. 1	24 x 72	32	6.75
Number of observations for LW, daily (2.5Z)	hour	0 .. 24	31 x 72	8	2.18
Number of observations for SW, daily (2.5Z)	hour	0 .. 24	31 x 72	8	2.18
Number of observations for Clear-sky LW, daily (2.5Z)	hour	0 .. 24	31 x 72	8	2.18
Number of observations for Clear-sky SW, daily (2.5Z)	hour	0 .. 24	31 x 72	8	2.18
Number of observations for LW, hourly (2.5Z)	day	0 .. 31	24 x 72	8	1.69
Number of observations for SW, hourly (2.5Z)	day	0 .. 31	24 x 72	8	1.69
Number of observations for Clear-sky LW, hourly (2.5Z)	day	0 .. 31	24 x 72	8	1.69
Number of observations for Clear-sky SW, hourly (2.5Z)	day	0 .. 31	24 x 72	8	1.69
Geotype (2.5Z)	N/A	N/A	72	8	0.07
Total SDS Size (KB)					**136.19**
Total SDS Size (MB)					**0.13**

Table 2.5-8 lists the SDSs contained in the 5.0-degree Zonal Vgroup. The number of elements in each SDS is determined by the number of colatitudinal zones (36), and may also be a function of the number of days in the month (31) or the number of hours in a day (24).

Table 2.5-8. 5.0-degree Zonal (1 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Solar Incidence for Monthly Averages by Day (5Z)	Wh/m^2	0 .. 500000	36	32	0.14
Monthly net radiant flux by day (5Z)	W/m^2	-200 .. 200	36	32	0.14
Clear-sky net radiant flux, monthly by day (5Z)	W/m^2	-200 .. 200	36	32	0.14
Clear-sky solar incidence, monthly by day (5Z)	W/m^2	0 .. 500000	36	32	0.14
Monthly net radiant flux by hour (5Z)	W/m^2	-200 .. 200	36	32	0.14
Solar incidence, monthly by hour (5Z)	Wh/m^2	0 .. 500000	36	32	0.14
Clear-sky net radiant flux, monthly by hour (5Z)	W/m^2	-200 .. 200	36	32	0.14
Clear-sky solar incidence, monthly by hour (5Z)	Wh/m^2	0 .. 500000	36	32	0.14
Daily solar incidence (5Z)	Wh/m^2	0 .. 500000	31 x 36	32	4.36
Hourly solar incidence (5Z)	Wh/m^2	0 .. 500000	24 x 36	32	3.38
Clear-sky solar incidence (5Z)	Wh/m^2	0 .. 500000	24 x 36	32	3.38
Longwave flux (5Z)	W/m^2	50 .. 400	36	32	0.14
Shortwave flux (5Z)	W/m^2	0 .. 1400	36	32	0.14
Monthly mean albedo (5Z)	N/A	0 .. 1	36	32	0.14
Clear-sky longwave flux (5Z)	W/m^2	50 .. 400	36	32	0.14
Clear-sky shortwave flux (5Z)	W/m^2	0 .. 1400	36	32	0.14
Monthly mean Clear-sky albedo (5Z)	N/A	0 .. 1	36	32	0.14
Longwave flux by the hour (5Z)	W/m^2	50 .. 400	36	32	0.14
Shortwave flux by the hour (5Z)	W/m^2	0 .. 1400	36	32	0.14
Monthly average albedo by the hour (5Z)	N/A	0 .. 1	36	32	0.14
Clear-sky longwave flux by the hour (5Z)	W/m^2	50 .. 400	36	32	0.14
Clear-sky shortwave flux by the hour (5Z)	W/m^2	0 .. 1400	36	32	0.14
Clear-sky Monthly averaged albedo by the hour (5Z)	N/A	0 .. 1	36	32	0.14
Longwave flux, daily (5Z)	W/m^2	50 .. 400	31 x 36	32	4.36
Shortwave flux, daily (5Z)	W/m^2	0 .. 1400	31 x 36	32	4.36
Monthly mean albedo, daily (5Z)	N/A	0 .. 1	31 x 36	32	4.36
Clear-sky longwave flux, daily (5Z)	W/m^2	50 .. 400	31 x 36	32	4.36
Clear-sky shortwave flux, daily (5Z)	W/m^2	0 .. 1400	31 x 36	32	4.36
Monthly mean Clear-sky albedo, daily (5Z)	N/A	0 .. 1	31 x 36	32	4.36
Longwave flux, hourly (5Z)	W/m^2	50 .. 400	24 x 36	32	3.38
Shortwave flux, hourly (5Z)	W/m^2	0 .. 1400	24 x 36	32	3.38
Monthly average albedo, hourly (5Z)	N/A	0 .. 1	24 x 36	32	3.38
Clear-sky longwave flux, hourly (5Z)	W/m^2	50 .. 400	24 x 36	32	3.38
Clear-sky shortwave flux, hourly (5Z)	W/m^2	0 .. 1400	24 x 36	32	3.38
Clear-sky Monthly averaged albedo, hourly (5Z)	N/A	0 .. 1	24 x 36	32	3.38
Number of observations for LW, daily (5Z)	hour	0 .. 24	31 x 36	8	1.09
Number of observations for SW, daily (5Z)	hour	0 .. 24	31 x 36	8	1.09
Number of observations for Clear-sky LW, daily (5Z)	hour	0 .. 24	31 x 36	8	1.09
Number of observations for Clear-sky SW, daily (5Z)	hour	0 .. 24	31 x 36	8	1.09
Number of observations for LW, hourly (5Z)	day	0 .. 31	24 x 36	8	0.84
Number of observations for SW, hourly (5Z)	day	0 .. 31	24 x 36	8	0.84

Table 2.5-8. 5.0-degree Zonal (2 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Number of observations for Clear-sky LW, hourly (5Z)	day	0 .. 31	24 x 36	8	0.84
Number of observations for Clear-sky SW, hourly (5Z)	day	0 .. 31	24 x 36	8	0.84
Geotype (5Z)	N/A	N/A	36	8	0.035
Total SDS Size (KB)					**68.12**
Total SDS Size (MB)					**0.07**

Table 2.5-9 lists the SDSs contained in the 10.0-degree Zonal Vgroup. The number of elements in each SDS is determined by the number of colatitudinal zones (18), and may also be a function of the number of days in the month (31) or the number of hours in a day (24).

Table 2.5-9. 10.0-degree Zonal (1 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Solar Incidence for Monthly Averages by Day (10Z)	Wh/m^2	0 .. 500000	18	32	.07
Monthly net radiant flux by day (10Z)	W/m^2	-200 .. 200	18	32	.07
Clear-sky net radiant flux, monthly by day (10Z)	W/m^2	-200 .. 200	18	32	.07
Clear-sky solar incidence, monthly by day (10Z)	W/m^2	0 .. 500000	18	32	.07
Monthly net radiant flux by hour (10Z)	W/m^2	-200 .. 200	18	32	.07
Solar incidence, monthly by hour (10Z)	Wh/m^2	0 .. 500000	18	32	.07
Clear-sky net radiant flux, monthly by hour (10Z)	W/m^2	-200 .. 200	18	32	.07
Clear-sky solar incidence, monthly by hour (10Z)	Wh/m^2	0 .. 500000	18	32	.07
Daily solar incidence (10Z)	Wh/m^2	0 .. 500000	31 x 18	32	2.18
Hourly solar incidence (10Z)	Wh/m^2	0 .. 500000	24 x 18	32	1.69
Clear-sky solar incidence (10Z)	Wh/m^2	0 .. 500000	24 x 18	32	1.69
Longwave flux (10Z)	W/m^2	50 .. 400	18	32	.07
Shortwave flux (10Z)	W/m^2	0 .. 1400	18	32	.07
Monthly mean albedo (10Z)	N/A	0 .. 1	18	32	.07
Clear-sky longwave flux (10Z)	W/m^2	50 .. 400	18	32	.07
Clear-sky shortwave flux (10Z)	W/m^2	0 .. 1400	18	32	.07
Monthly mean Clear-sky albedo (10Z)	N/A	0 .. 1	18	32	.07
Longwave flux by the hour (10Z)	W/m^2	50 .. 400	18	32	.07
Shortwave flux by the hour (10Z)	W/m^2	0 .. 1400	18	32	.07
Monthly average albedo by the hour (10Z)	N/A	0 .. 1	18	32	.07
Clear-sky longwave flux by the hour (10Z)	W/m^2	50 .. 400	18	32	.07
Clear-sky shortwave flux by the hour (10Z)	W/m^2	0 .. 1400	18	32	.07
Clear-sky Monthly averaged albedo by the hour (10Z)	N/A	0 .. 1	18	32	.07
Longwave flux, daily (10Z)	W/m^2	50 .. 400	31 x 18	32	2.18
Shortwave flux, daily (10Z)	W/m^2	0 .. 1400	31 x 18	32	2.18
Monthly mean albedo, daily (10Z)	N/A	0 .. 1	31 x 18	32	2.18
Clear-sky longwave flux, daily (10Z)	W/m^2	50 .. 400	31 x 18	32	2.18
Clear-sky shortwave flux, daily (10Z)	W/m^2	0 .. 1400	31 x 18	32	2.18
Monthly mean Clear-sky albedo, daily (10Z)	N/A	0 .. 1	31 x 18	32	2.18
Longwave flux, hourly (10Z)	W/m^2	50 .. 400	24 x 18	32	1.69
Shortwave flux, hourly (10Z)	W/m^2	0 .. 1400	24 x 18	32	1.69

Table 2.5-9. 10.0-degree Zonal (2 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Monthly average albedo, hourly (10Z)	N/A	0 .. 1	24 x 18	32	1.69
Clear-sky longwave flux, hourly (10Z)	W/m^2	50 .. 400	24 x 18	32	1.69
Clear-sky shortwave flux, hourly (10Z)	W/m^2	0 .. 1400	24 x 18	32	1.69
Clear-sky Monthly averaged albedo, hourly (10Z)	N/A	0 .. 1	24 x 18	32	1.69
Number of observations for LW, daily (10Z)	hour	0 .. 24	31 x 18	8	.54
Number of observations for SW, daily (10Z)	hour	0 .. 24	31 x 18	8	.54
Number of observations for Clear-sky LW, daily (10Z)	hour	0 .. 24	31 x 18	8	.54
Number of observations for Clear-sky SW, daily (10Z)	hour	0 .. 24	31 x 18	8	.54
Number of observations for LW, hourly (10Z)	day	0 .. 31	24 x 18	8	.42
Number of observations for SW, hourly (10Z)	day	0 .. 31	24 x 18	8	.42
Number of observations for Clear-sky LW, hourly (10Z)	day	0 .. 31	24 x 18	8	.42
Number of observations for Clear-sky SW, hourly (10Z)	day	0 .. 31	24 x 18	8	.42
Geotype (10Z)	N/A	N/A	18	8	.018
Total SDS Size (KB)					**34.04**
Total SDS Size (MB)					**0.03**

Table 2.5-10 lists the SDSs contained in the Global Vgroup. Each SDS contains global averages based on 2.5-, 5.0-, and 10.0-degree regions (3), and may also be a function of the number of days in the month (31) or the number of hours in a day (24).

Table 2.5-10. Global (1 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Solar Incidence for Monthly Averages by Day (G)	Wh/m^2	0 .. 500000	3	32	0.012
Monthly net radiant flux by day (G)	W/m^2	-200 .. 200	3	32	0.012
Clear-sky net radiant flux, monthly by day (G)	W/m^2	-200 .. 200	3	32	0.012
Clear-sky solar incidence, monthly by day (G)	W/m^2	0 .. 500000	3	32	0.012
Monthly net radiant flux by hour (G)	W/m^2	-200 .. 200	3	32	0.012
Solar incidence, monthly by hour (G)	Wh/m^2	0 .. 500000	3	32	0.012
Clear-sky net radiant flux, monthly by hour (G)	W/m^2	-200 .. 200	3	32	0.012
Clear-sky solar incidence, monthly by hour (G)	Wh/m^2	0 .. 500000	3	32	0.012
Daily solar incidence (G)	Wh/m^2	0 .. 500000	31 x 3	32	0.36
Hourly solar incidence (G)	Wh/m^2	0 .. 500000	24 x 3	32	0.28
Clear-sky solar incidence (G)	Wh/m^2	0 .. 500000	24 x 3	32	0.28
Longwave flux (G)	W/m^2	50 .. 400	3	32	0.012
Shortwave flux (G)	W/m^2	0 .. 1400	3	32	0.012
Monthly mean albedo (G)	N/A	0 .. 1	3	32	0.012
Clear-sky longwave flux (G)	W/m^2	50 .. 400	3	32	0.012
Clear-sky shortwave flux (G)	W/m^2	0 .. 1400	3	32	0.012
Monthly mean Clear-sky albedo (G)	N/A	0 .. 1	3	32	0.012
Longwave flux by the hour (G)	W/m^2	50 .. 400	3	32	0.012
Shortwave flux by the hour (G)	W/m^2	0 .. 1400	3	32	0.012
Monthly average albedo by the hour (G)	N/A	0 .. 1	3	32	0.012
Clear-sky longwave flux by the hour (G)	W/m^2	50 .. 400	3	32	0.012

Table 2.5-10. Global (2 of 2)

Parameter Name (SDS Name)	Units	Range	Number of SDS Elements	Bits per Element	SDS Size (KB)
Clear-sky shortwave flux by the hour (G)	W/m^2	0 .. 1400	3	32	0.012
Clear-sky Monthly averaged albedo by the hour (G)	N/A	0 .. 1	3	32	0.012
Longwave flux, daily (G)	W/m^2	50 .. 400	31 x 3	32	0.36
Shortwave flux, daily (G)	W/m^2	0 .. 1400	31 x 3	32	0.36
Monthly mean albedo, daily (G)	N/A	0 .. 1	31 x 3	32	0.36
Clear-sky longwave flux, daily (G)	W/m^2	50 .. 400	31 x 3	32	0.36
Clear-sky shortwave flux, daily (G)	W/m^2	0 .. 1400	31 x 3	32	0.36
Monthly mean Clear-sky albedo, daily (G)	N/A	0 .. 1	31 x 3	32	0.36
Longwave flux, hourly (G)	W/m^2	50 .. 400	24 x 3	32	0.28
Shortwave flux, hourly (G)	W/m^2	0 .. 1400	24 x 3	32	0.28
Monthly average albedo, hourly (G)	N/A	0 .. 1	24 x 3	32	0.28
Clear-sky longwave flux, hourly (G)	W/m^2	50 .. 400	24 x 3	32	0.28
Clear-sky shortwave flux, hourly (G)	W/m^2	0 .. 1400	24 x 3	32	0.28
Clear-sky Monthly averaged albedo, hourly (G)	N/A	0 .. 1	24 x 3	32	0.28
Number of observations for LW, daily (G)	hour	0 .. 24	31 x 3	8	0.091
Number of observations for SW, daily (G)	hour	0 .. 24	31 x 3	8	0.091
Number of observations for Clear-sky LW, daily (G)	hour	0 .. 24	31 x 3	8	0.091
Number of observations for Clear-sky SW, daily (G)	hour	0 .. 24	31 x 3	8	0.091
Number of observations for LW, hourly (G)	day	0 .. 31	24 x 3	8	0.07
Number of observations for SW, hourly (G)	day	0 .. 31	24 x 3	8	0.07
Number of observations for Clear-sky LW, hourly (G)	day	0 .. 31	24 x 3	8	0.07
Number of observations for Clear-sky SW, hourly (G)	day	0 .. 31	24 x 3	8	0.07
Geotype (G)	N/A	N/A	3	8	.0029
Total SDS Size (KB)					**5.65**
Total SDS Size (MB)					**0.01**

Maximum Meta Bits per Product: **TBD**
Maximum Data Bits per Product: **212868552**
Maximum Bits per Product: **212868552**
Maximum Product Size (MB) per Product: **16.41**

2.6 Single Satellite Footprint, TOA and Surface Flux, Clouds (SSF)

EOSDIS Product Code: CER11

The Single Satellite CERES Footprint TOA and Surface Fluxes, Clouds (SSF) product is produced from the cloud identification, convolution, inversion, and surface processing for CERES. Each SSF covers footprints, or CERES Fields-of-View (FOV), from a single hour and a single CERES scanner (3 channels) mounted on one satellite. This SSF parameter list is for HDF granules.

The major categories of data output on the SSF are

- CERES FOV geometry and CERES viewing angles
- CERES FOV radiance and flux (TOA and Surface)
- CERES FOV area statistics and imager viewing angles
- CERES FOV clear area statistics
- CERES FOV cloudy area statistics for two cloud height categories
- CERES FOV cloud overlap conditions (4 conditions)
- Imager radiance statistics (5 imager channels) over CERES FOV

The SSF product will be produced daily starting with the TRMM launch. The SSF provides data needed to produce a production-quality set of CERES Angular Distribution Models (CADMs). At a later time, the archival SSF product will be reproduced using the production CADMs.

The SSF contains only full Earth-view footprints which have adequate imager coverage. The number of CERES full Earth-view footprints depends on the elevation scan mode, azimuth scan mode, and height of the satellite. Since both scan modes are programmable, the range on the number of footprints in an SSF product has been set to the largest possible range, namely 0 .. 360000 as shown in Table 2.6-3. A smaller SSF size of 245475 footprints per hour is used in sizing estimates, however, as this is the estimated maximum number of TRMM full Earth-view CERES footprints per hour given a normal elevation scan. Accounting for the need for adequate imager coverage, this number may become even smaller. For this reason, operating in a cross-track scan reduces the number of footprints on an SSF. Cross-track scanning on TRMM will result in approximately 37% fewer footprints per hour. For EOS, cross-track scanning will result in approximately a 23% reduction. When operating in Rotating Azimuth Plane Scan (RAPS) mode, the expected number of footprints per hour is also reduced, but not to the same extent as in cross-track. A complete listing of parameters for this data product can be found in Table 2.6-5.

Level: 2
Type: Archival
Frequency: 1/Hour

Time Interval Covered
File: 1 Hour
Record: 1/100-Second

Portion of Globe Covered
File: Satellite Swath
Record: 1 CERES Footprint

Portion of Atmosphere Covered
File: Surface to TOA

SSF Metadata

The types of SSF metadata are summarized in Table 2.6-1 and contain information which need only be recorded once per hour. The CERES metadata are listed in Appendix B. Table B-1 lists the CERES Baseline Header Metadata and Table B-2 lists the parameters in the CERES_metadata Vdata Table. Note that the CERES_metadata Vdata is a subset of the CERES Baseline Header Metadata. The SSF product-specific metadata parameters are listed in Table 2.6-2 and the SSF_Header parameters are listed in Table 2.6-3.

Table 2.6-1. SSF Metadata Summary

HDF Name	Description Table	Records	Number of Fields
CERES Baseline Header Metadata	Table B-1	1	36
CERES_metadata Vdata	Table B-2	1	14
SSF Product-specific Metadata	Table 2.6-2	1	3
SSF_Header Vdata	Table 2.6-3	1	23

Table 2.6-2. SSF Product-specific Metadata

Item	Parameter Name	Units	Range	Data Type
1	PercentCrosstrackFOV	N/A	0.0 .. 100.0	4-byte real
2	PercentRapsFOV	N/A	0.0 .. 100.0	4-byte real
3	PercentOtherFOV	N/A	0.0 .. 100.0	4-byte real

Table 2.6-3. SSF_Header

Item	Description	Units	Range	Elements	Bytes/Elem
SSF-H1	SSF ID	N/A	112 .. 200	1	4
SSF-H2	Character name of CERES instrument	N/A	ASCII string	1	4
SSF-H3	Day and Time at hour start	N/A	ASCII string	1	28
SSF-H4	Character name of satellite	N/A	ASCII string	1	4
SSF-H5	Character name of high resolution imager instrument	N/A	ASCII string	1	8
SSF-H6	Number of imager channels	N/A	1 .. 20	1	4
SSF-H7	Central wavelengths of imager channels	μm	0.4 .. 15.0	20	4
SSF-H8	Earth-Sun distance at hour start	AU	0.98 .. 1.02	1	4
SSF-H9	Colatitude of subsatellite point at surface at hour start	deg	0 .. 180	1	4
SSF-H10	Longitude of subsatellite point at surface at hour start	deg	0 .. 360	1	4
SSF-H11	Colatitude of subsatellite point at surface at hour end	deg	0 .. 180	1	4
SSF-H12	Longitude of subsatellite point at surface at hour end	deg	0 .. 360	1	4
SSF-H13	Along-track angle of satellite at hour end	deg	0 .. 330	1	4
SSF-H14	Number of Footprints in SSF product	N/A	0 .. 360000	1	4
SSF-H15	Subsystem 4.1 identification string	N/A	ASCII string	1	128
SSF-H16	Subsystem 4.2 identification string	N/A	ASCII string	1	128
SSF-H17	Subsystem 4.3 identification string	N/A	ASCII string	1	128
SSF-H18	Subsystem 4.4 identification string	N/A	ASCII string	1	128
SSF-H19	Subsystem 4.5 identification string	N/A	ASCII string	1	128
SSF-H20	Subsystem 4.6 identification string	N/A	ASCII string	1	128
SSF-H21	IES production date and time	N/A	ASCII string	1	24
SSF-H22	MOA production date and time	N/A	ASCII string	1	24
SSF-H23	SSF production date and time	N/A	ASCII string	1	24

SSF Scientific Data Sets

The SSF contains 24 Scientific Data Sets (SDS) which are parameter collections of along-track ordered footprints where the first dimension corresponds to the number of footprints; the last dimension corresponds to the number of parameters; and the middle dimension, if rank 3, corresponds to the number of elements in each parameter array. This ordering is used by the C programming language and most HDF viewers. In FORTRAN, the dimensions are reversed such that the number of footprints becomes the last dimension and the first dimension is the number of parameters in the SDS. Table 2.6-4 summarizes the contents of each SDS contained within the SSF file.

Table 2.6-4. SSF SDS Summary

SDS Link	SDS Name	HDF Rank	Dimensions	Data Type	Maximum Hourly Size (MB)
SDS 1:	Julian_Time	2	n x 2	8-byte real	3.75
SDS 2:	Velocity	2	n x 3	8-byte real	5.62
SDS 3:	Colat_Longitude	2	n x 8	4-byte real	7.49
SDS 4:	Scan_Index	2	n x 2	2-byte integer	0.94
SDS 5:	FOV_Angles	2	n x 6	4-byte real	5.62
SDS 6:	ViewAngles	2	n x 5	4-byte real	4.68
SDS 7:	Surface_Types	3	n x 8 x 2	2-byte integer	7.49
SDS 8:	ADM_Types	2	n x 3	2-byte integer	1.40
SDS 9:	Flags_Operations_Radiance	2	n x 1	4-byte integer	0.94
SDS 10:	Unfiltered_Radiance	2	n x 3	4-byte real	2.81
SDS 11:	TOA_Flux	2	n x 3	4-byte real	2.81
SDS 12:	SurfaceFlux_ModelA	2	n x 6	4-byte real	5.62
SDS 13:	SurfaceFlux_ModelB	2	n x 4	4-byte real	3.75
SDS 14:	Full_FOV_Integers	2	n x 11	2-byte integer	5.15
SDS 15:	Full_FOV_Reals	2	n x 6	4-byte real	5.62
SDS 16:	Clear_FOV_Integers	2	n x 1	2-byte integer	0.47
SDS 17:	Clear_FOV_Reals	2	n x 4	4-byte real	3.75
SDS 18:	Cloudy_FOV_Integers	3	n x 2 x 2	2-byte integer	0.94
SDS 19:	Cloudy_FOV_Reals	3	n x 2 x 21	4-byte real	39.33
SDS 20:	Overlap_Conditions	3	n x 4 x 1	2-byte integer	1.87
SDS 21:	Validation_Stddev	3	n x 2 x 7	4-byte real	13.11
SDS 22:	Internal_Use_Integers	2	n x 3	2-byte integer	2.34
SDS 23:	Internal_Use_Reals	2	n x 63	4-byte real	58.99
SDS 24:	Imager_Radiance_Stats	3	n x 5 x 15	4-byte real	70.23
	SDS TOTAL SIZE				**255.64**

(Note: n = the number of footprints processed: Assuming n = 245475 for sizing)

Table 2.6-5 provides a complete listing of parameters for the SSF data product.

Table 2.6-5. Single Satellite Footprint, TOA and Surface Flux, Clouds (SSF) (1 of 3)

Product Code Key: **A:** **Archival - Parameters of interest to the general user community**
I: **Internal - Parameters required by subsequent subsystems or reprocessing**
V: **Validation - Parameters used for validation**

Description	Parameter Number	Units	Range	Elements/ Record	Bytes/ Elem	Product Code
SDS 1: Julian_Time						
1 Time of observation	1	day	2440000 .. 2480000	1	8	A
2 Radius of satellite from center of Earth at observation	2	km	6000 .. 8000	1	8	A
SDS 2: Velocity						
1 X component of satellite inertial velocity	3	km sec^{-1}	-10 .. 10	1	8	A
2 Y component of satellite inertial velocity	4	km sec^{-1}	-10 .. 10	1	8	A
1 Z component of satellite inertial velocity	5	km sec^{-1}	-10 .. 10	1	8	A
SDS 3: Colat_Longitude						
1 Colatitude of subsatellite point at surface at observation	6	deg	0 .. 180	1	4	A
2 Longitude of subsatellite point at surface at observation	7	deg	0 .. 360	1	4	A
3 Colatitude of subsolar point at surface at observation	8	deg	0 .. 180	1	4	A
4 Longitude of subsolar point at surface at observation	9	deg	0 .. 360	1	4	A
5 Colatitude of CERES FOV at TOA	10	deg	0 .. 180	1	4	A
6 Longitude of CERES FOV at TOA	11	deg	0 .. 360	1	4	A
7 Colatitude of CERES FOV at surface	12	deg	0 .. 180	1	4	A
8 Longitude of CERES FOV at surface	13	deg	0 .. 360	1	4	A
SDS 4: Scan_Index						
1 Scan sample number	14	N/A	1 .. 660	1	2	A
2 Packet number	15	N/A	0 .. 32766	1	2	A
SDS 5: FOV_Angles						
1 Cone angle of CERES FOV at satellite	16	deg	0 .. 90	1	4	A
2 Clock angle of CERES FOV at satellite wrt inertial velocity	17	deg	0 .. 360	1	4	A
3 Rate of change of cone angle	18	deg sec^{-1}	-300 .. 300	1	4	A
4 Rate of change of clock angle	19	deg sec^{-1}	-20 .. 20	1	4	A
5 Along-track angle of CERES FOV at surface	20	deg	-30 .. 330	1	4	A
6 Cross-track angle of CERES FOV at surface	21	deg	-90 .. 90	1	4	A
SDS 6: ViewAngles						
1 CERES viewing zenith at surface	22	deg	0 .. 90	1	4	A
2 CERES solar zenith at surface	23	deg	0 .. 180	1	4	A
3 CERES relative azimuth at surface	24	deg	0 .. 360	1	4	A
4 CERES viewing azimuth at surface wrt North	25	deg	0 .. 360	1	4	A
5 Altitude of surface above sea level	26	m	-1000 .. 10000	1	4	A
SDS 7: Surface_Types						
1 Surface type index	27	N/A	1 .. 20	8	2	A
2 Surface type percent coverage	28	N/A	0 .. 100	8	2	A
SDS 8: ADM_Types						
1 CERES SW ADM type for inversion process	29	N/A	0 .. 5000	1	2	A
2 CERES LW ADM type for inversion process	30	N/A	0 .. 5000	1	2	A
3 CERES WN ADM type for inversion process	31	N/A	0 .. 5000	1	2	A
SDS 9: Flags_Operations_Radiance						
1 Radiance and Mode flags	36	N/A	see Table 3.1-6	1	4	A
SDS 10: Unfiltered_Radiance						
1 CERES SW radiance, upwards	37	W m^{-2} sr^{-1}	-10 .. 510	1	4	A
2 CERES LW radiance, upwards	38	W m^{-2} sr^{-1}	0 .. 200	1	4	A
3 CERES WN radiance, upwards	39	W m^{-2} $sr^{-1}\mu m^{-1}$	0 .. 50	1	4	A
SDS 11: TOA_Flux						
1 CERES SW flux at TOA, upwards	40	W m^{-2}	0 .. 1400	1	4	A
2 CERES LW flux at TOA, upwards	41	W m^{-2}	0 .. 500	1	4	A
3 CERES WN flux at TOA, upwards	42	W m^{-2} μm^{-1}	2 .. 50	1	4	A

Table 2.6-5. Single Satellite Footprint, TOA and Surface Flux, Clouds (SSF) (2 of 3)

Description	Parameter Number	Units	Range	Elements/ Record	Bytes/ Elem	Product Code
SDS 12: SurfaceFlux_ModelA						
1 CERES downward SW surface flux, Model A	43	W m^{-2}	0 .. 1400	1	4	A
2 CERES downward LW surface flux, Model A	44	W m^{-2}	0 .. 700	1	4	A
3 CERES downward WN surface flux, Model A	45	W $m^{-2}\mu m^{-1}$	0 .. 250	1	4	A
4 CERES net SW surface flux, Model A	46	W m^{-2}	0 .. 1400	1	4	A
5 CERES net LW surface flux, Model A	47	W m^{-2}	-250 .. 50	1	4	A
6 CERES WN surface emissivity	55	N/A	0 .. 1	1	4	A
SDS 13: SurfaceFlux_ModelB						
1 CERES downward SW surface flux, Model B	48	W m^{-2}	0 .. 1400	1	4	A
2 CERES downward LW surface flux, Model B	49	W m^{-2}	0 .. 700	1	4	A
3 CERES net SW surface flux, Model B	50	W m^{-2}	0 .. 1400	1	4	A
4 CERES net LW surface flux, Model B	51	W m^{-2}	-250 .. 50	1	4	A
SDS 14: Full_FOV_Integers						
1 Number of imager pixels in CERES FOV	56	N/A	0 .. 9000	1	2	A
2 Imager percent coverage	57	N/A	0 .. 100	1	2	A
3 Flag, Source of precipitable water	64	N/A	0 .. 120	1	2	A
4 Shadowed imager pixels percent coverage (TBD)	65	N/A	0 .. 100	1	2	A
5 Imager sunglint percent coverage	66	N/A	0 .. 100	1	2	A
6 Imager-based snow/Ice percent coverage	67	N/A	0 .. 100	1	2	A
7 Imager-based fire percent coverage	68	N/A	0 .. 100	1	2	A
8 Imager-based aerosol percent coverage	69	N/A	0 .. 100	1	2	A
9 Flag, Type of aerosol	70	N/A	0 .. 9999	1	2	A
10 Notes on general procedure	71	N/A	1 .. 32766	1	2	A
11 Notes on Cloud Algorithms	72	N/A	0 .. 32766	1	2	A
SDS 15: Full_FOV_Reals						
1 Imager viewing zenith over CERES FOV	58	deg	0 .. 90	1	4	A
2 Imager relative azimuth over CERES FOV	59	deg	0 .. 180	1	4	A
3 Surface wind, U-Vector	60	m sec^{-1}	-100 .. 100	1	4	A
4 Surface wind, V-Vector	61	m sec^{-1}	-100 .. 100	1	4	A
5 Surface Skin Temperature	62	K	175 .. 375	1	4	A
6 Precipitable water	63	cm	0.001 .. 10	1	4	A
SDS 16: Clear_FOV_Integers						
1 Clear area percent coverage at subpixel resolution	73	N/A	0 .. 100	1	2	A
SDS 17: Clear_FOV_Reals						
1 Total aerosol optical depth at 0.63 μm in clear area	74	N/A	0 .. 2	1	4	A
2 Total aerosol optical depth at 1.6 μm in clear area	75	N/A	0 .. 2	1	4	A
3 Imager-based surface skin temperature	76	K	175 .. 375	1	4	A
4 Temperature contrast	77	K	-30 .. 90	1	4	A
SDS 18: Cloudy_FOV_Integers						
1 Cloud layer area percent coverage	78	N/A	0 .. 100	2	2	A
2 Cloud layer note (TBD)	79	N/A	0 .. 32766	2	2	A
SDS 19: Cloudy_FOV_Reals						
1 Mean linearly averaged visible optical depth for cloud layer	80	N/A	0 .. 400	2	4	A
2 Stddev of linearly averaged visible optical depth for cloud layer	81	N/A	0 .. 300	2	4	A
3 Mean logarithmically averaged visible optical depth for cloud layer	82	N/A	0 .. 400	2	4	A
4 Stddev of logarithmically averaged visible optical depth for cloud layer	83	N/A	0 .. 300	2	4	A
5 Mean cloud infrared emissivity for cloud layer	84	N/A	0 .. 1	2	4	A
6 Stddev of cloud infrared emissivity for cloud layer	85	N/A	0 .. 1	2	4	A
7 Mean liquid water path for cloud layer	86	g m^{-2}	0 .. 10000	2	4	A
8 Mean ice water path for cloud layer	88	g m^{-2}	0 .. 10000	2	4	A
9 Mean cloud top pressure for cloud layer	90	hPa	0 .. 1100	2	4	A
10 Mean cloud effective pressure for cloud layer	92	hPa	0 .. 1100	2	4	A
11 Stddev of cloud effective pressure for cloud layer	93	hPa	0 .. 150	2	4	A
12 Mean cloud effective temperature for cloud layer	94	K	100 .. 350	2	4	A
13 Stddev of cloud effective temperature for cloud layer	95	K	0 .. 150	2	4	A
14 Mean cloud effective height for cloud layer	96	km	0 .. 20	2	4	A
15 Mean cloud base pressure for cloud layer	98	hPa	0 .. 1100	2	4	A
16 Mean water particle radius for cloud layer	100	μm	0 .. 40	2	4	A
17 Stddev of water particle radius for cloud layer	101	μm	0 .. 20	2	4	A
18 Mean ice particle effective diameter for cloud layer	102	μm	0 .. 300	2	4	A
19 Stddev of ice particle effective diameter for cloud layer	103	μm	0 .. 200	2	4	A
20 Mean cloud particle phase for cloud layer	104	N/A	1 .. 2	2	4	A
21 Mean vertical aspect ratio for cloud layer (TBD)	106	N/A	0 .. 20	2	4	A

Table 2.6-5. Single Satellite Footprint, TOA and Surface Flux, Clouds (SSF) (3 of 3)

Description	Parameter Number	Units	Range	Elements/ Record	Bytes/ Elem	Product Code
SDS 20: Overlap_Conditions						
1 Overlap condition weighted area percentage	110	N/A	0 .. 100	4	2	A
SDS 21: Validation_Stddev						
1 Stddev of liquid water path for cloud layer	87	g m^{-2}	0 .. 8000	2	4	V
2 Stddev of ice water path for cloud layer	89	g m^{-2}	0 .. 8000	2	4	V
3 Stddev of cloud top pressure for cloud layer	91	hPa	0 .. 600	2	4	V
4 Stddev of cloud effective height for cloud layer	97	km	0 .. 12	2	4	V
5 Stddev of cloud base pressure for cloud layer	99	hPa	0 .. 600	2	4	V
6 Stddev of cloud particle phase for cloud layer	105	N/A	0 .. 1	2	4	V
7 Stddev of vertical aspect ratio for cloud layer (TBD)	107	N/A	0 .. 15	2	4	V
SDS 22: Internal_Use_Integers						
1 ADM geo (TBD)	32	N/A	> 0	1	2	I
2 Clear area percent coverage at imager resolution	112	N/A	0 .. 100	1	2	I
3 Overcast cloud area percent coverage at imager resolution	113	N/A	0 .. 100	1	2	I
SDS 23: Internal_Use_Reals						
1 CERES TOT filtered radiance, upwards	33	W m^{-2} sr^{-1}	0 .. 700	1	4	I
2 CERES SW filtered radiance, upwards	34	W m^{-2} sr^{-1}	-10 .. 510	1	4	I
3 CERES WN filtered radiance, upwards	35	W m^{-2} sr^{-1} μm^{-1}	0 .. 50	1	4	I
4 CERES spectral albedo	52	N/A	0 .. 1	6	4	I
5 CERES broadband surface albedo	53	N/A	0 .. 1	1	4	I
6 CERES LW surface emissivity	54	N/A	0 .. 1	1	4	I
7 Percentiles of visible optical depth for lower cloud layer	108	N/A	0 .. 400	13	4	I
8 Percentiles of IR emissivity for lower cloud layer	109	N/A	0 .. 1	13	4	I
9 Percentiles of visible optical depth for upper cloud layer	108	N/A	0 .. 400	13	4	I
10 Percentiles of IR emissivity for upper cloud layer	109	N/A	0 .. 1	13	4	I
SDS 24: Imager_Radiance_Stats						
1 Imager channel central wavelength	111	μm	0.4 .. 15.0	5	4	I
2 Mean of imager radiances over clear area	114	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
3 Stddev of imager radiances over clear area	115	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
4 Mean of imager radiances over overcast cloud area	116	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
5 Stddev of imager radiances over overcast cloud area	117	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
6 Mean of imager radiances over full CERES FOV	118	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
7 Stddev of imager radiances over full CERES FOV	119	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
8 5th percentile of imager radiances over full CERES FOV	120	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
9 95th percentile of imager radiances over full CERES FOV	121	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
10 Mean of imager radiances over cloud layer 1 (no overlap)	122	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
11 Stddev of imager radiances over cloud layer 1 (no overlap)	123	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
12 Mean of imager radiances over cloud layer 2 (no overlap)	124	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
13 Stddev of imager radiances over cloud layer 2 (no overlap)	125	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
14 Mean of imager radiances over cloud layer 1 and 2 overlap	126	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I
15 Stddev of imager radiances over cloud layer 1 and 2 overlap	127	W m^{-2} sr^{-1} μm^{-1}	0 .. 1000	5	4	I

Total GigaBytes / Day 6.1

SSF parameter distribution is as follows: (See Product Code Key)

A - Archival Parameters 2.6 GigaBytes/Day (42.6%)
I - Internal Parameters 3.2 GigaBytes/Day (52.4%)
V - Validation Parameters 0.3 GigaBytes/Day (5.0%)

Sizes do not include metadata, the header, nor HDF accounting information.

2.7 Clear Reflectance History (CRH)

EOSDIS Product Code: CER16

The Clear Reflectance/Temperature History (CRH) data are organized on a global equal-area grid that is approximately 1/6-degree by 1/6-degree (2160 x 1080=2,332,800 grid boxes). The data coverage is 24 hours and is produced every day. The CRH data consists of two data products. One data product has visible albedo information, and the other has top-of-atmosphere clear-sky brightness temperature and satellite viewing angle information.

The parameters are derived from cloud imager measurements by Subsystems 4.1 - 4.3. The CRH product is the same structure for both Moderate Resolution Imaging Spectrometer (MODIS) values and Visible Infrared Scanner (VIRS) values, and are differentiated by their file names. The CRH product is archived because the product is needed for reprocessing. A complete listing of parameters for these data products can be found in Table 2.7-1.

Level: 3
Type: Archival
Frequency: Every Day

Portion of Globe Covered
File: Entire Globe
Record: 1/6-Deg by 1/6-Deg

Time Interval Covered
File: Life of Mission
Record: Every Day

Portion of Atmosphere Covered
File: Surface

Table 2.7-1. Clear Reflectance History (CRH)

Description	Param Num	Units	Range	Bits/Elem
CRH_albedo				
Visible albedo for collimated, overhead sun illumination	1	x10 percent	0 ...1000	16
Visible albedo running mean, overhead sun illumination	2	x10 percent	0 ...1000	16
Number of albedo counts, since last updated	3	N/A	> = 0	32
Total Data Bits/Grid:				64
Total Grids/File:				2,332,800
Total Data Bits/File:				149,299,200
CRH_temperature				
Temperature derived from 11 μm imager channel	1	K	TBD	16
Mean imager viewing zenith over CERES FOV	2	deg	0 .. 90	16
Time of observation	3	N/A	> = 0	32
Total Data Bits/Grid:				64
Total Grids/File:				2,332,800
Total Data Bits/File:				149,299,200
Total Bits/CRH Data Set:				**298,598,400**

2.8 Clouds and Radiative Swath (CRS)

EOSDIS Product Code: CER04

The Clouds and Radiative Swath (CRS) product is produced by the CERES Instantaneous Surface and Atmospheric Radiation Budget (SARB) Subsystem. Each CRS file contains instantaneous data for one hour from one CERES instrument. Each CRS record contains data for one CERES field-of-view (FOV). The CRS contains the same data as the SSF, with the addition of longwave and shortwave vertical flux profile data.

Each CRS record contains:

- CERES FOV geometry, time, and scene data
- CERES FOV satellite altitude radiance data
- CERES FOV estimated TOA flux data
- CERES FOV surface flux data
- CERES FOV total-sky area data
- CERES FOV clear-sky area data
- Cloud properties for up to two cloud layers over the CERES FOV
- CERES FOV data for four cloud overlap conditions
- FOV imager radiance statistics for five imager channels
- CERES FOV surface radiative parameters
- Atmospheric flux profiles for both clear-sky and total-sky at the surface, 500 hPa, 70 hPa, and the TOA over the CERES FOV
- Flux adjustments (constrained-initial) for clear-sky and total-sky at the surface and TOA over the CERES FOV
- Adjustment parameters for clear-sky (note that these are calculated for both clear-sky and total-sky FOV)
- Adjustment parameters for the two cloud categories over the CERES FOV

Level: 2
Type: Archival
Frequency: 1/ Hour

Time Interval Covered
File: 1 Hour
Record: 1/100-Second

Portion of Globe Covered
File: Satellite Swath
Record: 1 CERES FOV

Portion of Atmosphere Covered
File: Surface to TOA

CRS Metadata

The types of CRS metadata are summarized in Tables 2.8-1 and 2.8-2. These data contain information which need only be recorded once per hour. The CERES metadata are listed in Tables B-1 and B-2 in Appendix B. Table B-1 lists the CERES Baseline Header Metadata and Table B-2 lists the parameters in the CERES_Metadata Vdata.

Table 2.8-1. CRS Metadata Summary

HDF Name	Description Table	Records	Number of Fields
CERES Baseline Header Metadata	Table B-1	1	36
CERES_Metadata Vdata	Table B-2	1	14
CRS Product-specific Metadata	Table 2.8-2	1	3

Table 2.8-2. CRS Product-specific Metadata

Item	Parameter Name	Units	Range	Data Type
1	PercentCrosstrackFOV	N/A	0.0 .. 100.0	32-bit real
2	PercentRapsFOV	N/A	0.0 .. 100.0	32-bit real
3	PercentOtherFOV	N/A	0.0 .. 100.0	32-bit real

CRS Vdata

The CRS contains one Vdata. This Vdata contains information which need only be recorded once per hour. The CRS_Header_Vdata contains CRS-specific data.

Table 2.8-3 summarizes the contents of the Vdata contained within the CRS file.

Table 2.8-3. CRS Vdata Summary

Vdata Name	Description Table	Records	Number of Fields	Nominal Size (Bytes)
CRS_Header_Vdata	Table 2.8-5	1	25	1152
Vdata TOTAL SIZE				**1152**

CRS Scientific Data Sets

The CRS contains 31 Scientific Data Sets (SDS) which are collections of along-track ordered parameters where each row corresponds to a FOV and each column corresponds to a single parameter. The first 24 SDSs are identical to those in SSF. The i^{th} row of every SDS contains those parameters associated with the i^{th} FOV. Table 2.8-4 summarizes the contents of each SDS contained within the CRS file. (Note: n = the number of FOVs processed.)

Table 2.8-4. CRS SDS Summary

SDS Link	SDS Name	HDF Rank	Dimensions	Data Type	Maximum Hourly Size (MB)
SDS 1:	Julian_Time	2	n x 2	64-Bit Real	3.75
SDS 2:	Velocity	2	n x 3	64-Bit Real	5.62
SDS 3:	Colat_Longitude	2	n x 8	32-Bit Real	7.49
SDS 4:	Scan_Index	2	n x 2	16-Bit Integer	0.94
SDS 5:	FOV_Angles	2	n x 6	32-Bit Real	5.62
SDS 6:	ViewAngles	2	n x 5	32-Bit Real	4.68
SDS 7:	Surface_Types	3	n x 8 x 2	16-Bit Integer	7.49
SDS 8:	ADM_Types	2	n x 3	16-Bit Integer	1.40
SDS 9:	Flags_Operations_Radiance	2	n x 1	32-Bit Integer	0.94
SDS 10:	Unfiltered_Radiance	2	n x 3	32-Bit Real	2.81
SDS 11:	TOA_Flux	2	n x 3	32-Bit Real	2.81
SDS 12:	SurfaceFlux_ModelA	2	n x 6	32-Bit Real	5.62
SDS 13:	SurfaceFlux_ModelB	2	n x 4	32-Bit Real	3.75
SDS 14:	Full_FOV_Integers	2	n x 11	16-Bit Integer	5.15
SDS 15:	Full_FOV_Reals	2	n x 6	32-Bit Real	5.62
SDS 16:	Clear_FOV_Integers	2	n x 1	16-Bit Integer	0.47
SDS 17:	Clear_FOV_Reals	2	n x 4	32-Bit Real	3.75
SDS 18:	Cloudy_FOV_Integers	3	n x 2 x 2	16-Bit Integer	0.94
SDS 19:	Cloudy_FOV_Reals	3	n x 2 x 21	32-Bit Real	39.33
SDS 20:	Overlap_Conditions	3	n x 4 x 1	16-Bit Integer	1.87
SDS 21:	Validation_Stddev	3	n x 2 x 7	32-Bit Real	13.11
SDS 22:	Internal_Use_Integers	2	n x 3	16-Bit Integer	2.34
SDS 23:	Internal_Use_Reals	2	n x 63	32-Bit Real	58.99
SDS 24:	Imager_Radiance_Stats	3	n x 5 x 15	32-Bit Real	70.23
SDS 25:	Surface_Radiative	2	n x 3	32-Bit Real	2.81
SDS 26:	NumLev_Profile	2	n x 1	32-Bit Integer	0.04
SDS 27:	Vert_Flux_Profiles	3	n x 4 x 9	32-Bit Real	33.71
SDS 28:	Flux_Adjust	2	n x 12	32-Bit Real	0.50
SDS 29:	Adj_Clear	2	n x 7	32-Bit Real	0.29
SDS 30:	Adj_Cloudy	3	n x 2 x 3	32-Bit Real	0.25
SDS 31:	Adjust_QC	2	n x 2	32-Bit Integer	0.08
	SDS TOTAL SIZE				**293.32**

Table 2.8-5 provides a complete listing of parameters for the CRS data product.

Table 2.8-5. Clouds and Radiative Swath (CRS) (1 of 2)

Description	Parameter Number	Units	Range	Elements/ Record	Bits/ Elem	Product Code
Vdata 1 : CRS_Header_Vdata						
SSF ID		N/A	112 .. 200	1	32	A
Character name of CERES instrument		N/A	ASCII string	1	32	A
Day and time at hour start		N/A	ASCII string	1	224	A
Character name of satellite		N/A	ASCII string	1	32	A
Character name of high resolution imager instrument		N/A	ASCII string	1	64	A
Number of imager channels used		N/A	1 .. 20	1	32	A
Central wavelengths of imager channels		μm	0.4 .. 15.0	20	32	A
Earth-Sun distance at hour start		AU	.98 .. 1.02	1	32	A
Colatitude of subsatellite point at surface at hour start		deg	0 .. 180	1	32	A
Longitude of subsatellite point at surface at hour start		deg	0 .. 360	1	32	A
Colatitude of subsatellite point at surface at hour end		deg	0 .. 180	1	32	A
Longitude of subsatellite point at surface at hour end		deg	0 .. 360	1	32	A
Along-track angle of satellite at hour end		deg	0 .. 330	1	32	A
Number of FOVs in CRS product		N/A	0 .. 245275	1	32	A
Subsystem 4.1 identification string		N/A	ASCII string	1	1024	A
Subsystem 4.2 identification string		N/A	ASCII string	1	1024	A
Subsystem 4.3 identification string		N/A	ASCII string	1	1024	A
Subsystem 4.4 identification string		N/A	ASCII string	1	1024	A
Subsystem 4.5 identification string		N/A	ASCII string	1	1024	A
Subsystem 4.6 identification string		N/A	ASCII string	1	1024	A
Subsystem 5.0 identification string		N/A	ASCII string	1	1024	A
IES production date and time		N/A	ASCII string	1	192	A
MOA production date and time		N/A	ASCII string	1	192	A
SSF production date and time		N/A	ASCII string	1	192	A
CRS production date and time		N/A	ASCII string	1	192	A
Note that the first 24 CRS SDSs are identical to those in SSF (See Table 2.6-5)						
SDS 25: Surface_Radiative						
Photosynthetically active radiation, surface (TBD)	128	W m^{-2}	0 .. 780	1	32	A
Direct/diffuse ratio, surface	129	N/A	0 .. 30	1	32	A
Corrected initial broadband surface albedo	130	N/A	0 .. 1	1	32	A
SDS 26: NumLev_Profile						
Number atmospheric levels	131	N/A	0 .. 4	1	32	A
SDS 27: Vert_Flux_Profiles						
Level pressures	132	hPa	0 .. 1100	4	32	A
SW flux, atmospheric level, upwards, Clear-sky	133	W m^{-2}	0 .. 1400	4	32	A
SW flux, atmospheric level, downwards, Clear-sky	134	W m^{-2}	0 .. 1400	4	32	A
LW flux, atmospheric level, upwards, Clear-sky	135	W m^{-2}	0 .. 700	4	32	A
LW flux, atmospheric level, downwards, Clear-sky	136	W m^{-2}	0 .. 600	4	32	A
SW flux, atmospheric level, upwards, total-sky	137	W m^{-2}	0 .. 1400	4	32	A
SW flux, atmospheric level, downwards, total-sky	138	W m^{-2}	0 .. 1400	4	32	A
LW flux, atmospheric level, upwards, total-sky	139	W m^{-2}	0 .. 700	4	32	A
LW flux, atmospheric level, downwards, total-sky	140	W m^{-2}	0 .. 600	4	32	A
SDS 28: Flux_Adjust						
SW flux, surface, downwards, Clear-sky, delta	141	W m^{-2}	-1400 .. 1400	1	32	A
SW flux, surface, upwards, Clear-sky, delta	142	W m^{-2}	-1400 .. 1400	1	32	A
SW flux, TOA, upwards, Clear-sky, delta	143	W m^{-2}	-1400 .. 1400	1	32	A
LW flux, surface, downwards, Clear-sky, delta	144	W m^{-2}	-600 .. 600	1	32	A
LW flux, surface, upwards, Clear-sky, delta	145	W m^{-2}	-700 .. 700	1	32	A
LW flux, TOA, upwards, Clear-sky, delta	146	W m^{-2}	-700 .. 700	1	32	A
SW flux, surface, downwards, total-sky, delta	147	W m^{-2}	-1400 .. 1400	1	32	A
SW flux, surface, upwards, total-sky, delta	148	W m^{-2}	-1400 .. 1400	1	32	A
SW flux, TOA, upwards, total-sky, delta	149	W m^{-2}	-1400 .. 1400	1	32	A
LW flux, surface, downwards, total-sky, delta	150	W m^{-2}	-600 .. 600	1	32	A
LW flux, surface, upwards, total-sky, delta	151	W m^{-2}	-700 .. 700	1	32	A
LW flux, TOA, upwards, total-sky, delta	152	W m^{-2}	-700 .. 700	1	32	A

Table 2.8-5. Clouds and Radiative Swath (CRS) (2 of 2)

Description	Parameter Number	Units	Range	Elements/ Record	Bits/ Elem	Product Code
SDS 29: Adj_Clear						
Initial precipitable water	153	cm	0 .. 10	1	32	A
Adjusted precipitable water, delta	154	cm	-10 .. 10	1	32	A
Adjusted surface albedo, delta	155	N/A	-1 .. 1	1	32	A
Initial aerosol optical depth	156	N/A	0 .. 2	1	32	A
Adjusted aerosol optical depth, delta	157	N/A	-2 .. 2	1	32	A
Initial skin temperature	158	K	TBD	1	32	A
Adjusted skin temperature, delta	159	K	TBD	1	32	A
SDS 30: Adj_Cloudy						
Adjusted mean visible optical depth, delta	160	N/A	-400 .. 400	2	32	A
Adjusted mean cloud fractional area, delta	161	N/A	-1 .. 1	2	32	A
Adjusted mean cloud effective temperature, delta	162	K	TBD	2	32	A
SDS 31: Adjust_QC						
Constrainment status flag	163	N/A	TBD	1	32	A
Sigma table version number	164	N/A	1 .. 20	1	32	A

Total Meta Bits/File:	**9216**
Total Data Bits/Record:	**10848**
Total Records/File:	**245475**
Total Data Bits/File:	**2662912800**
Total Bits/FIle:	**2662922016**

2.9 Monthly Gridded Single Satellite Fluxes and Clouds (FSW)

EOSDIS Product Code: CER05

The Monthly Gridded Single Satellite Fluxes and Clouds (FSW) archival data product contains hourly single satellite flux and cloud parameters averaged over 1.0-degree regions. Input to the FSW Subsystem is the Clouds and Radiative Swath (CRS) archival data product. Each FSW covers a single month swath from a single CERES instrument mounted on one satellite. The product is written in HDF and contains metadata as well as gridded science data. The science data are Vdata with multiple records. Each record contains spatially averaged data for an individual region.

The major categories of data output on the FSW are as follows:

- Region data
- Total-sky radiative fluxes at TOA, surface, and atmospheric levels
- Clear-sky radiative fluxes at TOA, surface, and atmospheric levels
- Cloud overlap conditions
- Cloud category properties
- Column-averaged cloud properties
- Angular model scene classes
- Surface-only data
- Adjustment parameters

FSW is an archival product generated on a monthly basis. Initially, at the launch of the TRMM spacecraft, this product will be produced in validation mode once every 3 months, or for 4 data months a year. During the first 18 months after the launch of TRMM, the CERES Science Team will derive a production quality set of ADMs, which are needed to produce the SW and LW instantaneous fluxes. Eighteen months after the launch of TRMM, this product will be archived and will contain SW and LW fluxes at the tropopause and at the 500 hPa pressure level, in addition to fluxes at TOA and at the surface. A complete listing of parameters for this data product can be found in Table 2.9-4 through Table 2.9-23.

Level: 3
Type: Archival
Frequency: 1/Month

Time Interval Covered
File: Month
Record: Hour

Portion of Globe Covered
File: Gridded Satellite Swath
Record: 1.0-Deg Equal-angle Regions

Portion of Atmosphere Covered
File: TOA, Surface, and Atmospheric Pressure Levels

FSW Metadata

The types of FSW metadata are summarized in Table 2.9-1 and contain information which need only be recorded once per product. The CERES metadata are listed in Appendix B. Table B-1 lists the CERES Baseline Header Metadata and Table B-2 lists the parameters in the CERES_metadata Vdata Table. Note that the CERES_metadata Vdata is a subset of the CERES Baseline Header Metadata. The FSW product-specific metadata parameters are listed in Table 2.9-2.

Table 2.9-1. FSW Metadata Summary

HDF Name	Description Table	Records	Number of Fields
CERES Baseline Header Metadata	Table B-1	1	36
CERES_metadata Vdata	Table B-2	1	14
FSW Product Specific Metadata	Table 2.9-2	1	2

Table 2.9-2. FSW Product-specific Metadata

Item	Parameter Name	Description	DataType	Units	Range
1	ZoneBeginning	Beginning zone number	I4	N/A	1 .. 180
2	ZoneEnding	Ending zone number	I4	N/A	1 .. 180

All of the FSW science data are organized into various Vdata Structures, which are summarized in Table 2.9-3. Table 2.9-4 through Table 2.9-23 contain a list of the parameters within each Vdata, including the field number, the field name, the data type, the units, the range, and the number of components within each field. The size of each Vdata is based on the FSW HDF product which consist of 18 files containing data for 10 1.0-degree equal-angle zones in each file. The number of records per Vdata is defined as n where n varies for each file. Sizing estimates are based on anticipated TRMM sampling.

Table 2.9-3. FSW Vdata Summary (1 of 2)

Vdata Name	Description Table	Records	Number of Fields	VData Size (MB)
Time and Position Data	Table 2.9-4	n	6	97.1
Regional Identification Data	Table 2.9-5	n	3	48.6
Other Regional Parameters	Table 2.9-6	n	13	501.7
Regional Imager Data	Table 2.9-7	n	8	453.2
TOA FLuxes (mean std num_obs)	Table 2.9-8	n	8	388.4
Atmos. Flux Profiles for 4 Layers (mean std num_obs)	Table 2.9-9	n	32	1553.7
Flux Adjustments (Tuned-Untuned) Data (mean std num_obs)	Table 2.9-10	n	12	582.6
Other Flux Related Data	Table 2.9-11	n	8	210.4
Cloud Overlap Conditions	Table 2.9-12	n	11	178.0
Cloud Property Data - High Layer (mean std num_obs)	Table 2.9-13	n	19	744.5
Cloud Property Data - UpperMid Layer (mean std num_obs)	Table 2.9-14	n	19	744.5
Cloud Property Data - LowerMid Layer (mean std num_obs)	Table 2.9-15	n	19	744.5

Table 2.9-3. FSW Vdata Summary (2 of 2)

Vdata Name	Description Table	Records	Number of Fields	VData Size (MB)
Cloud Property Data - Low Layer (mean std num_obs)	Table 2.9-16	n	19	744.5
Column Weighted Cloud Data - SW TOA (mean std num_obs)	Table 2.9-17	n	16	695.9
Column Weighted Cloud Data - LW TOA (mean std num_obs)	Table 2.9-18	n	16	695.9
Column Weighted Cloud Data - LW SRF (mean std num_obs)	Table 2.9-19	n	16	695.9
Column Weighted Cloud Data - LWP (mean std num_obs)	Table 2.9-20	n	16	695.9
Column Weighted Cloud Data - IWP (mean std num_obs)	Table 2.9-21	n	16	695.9
Angular Model Scene Type Data for 12 Scenes	Table 2.9-22	n	6	987.2
Clear-sky Adjustment Parameters (mean std)	Table 2.9-23	n	4	129.5
Vdata TOTAL SIZE				**11587.9**

Table 2.9-4. Time and Position Data

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Julian Time	32-Bit Float	day	2 440 000.0 .. 2 480 000.0	1
2	Sun Colatitude	32-Bit Float	deg	0.0 .. 180.0	1
3	Sun Longitude	32-Bit Float	deg	0.0 .. 360.0	1
4	Relative Azimuth Angle	32-Bit Float	deg	0.0 .. 360.0	1
5	Cos. Solar Zenith Angle	32-Bit Float	N/A	0.0 .. 1.0	1
6	Spacecraft Zenith Angle	32-Bit Float	deg	0.0 .. 90.0	1

Table 2.9-5. Regional Identification Data

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Region Number	32-Bit Float	N/A	1 .. 64800	1
2	Hour Box Number	32-Bit Float	N/A	1 .. 744	1
3	Num. Footprints in Region	32-Bit Float	N/A	1 .. 40	1

Table 2.9-6. Other Regional Parameters

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Alt. of Srf. above Sea	32-Bit Float	m	-1000 .. 10000	1
2	Surface Type Percentage	32-Bit Float	percent	0.0 .. 100.0	20
3	Sunglint Percentage	32-Bit Float	percent	0.0 .. 100.0	1
4	Snow/Ice Percentage	32-Bit Float	percent	0.0 .. 100.0	1
5	Fire Percentage	32-Bit Float	percent	0.0 .. 100.0	1
6	Aerosol Percentage	32-Bit Float	percent	0.0 .. 100.0	1
7	Flag - Aerosol Type	32-Bit Float	N/A	0.0 .. 9999.0	1
8	Total Aerosol Opt. Depth at 0.63 μm in clear area	32-Bit Float	N/A	0.0 .. 2.0	1
9	Total Aerosol Opt. Depth at 1.6 μm in clear area	32-Bit Float	μm	0.0 .. 2.0	1
10	Precipitable Water	32-Bit Float	cm	0.0001 .. 10.0	1
11	Flag - Source Precip. H2O	32-Bit Float	N/A	0 .. 120	1
12	Shadowed Pixels Percent	32-Bit Float	percent	0.0 .. 100.0	1

Table 2.9-7. Regional Imager Data

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Imager Percent Coverage	32-Bit Float	percent	0.0 .. 100.0	1
2	Imager View. Zen. Angle	32-Bit Float	deg	0.0 .. 90.0	1
3	Imager Rel. Azth. Angle	32-Bit Float	deg	0.0 .. 360.0	1
4	Imager Channel Id	32-Bit Float	N/A	1 .. 20	5
5	Imager Rad. 5TH Percent	32-Bit Float	$Wm^{-2}sr^{-1}\mu m^{-1}$	0.0 .. 1000.0	5
6	Imager Radiance	32-Bit Float	$Wm^{-2}sr^{-1}\mu m^{-1}$	0.0 .. 1000.0	5
7	Imager Rad. 95TH Percent	32-Bit Float	$Wm^{-2}sr^{-1}\mu m^{-1}$	0.0 .. 1000.0	5
8	Imager Radiance Clr-sky	32-Bit Float	$Wm^{-2}sr^{-1}\mu m^{-1}$	0.0 .. 1000.0	5

Table 2.9-8. TOA Fluxes (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	SW TOA Clear-sky	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
2	LW TOA Clear-sky	32-Bit Float	Wm^{-2}	100.0 .. 500.0	3
3	WN TOA Clear-sky	32-Bit Float	Wm^{-2}	0.0 .. 800.0	3
4	ALB TOA Clear-sky	32-Bit Float	N/A	0.0 .. 1.0	3
5	SW TOA Total-Sky	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
6	LW TOA Total-Sky	32-Bit Float	Wm^{-2}	100.0 .. 500.0	3
7	WN TOA Total-Sky	32-Bit Float	Wm^{-2}	0.0 .. 800.0	3
8	ALB TOA Total-Sky	32-Bit Float	N/A	0.0 .. 1.0	3

Table 2.9-9. Atmosmospheric Flux Profiles for 4 Layers (mean std num_obs) (1 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Downward SW Clear-sky (sfc)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
2	Downward SW Clear-sky (500hPa)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
3	Downward SW Clear-sky (70 hPa)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
4	Downward SW Clear-sky (TOA AVG)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
5	Upward SW Clear-sky (sfc)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
6	Upward SW Clear-sky (500hPa)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
7	Upward SW Clear-sky (70 hPa)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
8	Upward SW Clear-sky (TOA AVG)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
9	Downward LW Clear-sky (sfc)	32-Bit Float	Wm^{-2}	0.0 .. 600.0	3
10	Downward LW Clear-sky (500hPa)	32-Bit Float	Wm^{-2}	0.0 .. 600.0	3
11	Downward LW Clear-sky (70 hPa)	32-Bit Float	Wm^{-2}	0.0 .. 600.0	3
12	Downward LW Clear-sky (TOA AVG)	32-Bit Float	Wm^{-2}	0.0 .. 600.0	3
13	Upward LW Clear-sky (sfc)	32-Bit Float	Wm^{-2}	0.0 .. 700.0	3
14	Upward LW Clear-sky (500hPa)	32-Bit Float	Wm^{-2}	0.0 .. 700.0	3
15	Upward LW Clear-sky (70 hPa)	32-Bit Float	Wm^{-2}	0.0 .. 700.0	3
16	Upward LW Clear-sky (TOA AVG)	32-Bit Float	Wm^{-2}	0.0 .. 700.0	3
17	Downward SW Total-Sky (sfc)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
18	Downward SW Total-Sky (500hPa)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
19	Downward SW Total-Sky (70 hPa)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
20	Downward SW Total-Sky (TOA AVG)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
21	Upward SW Total-Sky (sfc)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
22	Upward SW Total-Sky (500hPa)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3

Table 2.9-9. Atmosmospheric Flux Profiles for 4 Layers (mean std num_obs) (2 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
23	Upward SW Total-Sky (70 hPa)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
24	Upward SW Total-Sky (TOA AVG)	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
25	Downward LW Total-Sky (sfc)	32-Bit Float	Wm^{-2}	0.0 .. 600.0	3
26	Downward LW Total-Sky (500hPa)	32-Bit Float	Wm^{-2}	0.0 .. 600.0	3
27	Downward LW Total-Sky (70 hPa)	32-Bit Float	Wm^{-2}	0.0 .. 600.0	3
28	Downward LW Total-Sky (TOA AVG)	32-Bit Float	Wm^{-2}	0.0 .. 600.0	3
29	Upward LW Total-Sky (sfc)	32-Bit Float	Wm^{-2}	0.0 .. 700.0	3
30	Upward LW Total-Sky (500hPa)	32-Bit Float	Wm^{-2}	0.0 .. 700.0	3
31	Upward LW Total-Sky (70 hPa)	32-Bit Float	Wm^{-2}	0.0 .. 700.0	3
32	Upward LW Total-Sky (TOA AVG)	32-Bit Float	Wm^{-2}	0.0 .. 700.0	3

Table 2.9-10. Flux Adjustments (Tuned-Untuned) Data (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Down. SW Srf. Clear-sky	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	3
2	Up. SW Srf. Clear-sky	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	3
3	Down. LW Srf. Clear-sky	32-Bit Float	Wm^{-2}	-600.0 .. 600.0	3
4	Up. LW Srf. Clear-sky	32-Bit Float	Wm^{-2}	-700.0 .. 700.0	3
5	Up. SW TOA Clear-sky	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	3
6	Up. LW TOA Clear-sky	32-Bit Float	Wm^{-2}	-700.0 .. 700.0	3
7	Down. SW Srf. Total-Sky	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	3
8	Up. SW Srf. Total-Sky	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	3
9	Down. LW Srf. Total-Sky	32-Bit Float	Wm^{-2}	-600.0 .. 600.0	3
10	Up. LW Srf. Total-Sky	32-Bit Float	Wm^{-2}	-700.0 .. 700.0	3
11	Up. SW TOA Total-Sky	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	3
12	Up. LW TOA Total-Sky	32-Bit Float	Wm^{-2}	-700.0 .. 700.0	3

Table 2.9-11. Other Flux Related Data

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	LW Surface Emissivity	32-Bit Float	N/A	0.0 .. 1.0	1
2	WN Surface Emissivity	32-Bit Float	N/A	0.0 .. 1.0	1
3	Photosynthetically Active Radiation, Surface	32-Bit Float	Wm^{-2}	34 0.0 .. 780.0	1
4	Direct/Diffuse, Surface	32-Bit Float	N/A	0.0 .. 30.0	1
5	Corrected Initial Broadband Surface Albedo	32-Bit Float	N/A	0.0 .. 1.0	1
6	CERES Spectral Albedo	32-Bit Float	N/A	0.0 .. 1.0	6
7	CERES Broadband Surface Albedo (uncorrected)	32-Bit Float	N/A	0.0 .. 1.0	1
8	Skin Temperature	32-Bit Float	K	175.0 .. 375.0	1

Table 2.9-12. Cloud Overlap Conditions

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Clear	32-Bit Float	percent	0.0 .. 100.0	1
2	Low	32-Bit Float	percent	0.0 .. 100.0	1
3	Lowermid	32-Bit Float	percent	0.0 .. 100.0	1
4	Uppermid	32-Bit Float	percent	0.0 .. 100.0	1
5	High	32-Bit Float	percent	0.0 .. 100.0	1
6	High Uppermid	32-Bit Float	percent	0.0 .. 100.0	1
7	High Lowermid	32-Bit Float	percent	0.0 .. 100.0	1
8	High Low	32-Bit Float	percent	0.0 .. 100.0	1
9	Uppermid - Lowermid	32-Bit Float	percent	0.0 .. 100.0	1
10	Uppermid - Low	32-Bit Float	percent	0.0 .. 100.0	1
11	Lowermid - Low	32-Bit Float	percent	0.0 .. 100.0	1

Table 2.9-13. Cloud Property Data - High Layer (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	μm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	μm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3
16	Adj. Vis. Opt. Depth	32-Bit Float	N/A	0.0 .. 400.0	1
17	Adj. Fractional Area	32-Bit Float	N/A	0.0 .. 100.0	1
18	Adj. Effective Temp.	32-Bit Float	K	0.0 .. 250.0	1

Table 2.9-14. Cloud Property Data - UpperMid Layer (mean std num_obs) (1 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3

Table 2.9-14. Cloud Property Data - UpperMid Layer (mean std num_obs) (2 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	μm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	μm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3
16	Adj. Vis. Opt. Depth	32-Bit Float	N/A	0.0 .. 400.0	1
17	Adj. Fractional Area	32-Bit Float	N/A	0.0 .. 100.0	1
18	Adj. Effective Temp.	32-Bit Float	K	0.0 .. 250.0	1

Table 2.9-15. Cloud Property Data - LowerMid Layer (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	μm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	μm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3
16	Adj. Vis. Opt. Depth	32-Bit Float	N/A	0.0 .. 400.0	1
17	Adj. Fractional Area	32-Bit Float	N/A	0.0 .. 100.0	1
18	Adj. Effective Temp.	32-Bit Float	K	0.0 .. 250.0	1

Table 2.9-16. Cloud Property Data - Low Layer (mean std num_obs) (1 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3

Table 2.9-16. Cloud Property Data - Low Layer (mean std num_obs) (2 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	µm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	µm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3
16	Adj. Vis. Opt. Depth	32-Bit Float	N/A	0.0 .. 400.0	1
17	Adj. Fractional Area	32-Bit Float	N/A	0.0 .. 100.0	1
18	Adj. Effective Temp.	32-Bit Float	K	0.0 .. 250.0	1

Table 2.9-17. Column Weighted Cloud Data - SW TOA (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	µm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	µm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.9-18. Column Weighted Cloud Data - LW TOA (mean std num_obs) (1 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	µm	0.0 .. 40.0	3

Table 2.9-18. Column Weighted Cloud Data - LW TOA (mean std num_obs) (2 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
11	Ice Particle Effective Diameter	32-Bit Float	μm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.9-19. Column Weighted Cloud Data - LW SRF (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3
89	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	μm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	μm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.9-20. Column Weighted Cloud Data - LWP (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	μm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	μm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.9-21. Column Weighted Cloud Data - IWP (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	μm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	μm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.9-22. Angular Model Scene Type Data for 12 Scenes

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Incident Solar Flux	32-Bit Float	N/A	0.0 .. 1400.0	1
2	Area Coverage	32-Bit Float	percent	0.0 .. 100.0	12
3	Albedo (mean)	32-Bit Float	N/A	0.0 .. 1.0	12
4	Albedo (std)	32-Bit Float	N/A	0.0 .. 1.0	12
5	LW (mean)	32-Bit Float	Wm^{-2}	0.0 .. 400.0	12
6	LW (std)	32-Bit Float	Wm^{-2}	0.0 .. 400.0	12

Table 2.9-23. Clear-sky Adjustment Parameters (mean std)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Precipitable H2O	32-Bit Float	cm	0.001 .. 8.0	2
2	Surface Albedo	32-Bit Float	N/A	0.0 .. 1.0	2
3	Aerosol Opt. Dep.	32-Bit Float	N/A	0.0 .. 2.0	2
4	Skin Temperature	32-Bit Float	K	175 .. 375	2

2.10 Synoptic Radiative Fluxes and Clouds (SYN)

EOSDIS Product Code: CER07

The Synoptic Radiative Fluxes and Clouds (SYN), a CERES archival product, is produced by the CERES Synoptic Surface and Atmospheric Radiation Budget (SARB) Subsystem. Each SYN file contains regional longwave and shortwave radiative fluxes for the surface, internal atmosphere, and TOA. The data are computed at 3-hour intervals on the CERES grid, and are based on measurements from multiple EOS CERES instruments. Since there are eight synoptic times for a day, there are eight SYN products in a single file. As a single run of the Synoptic SARB Subsystem processes data for 1 hour only, data on this file are grouped according to hour. Within an hour's data, the data are organized according to CERES region number.

The SYN contains averaged:

- Regional data
- Clear-sky area scene data
- Observed CERES TOA data for both Clear-sky and total-sky
- Cloud category properties for four (low, lower middle, upper middle and high) cloud height categories
- Column averaged cloud properties for five (TOA SW, TOA LW, SFC LW, Liquid Water Content (LWC), and Ice Water Content (IWC)) weighting schemes
- Overlap data for eleven (clear, low (L), lower middle (LM), upper middle (UM), high (H), H/UM, H/LM, H/L, UM/LM, UM/L, and LM/L) cloud overlap conditions
- Angular model scene classes for the twelve ERBE scene types
- Surface radiative parameters
- Atmospheric flux profiles for both Clear-sky and total-sky at the surface, 500 hPa, 70 hPa, and the TOA
- Flux adjustments (constrained-initial) for Clear-sky and total-sky at the surface and TOA over the CERES region
- Adjustment parameters for Clear-sky
- Adjustment parameters for four (L, LM, UM, and H) cloud height categories
- Auxiliary adjustment quality control flags

Level: 3
Type: Archival
Frequency: Every 3 Hours

Time Interval Covered
File: 3 Hours
Record: 3 Hours

Portion of Globe Covered
File: Global
Record: 1 CERES region

Portion of Atmosphere Covered
File: Surface, Internal and TOA

SYN Metadata

The types of SYN metadata are summarized in Table 2.10-1 and contain information which need only be recorded once per hour. The CERES metadata are listed in Appendix B. Table B-1 lists the CERES Baseline Header Metadata and Table B-2 lists the CERES_Metadata Vdata.

Table 2.10-1. SYN Metadata Summary

HDF Name	Description Table	Records	Number of Fields
CERES Baseline Header Metadata	Table B-1	1	36
CERES_Metadata Vdata	Table B-2	1	14

SYN Grid Fields

The SYN contains 19 data fields for each region in the grid (See Table 2.10-2). Each region corresponds to a 1-degree global region.

Table 2.10-2. SYN Grid Fields Summary

Grid Field Name	HDF Rank	Dimension (360x180x)	Data Type
Reg_Data	3	4	4-byte Real
Reg_Data_Int	3	2	4-byte Integer
Reg_Data_Surface	4	1 x 20	4-byte Real
Clear_Sky_Data	3	8	4-byte Real
TOA_Flux	3	12	4-byte Real
TOA_Albedo	3	4	4-byte Real
Cld_Props	4	29 x 4	4-byte Real
Col_Avg_Cld_Props	4	29 x 5	4-byte Real
Overlap	4	1 x 11	4-byte Real
Solar_Flux	3	1	4-byte Real
Ang_Scenes	4	5 x 12	4-byte Real
Sfc_Rad_Spec_Alb	4	1 x 6	4-byte Real
Sfc_Rad_Params	3	8	4-byte Real
Flux_Profile_Levels	3	2	4-byte Integer
Flux_Profile_SW_LW	4	9 x 4	4-byte Real
Flux_Adjustments_SW_LW	3	12	4-byte Real
Adj_Params_ClrSky	3	7	4-byte Real
Adj_Params_Cld_Layers	4	3 x 4	4-byte Real
QC_Flags	3	2	4-byte Real

Table 2.10-3 provides a complete listing of parameters for the SYN data product.

Table 2.10-3. Synoptic Radiative Fluxes and Clouds (SYN) (1 of 3)

Description	Parameter Number	Units	Range	Elements/ Record	Bits/ Elem	Elem Num
Meta Data						
SYN Header FIle		N/A		1	15168	
Field 1: Reg_Data						
Julian date at hour start	1	day	2440000 .. 2480000	1	32	1
Julian time at hour start	2	day	-0.01 .. 1.01	1	32	2
Surface altitude above sea level, mean	3	m	-1000 .. 10000	1	32	3
Cosine of solar zenith angle	4	deg	0 .. 1	1	32	4
Field 2: Reg_Data_Int						
Region number	5	N/A	1 .. 44012	1	32	5
Hour-box number	6	N/A	1 .. 744	1	32	6
Field 3: Reg_Data_Surface						
Surface type percent coverage	7	N/A	0 .. 100	20	32	7
Field 4: Clear_Sky_Data						
Snow/ice percent coverage	8	N/A	0 .. 100	1	32	27
Smoke percent coverage	9	N/A	0 .. 100	1	32	28
Fire percent coverage	10	N/A	0 .. 100	1	32	29
Total aerosol visible optical depth, 0.63 μm, clear area	11	N/A	0 .. 2	1	32	30
Total aerosol visible optical depth, 1.60 μm, clear area	12	N/A	0 .. 2	1	32	31
Total aerosol effective radius, clear area	13	N/A	0 .. 20	1	32	32
Aerosol percent coverage	14	N/A	0 .. 100	1	32	33
Sunglint percent coverage	15	N/A	0 .. 100	1	32	34
Field 5: TOA_Flux						
CERES SW flux, TOA, upwards, Clear-sky, mean	16	W m^{-2}	0 .. 1400	1	32	35
CERES SW flux, TOA, upwards, Clear-sky, std	17	W m^{-2}	TBD	1	32	36
CERES LW flux, TOA, upwards, Clear-sky, mean	18	W m^{-2}	0 .. 500	1	32	37
CERES LW flux, TOA, upwards, Clear-sky, std	19	W m^{-2}	TBD	1	32	38
CERES WN flux, TOA, upwards, Clear-sky, mean	20	W m^{-2}	10 .. 400	1	32	39
CERES WN flux, TOA, upwards, Clear-sky, std	21	W m^{-2}	TBD	1	32	40
CERES SW flux, TOA, upwards, total-sky, mean	22	W m^{-2}	0 .. 1400	1	32	41
CERES SW flux, TOA, upwrads, total-sky, std	23	W m^{-2}	TBD	1	32	42
CERES LW flux, TOA, upwards, total-sky, mean	24	W m^{-2}	0 .. 500	1	32	43
CERES LW flux, TOA, upwards, total-sky, std	25	W m^{-2}	TBD	1	32	44
CERES WN flux, TOA, upwards, total-sky, mean	26	W m^{-2}	10 .. 400	1	32	45
CERES WN flux, TOA, upwards, total-sky, std	27	W m^{-2}	TBD	1	32	46
Field 6: TOA_Albedo						
Albedo, TOA, Clear-sky, mean	28	N/A	0 .. 1	1	32	47
Albedo, TOA, Clear-sky, std	29	N/A	0 .. 1	1	32	48
Albedo, TOA, total-sky, mean	30	N/A	0 .. 1	1	32	49
Albedo, TOA, total-sky, std	31	N/A	0 .. 1	1	32	50
Field 7: Cld_Props						
Total cloud area percentage	32	N/A	0 .. 100	4	32	51
Cloud visible optical depth, linear, mean	33	N/A	0 .. 400	4	32	55
Cloud vsible optical depth, linear, std	34	N/A	TBD	4	32	59
Cloud visible optical depth, logarithmic, mean	35	N/A	0 .. 6	4	32	63
Cloud vsible optical depth, logarithmic, std	36	N/A	TBD	4	32	67
Cloud infrared emissivity, mean	37	N/A	0 .. 1	4	32	71
Cloud infrared emissivity, std	38	N/A	TBD	4	32	75
Cloud liquid water path, mean	39	g m^{-2}	TBD	4	32	79
Cloud liquid water path, std	40	g m^{-2}	TBD	4	32	83
Cloud ice water path, mean	41	g m^{-2}	TBD	4	32	87
Cloud ice water path, std	42	g m^{-2}	TBD	4	32	91
Cloud top pressure, mean	43	hPa	0 .. 1100	4	32	95
Cloud top pressure, std	44	hPa	TBD	4	32	99
Cloud effective pressure, mean	45	hPa	0 .. 1100	4	32	103
Cloud effective pressure, std	46	hPa	TBD	4	32	107
Cloud effective temperature, mean	47	K	100 .. 350	4	32	111
Cloud effective temperature, std	48	K	TBD	4	32	115

Table 2.10-3. Synoptic Radiative Fluxes and Clouds (SYN) (2 of 3)

Description	Parameter Number	Units	Range	Elements/ Record	Bits/ Elem	Elem Num
Field 7: Cld_Props (cont'd)						
Cloud effective height, mean	49	km	0 .. 20	4	32	119
Cloud effective height, std	50	km	TBD	4	32	123
Cloud bottom pressure, mean	51	hPa	0 .. 1100	4	32	127
Cloud bottom pressure, std	52	hPa	TBD	4	32	131
Cloud liquid particle radius, mean	53	µm	TBD	4	32	135
Cloud liquid particle radius, std	54	µm	TBD	4	32	139
Cloud ice particle effective radius, mean	55	µm	TBD	4	32	143
Cloud ice particle effective radius, std	56	µm	TBD	4	32	147
Cloud particle phase, mean	57	N/A	1 .. 2	4	32	151
Cloud particle phase, std	58	N/A	TBD	4	32	155
Vertical aspect ratio, mean (TBD)	59	N/A	0 .. 20	4	32	159
Vertical aspect ratio, std (TBD)	60	N/A	TBD	4	32	163
Field 8: Col_Avg_Cld_Props						
Total cloud area percentage	61	N/A	0 .. 100	5	32	167
Cloud visible optical depth, linear, mean	62	N/A	0 .. 400	5	32	172
Cloud vsible optical depth, linear, std	63	N/A	TBD	5	32	177
Cloud visible optical depth, logarithmic, mean	64	N/A	0 .. 6	5	32	182
Cloud vsible optical depth, logarithmic, std	65	N/A	TBD	5	32	187
Cloud infrared emissivity, mean	66	N/A	0 .. 1	5	32	192
Cloud infrared emissivity, std	67	N/A	TBD	5	32	197
Cloud liquid water path, mean	68	g m^{-2}	TBD	5	32	202
Cloud liquid water path, std	69	g m^{-2}	TBD	5	32	207
Cloud ice water path, mean	70	g m^{-2}	TBD	5	32	212
Cloud ice water path, std	71	g m^{-2}	TBD	5	32	217
Cloud top pressure, mean	72	hPa	0 .. 1100	5	32	222
Cloud top pressure, std	73	hPa	TBD	5	32	227
Cloud effective pressure, mean	74	hPa	0 .. 1100	5	32	232
Cloud effective pressure, std	75	hPa	TBD	5	32	237
Cloud effective temperature, mean	76	K	100 .. 350	5	32	242
Cloud effective temperature, std	77	K	TBD	5	32	247
Cloud effective height, mean	78	km	0 .. 20	5	32	252
Cloud effective height, std	79	km	TBD	5	32	257
Cloud bottom pressure, mean	80	hPa	0 .. 1100	5	32	262
Cloud bottom pressure, std	81	hPa	TBD	5	32	267
Cloud liquid particle radius, mean	82	µm	TBD	5	32	272
Cloud liquid particle radius, std	83	µm	TBD	5	32	277
Cloud ice particle effective radius, mean	84	µm	TBD	5	32	282
Cloud ice particle effective radius, std	85	µm	TBD	5	32	287
Cloud particle phase, mean	86	N/A	1 .. 2	5	32	292
Cloud particle phase, std	87	N/A	TBD	5	32	297
Vertical aspect ratio, mean (TBD)	88	N/A	0 .. 20	5	32	302
Vertical aspect ratio, std (TBD)	89	N/A	TBD	5	32	307
Field 9: Overlap						
Overlap condition weighted area percentage	90	N/A	0 .. 100	11	32	312
Field 10: Solar_Flux						
Incident solar flux	91	W m^{-2}	0 .. 1400	1	32	323
Field 11: Ang_Scenes						
Area percent coverage	92	N/A	0 .. 100	12	32	324
Albedo, mean	93	N/A	0 .. 1	12	32	336
Albedo, std	94	N/A	0 .. 1	12	32	348
LW flux, mean	95	W m^{-2}	0 .. 400	12	32	360
LW flux, std	96	W m^{-2}	0 .. 400	12	32	372
Field 12: Sfc_Rad_Spec_Alb						
Spectral albedo	97	N/A	0 .. 1	6	32	384

Table 2.10-3. Synoptic Radiative Fluxes and Clouds (SYN) (3 of 3)

Description	Parameter Number	Units	Range	Elements/ Record	Bits/ Elem	Elem Num
Field 13: Sfc_Rad_Params						
Broadband surface albedo (uncorrected)	98	N/A	0 .. 1	1	32	390
LW surface emissivity	99	N/A	0 .. 1	1	32	391
WN surface emissivity	100	N/A	0 .. 1	1	32	392
Imager-based surface skin temperature	101	K	175 .. 375	1	32	393
Corrected initial broadband surface albedo	102	N/A	0 .. 1	1	32	394
Photosynthetically active radiation (TBD)	103	W m^{-2}	0 .. 780	1	32	395
DIrect/diffuse ratio (TBD)	104	N/A	0 .. 30	1	32	396
Corrected initial broadband surface albedo ratio	105	N/A	0 .. 1	1	32	397
Field 14: Flux_Profile_Levels						
Number atmospheric levels	106	N/A	0 .. 4	1	32	398
Number of constrainment iterations	107	N/A	0 .. 1	1	32	399
Field 15: Flux_Profile_SW_LW						
Pressure, atmospheric levels	108	hPa	0 .. 1100	4	32	400
SW flux, atmospheric level, upwards, Clear-sky, constrained	109	W m^{-2}	0 .. 1400	4	32	404
SW flux, atmospheric level, downwards, Clear-sky, constrained	110	W m^{-2}	0 .. 1400	4	32	408
LW flux, atmospheric level, upwards, Clear-sky, constrained	111	W m^{-2}	0 .. 700	4	32	412
LW flux, atmospheric level, downwards, Clear-sky, constrained	112	W m^{-2}	0 .. 600	4	32	416
SW flux, atmospheric level, upwards, total-sky, constrained	113	W m^{-2}	0 .. 1400	4	32	420
SW flux, atmospheric level, downwards, total-sky, constrained	114	W m^{-2}	0 .. 1400	4	32	424
LW flux, atmospheric level, upwards, total-sky, constrained	115	W m^{-2}	0 .. 700	4	32	428
LW flux, atmospheric level, downwards, total-sky, constrained	116	W m^{-2}	0 .. 600	4	32	432
Field 16: Flux_Adjustments						
SW flux, surface, downwards, Clear-sky, delta	117	W m^{-2}	-1400 .. 1400	1	32	436
SW flux, surface, upwards, Clear-sky, delta	118	W m^{-2}	-1400 .. 1400	1	32	437
SW flux, TOA, upwards, Clear-sky, delta	119	W m^{-2}	-1400 .. 1400	1	32	438
LW flux, surface, downwards, Clear-sky, delta	120	W m^{-2}	-500 .. 500	1	32	439
LW flux, surface, upwards, Clear-sky, delta	121	W m^{-2}	-500 .. 500	1	32	440
LW flux, TOA, upwards, Clear-sky, delta	122	W m^{-2}	-500 .. 500	1	32	441
SW flux, surface, downwards, total-sky, delta	123	W m^{-2}	-1400 .. 1400	1	32	442
SW flux, surface, upwards, total-sky, delta	124	W m^{-2}	-1400 .. 1400	1	32	443
SW flux, TOA, upwards, total-sky, delta	125	W m^{-2}	-1400 .. 1400	1	32	444
LW flux, surface, downwards, total-sky, delta	126	W m^{-2}	-500 .. 500	1	32	445
LW flux, surface, upwards, total-sky, delta	127	W m^{-2}	-500 .. 500	1	32	446
LW flux, surface, upwards, total-sky, delta	128	W m^{-2}	-500 .. 500	1	32	447
Field 17: Adj_Params_ClrSky						
Initial precipitable water	129	cm	0 .. 10	1	32	448
Adjusted precipitable water, delta	130	cm	-10 .. 10	1	32	449
Adjusted surface albedo, delta	131	N/A	-1 ..1	1	32	450
Initial aerosol optical depth	132	N/A	0 .. 2	1	32	451
Adjusted aerosol optical depth, delta	133	N/A	-2 .. 2	1	32	452
Initial skin temperature	134	K	TBD	1	32	453
Adjusted skin temperature, delta	135	K	TBD	1	32	454
Field 18: Adj_Params_Cld_Layers						
Adjusted mean visible optical depth (logarithmic), delta	136	N/A	-400 .. 400	4	32	455
Adjusted mean cloud fractional area, delta	137	N/A	-1 .. 1	4	32	459
Adjusted mean cloud effective temperature, delta	138	K	TBD	4	32	463
Field 19: QC_Flags						
Constrainment status flag	139	N/A	TBD	1	32	467
Sigma table configuration flag	140	N/A	TBD	1	32	468

Total Meta Bits/File:	**15168**
Total Data Bits/Record:	**15168**
Total Records/File:	**352096**
Total Data Bits/File:	**5340592128**
Total Bits/File:	**5340607296**

2.11 Monthly Regional Radiative Fluxes and Clouds (AVG)

EOSDIS Product Code: CER08

The Monthly Regional Radiative Fluxes and Clouds (AVG) product contains monthly and monthly hourly averages of the Top-of-the-Atmosphere (TOA) and surface longwave (LW) and shortwave (SW) radiative fluxes, together with LW and SW fluxes at standard pressure levels in between. The product is written in HDF-EOS and contains metadata as well as gridded science data.

The major categories of data output on the AVG are as follows:

- Regional data
- Radiative fluxes for both clear-sky and total-sky at TOA
- Cloud category properties for four (low, lower middle, upper middle and high) cloud layers
- Adjustment parameters for four cloud layers
- Column-averaged cloud properties for five (TOASW, TOALW, Hourly Gridded Single Satellite TOA and Surface Fluxes and Clouds (SFC) LW, Liquid Water Path (LWP), and Ice Water Path (IWP)) weighting schemes
- Adjustment parameters for five weighting schemes
- Overlap data for eleven (clear, low (L), lower middle (LM), upper middle (UM), high (H), H/UM, H/LM, H/L, UM/LM, UM/L, LM/L) cloud conditions
- Angular model scene classes
- Atmospheric flux profile for clear-sky and total-sky
- Flux adjustments for clear-sky and total-sky
- Adjustment parameters for clear-skies
- Surface data

A complete listing of metadata and science parameters for this data product can be found in Table 2.11-1 and Table 2.11-2.

Level: 3
Type: Archival
Frequency: 1/Month

Time Interval Covered
File: 1 Month
Record: 1 Month

Portion of Globe Covered
File: Entire Globe
Record: 1.0-Deg Regions

Portion of Atmosphere Covered
File: Surface to TOA

AVG Metadata

The types of AVG metadata are summarized in Table 2.11-1 and contain information which need only be recorded once per product. The CERES metadata are listed in Appendix B. Table B-1 lists the CERES Baseline Header Metadata and Table B-2 lists the CERES_metadata Vdata.

Table 2.11-1. AVG Metadata Summary

HDF Name	Description Table	Records	Number of Fields
CERES Baseline Header Metadata	Table B-1	1	36
CERES_metadata gridded data	Table B-2	1	14

All of the AVG science data are organized into the HDF-EOS Grid data type, which is shown in Table 2.11-2 below. This table contains a list of the parameters within each grid, including the field number, the field name, the data type, the units, the range, and the number of components within each field.

Table 2.11-2. AVG Grid Data (1 of 3)

Field No.	Field Name	Data Type	Units	Range	No. of Components
	Region Parameters				
1	Surface Type Percent Coverage	32-Bit Float	N/A	0.0 .. 100.0	20
2	Surface Altitude	32-Bit Float	m	-1000 .. 10000	1
3	Snow/Ice Percent Coverage	32-Bit Float	N/A	0.0 .. 100.0	1
4	Fire Percent Coverage	32-Bit Float	N/A	0.0 .. 100.0	1
5	Total Aerosol Visible Optical Depth @ 0.63 microns	32-Bit Float	N/A	0.0 .. 2.0	1
6	Total Aerosol Visible Optical Depth @ 1.6 microns	32-Bit Float	N/A	0.0 .. 2.0	1
7	Aerosol Percent Coverage	32-Bit Float	N/A	0.0 .. 20.0	1
	Clear-sky TOA Fluxes (mean, stdev, num obs)				
8	Clear-sky TOA SW Flux	32-Bit Float	Wm^{-2}	0.0 .. 800.0	27
9	Clear-sky TOA LW Flux	32-Bit Float	Wm^{-2}	0.0 .. 400.0	27
10	Clear-sky TOA WN Flux	32-Bit Float	Wm^{-2}	0.0 .. 800.0	27
11	Clear-sky TOA Albedo	32-Bit Float	N/A	0.0 .. 1.0	27
	Total-sky TOA Fluxes (mean, stdev, num obs)				
12	Total-sky TOA SW Flux	32-Bit Float	Wm^{-2}	0.0 .. 800.0	27
13	Total-sky TOA LW Flux	32-Bit Float	Wm^{-2}	0.0 .. 400.0	27
14	Total-sky TOA WN Flux	32-Bit Float	Wm^{-2}	0.0 .. 800.0	27
15	Total-sky TOA Albedo	32-Bit Float	N/A	0.0 .. 1.0	27

Table 2.11-2. AVG Grid Data (2 of 3)

Field No.	Field Name	Data Type	Units	Range	No. of Components
	Atmospheric Flux Profile for Clear-sky for 4 Layers - sfc, 500hpa, 70hpa, & TOA (mean, stdev, num obs)				
17	Clear-sky Upward SW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	108
18	Clear-sky Downward SW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	108
19	Clear-sky Upward LW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 700.0	108
20	Clear-sky Downward LW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 600.0	108
	Atmospheric Flux Profile for Total-sky for 4 Layers - sfc, 500hpa, 70hpa, & TOA (mean, stdev, num obs)				
21	Total-sky Upward SW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	108
22	Total-sky Downward SW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	108
23	Total-sky Upward LW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 700.0	108
24	Total-sky Downward LW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 600.0	108
25	Number of Atmospheric Layers	32-Bit Float	N/A	0 .. 4	9
26	Pressure - Atmospheric Layer	32-Bit Float	hPa	0 .. 1100	36
	Flux Adjustments Clear-sky - sfc, TOA (mean, stdev, num obs)				
27	Clear-sky Downward Sfc SW Flux Adj	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	27
28	Clear-sky Downward Sfc LW Flux Adj	32-Bit Float	Wm^{-2}	-500.0 .. 500.0	27
29	Clear-sky Upward Sfc SW Flux Adj	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	27
30	Clear-sky Upward Sfc LW Flux Adj	32-Bit Float	Wm^{-2}	-500.0 .. 500.0	27
31	Clear-sky Upward TOA SW Flux Adj	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	27
32	Clear-sky Upward TOA LW Flux Adj	32-Bit Float	Wm^{-2}	-500.0 .. 500.0	27
	Flux Adjustments Total-sky - sfc, TOA (mean, stdev, num obs)				
33	Total-sky Downward Sfc SW Flux Adj	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	27
34	Total-sky Downward Sfc LW Flux Adj	32-Bit Float	Wm^{-2}	-500.0 .. 500.0	27
35	Total-sky Upward Sfc SW Flux Adj	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	27
36	Total-sky Upward Sfc LW Flux Adj	32-Bit Float	Wm^{-2}	-500.0 .. 500.0	27
37	Total-sky Upward TOA SW Flux Adj	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	27
38	Total-sky Upward TOA LW Flux Adj	32-Bit Float	Wm^{-2}	-500.0 .. 500.0	27
	Clear-sky Adjustment Parameters (mean, stdev, num obs)				
39	Clear-sky Adj Precipitable Water	32-Bit Float	cm	-10.0 .. 10.0	27
40	Clear-sky Adj Suface Albedo	32-Bit Float	N/A	-1.0 .. 1.0	27
41	Clear-sky Adj Aerosol Optical Depth	32-Bit Float	N/A	-2.0 .. 2.0	27
42	Clear-sky Adj Skin Temperature	32-Bit Float	k	175 .. 375	27
	Surface Data				
43	Spectral Albedo	32-Bit Float	N/A	0.0 .. 1.0	54
44	Broadband Surface Albedo	32-Bit Float	N/A	0.0 .. 1.0	9
45	LW Surface Emissivity	32-Bit Float	N/A	0.0 .. 1.0	9
46	WN Surface Emissivity	32-Bit Float	N/A	0.0 .. 1.0	9
47	Imager_based Surf Skin Temp	32-Bit Float	k	175.0 .. 375.0	9
48	Photosynthetically Active Radiation	32-Bit Float	Wm^{-2}	0.0 .. 780.0	9
49	Direct/Diffuse Ratio at Surface, mean	32-Bit Float	N/A	0.0 .. 30.0	9
50	Corrected Initial Broadband Surf Albedo	32-Bit Float	N/A	0.0 .. 1.0	9
	Angular Model Scene Types				
51	Angular Model Incident Solar Flux	32-Bit Float	N/A	0.0 .. 1400.0	9
52	Angular Model Fractional Area Coverage	32-Bit Float	percent	0.0 .. 100	108
53	Angular Model Albedo, mean, stdev	32-Bit Float	N/A	0.0 .. 1.0	216
54	Angular Model LW Flux, mean, stdev	32-Bit Float	Wm^{-2}	0.0 .. 400.0	216

Table 2.11-2. AVG Grid Data (3 of 3)

Field No.	Field Name	Data Type	Units	Range	No. of Components
	Column Averaged Cloud Properties for 5 Weightings - TOA SW, TOA LW, SFC LW, LWP, & IWP (mean, stdev, num obs)				
55	Col Wtd Total Cld Area Fraction	32-Bit Float	percent	0.0 .. 100.0	45
56	Col Wtd Cld Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	135
57	Col Wtd Cld Effective Temperature	32-Bit Float	K	100.0 .. 350.0	135
58	Col Wtd Cld Effective Height	32-Bit Float	km	0.0 .. 20.0	135
59	Col Wtd Cld Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	135
60	Col Wtd Cld Bottom Pressure	32-Bit Float	hPa	0.0 .. 1100.0	135
61	Col Wtd Cld Particle Phase	32-Bit Float	N/A	1.0 .. 2.0	135
62	Col Wtd Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	135
63	Col Wtd Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	135
64	Col Wtd Water Particle Radius	32-Bit Float	µm	0.0 .. 40.0	135
65	Col Wtd Ice Particle Effective Diam	32-Bit Float	µm	0.0 .. 300.0	135
66	Col Wtd Cld Visible Optical Depth - lin	32-Bit Float	N/A	0.0 .. 100.0	135
67	Col Wtd Cld Visible Optical Depth - log	32-Bit Float	N/A	0.0 .. 100.0	135
68	Col Wtd Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	135
69	Col Wtd Cld Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	135
	Adjustment Parameters for Column-Averaged Data for 5 Weightings - TOA SW, TOA LW, SFC LW, LWP, & IWP (mean, stdev, num obs)				
70	Col Wtd Adj Optical Depth - log	2-Bit Float	N/A	-400.0 .. 400.0	135
71	Col Wtd Adj Cld Fractional Area	32-Bit Float	N/A	-1.0 .. 1.0	135
72	Col Wtd Adj Cld Effective Temperature	32-Bit Float	K	100.0 .. 350.0	135
	Cloud Properties for 4 Layers - H, UM, LM, & L (mean, stdev, num obs)				
73	Cld Layer Total Cld Area Fraction	32-Bit Float	percent	0.0 .. 100.0	4
74	Cld Layer Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	12
75	Cld Layer Effective Temperature	32-Bit Float	K	100.0 .. 350.0	12
76	Cld Layer Effective Height	32-Bit Float	km	0.0 .. 20.0	12
77	Cld Layer Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	12
78	Cld Layer Bottom Pressure	32-Bit Float	hPa	0.0 .. 1100.0	12
79	Cld Layer Particle Phase	32-Bit Float	N/A	1.0 .. 2.0	12
80	Cld Layer Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	12
81	Cld Layer Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	12
82	Cld Layer Water Particle Radius	32-Bit Float	µm	0.0 .. 40.0	12
83	Cld Layer Ice Particle Effective Diam	32-Bit Float	µm	0.0 .. 300.0	12
84	Cld Layer Visible Optical Depth - lin	32-Bit Float	N/A	0.0 .. 100.0	12
85	Cld Layer Visible Optical Depth - log	32-Bit Float	N/A	0.0 .. 100.0	12
86	Cld Layer Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	12
87	Cld Layer Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	12
	Adjustment Parameters for 4 Layers - H, UM, LM, & L (mean, stdev, num obs)				
88	Adj Cld Layer Optical Depth	32-Bit Float	N/A	-400.0 .. 400.0	12
89	Adj Cld Layer Fractional Area	32-Bit Float	N/A	-1.0 .. 1.0	12
90	Adj Cld Layer Effective Temperature	32-Bit Float	K	100.0 .. 350.0	12
	Overlap Data for 11 Cloud Conditions - clear, L, LM, UM, H, H/UM, H/LM, H/L, UM/LM, UM/L, LM/L (mean, stdev, num obs)				
91	Overlap Condition Weighted Area Fraction	32-Bit Float	percent	0.0 .. 100.0	11

Total Bits / Record: **153856**
Total Records / File: **64800**
Total Bits / File: **9969868800**

Total Bytes / Record: **19232**
Total Bytes / File: **1246233600**

2.12 Monthly Zonal and Global Radiative Fluxes and Clouds (ZAVG)

EOSDIS Product Code: CER15

The Monthly Zone and Global Radiative Fluxes and Clouds (ZAVG) product is a summary of zonal and global averages of the radiative fluxes and cloud properties, probably most suitable for inclusion in the Earth Observing System Data and Information System (EOSDIS) Information Management System (IMS) as a browse product. This product is the CERES equivalent to the zonal averages and global averages in the ERBE S-4 product. This product is written in HDF-EOS and contains metadata as well as gridded science data.

The major categories of data output on the ZAVG are as follows:

- Zonal/Global data
- Radiative fluxes for both Clear-sky and total-sky at TOA
- Cloud category properties for four cloud layers
- Column-averaged cloud properties for five weighting schemes
- Overlap data for eleven cloud conditions
- Angular model scene classes
- Adjustment parameters for four cloud layers
- Atmospheric flux profile for Clear-sky and total-sky
- Flux adjustments for Clear-sky and total-sky
- Surface data
- Adjustment parameters for clear-skies

A complete listing of metadata and science parameters for this data product can be found in Table 2.12-1 and Table 2.12-2.

Level: 3
Type: Archival
Frequency: Monthly

Time Interval Covered
File: 1 Month
Record: 1 Month

Portion of Globe Covered
File: Entire Globe
Record: Zonal or Global

Portion of Atmosphere Covered
File: Surface to TOA

ZAVG Metadata

The types of ZAVG metadata are summarized in Table 2.12-1 and contain information which need only be recorded once per product. The CERES metadata are listed in Appendix B. Table B-1 lists the CERES Baseline Header Metadata and Table B-2 lists the CERES_metadata Vdata.

Table 2.12-1. AVG Metadata Summary

HDF Name	Description Table	Records	Number of Fields
CERES Baseline Header Metadata	Table B-1	1	36
CERES_metadata science data	Table B-2	1	14

All of the ZAVG science data are organized into the HDF-EOS Grid data type, which is shown in Table 2.12-2 below. This table contains a list of the parameters within each grid, including the field number, the field name, the data type, the units, the range, and the number of components within each field.

Table 2.12-2. ZAVG Grid Data (1 of 3)

Field No.	Field Name	Data Type	Units	Range	No. of Components
	Zone/Globe Parameters				
1	Surface Type Percent Coverage	32-Bit Float	N/A	0.0 .. 100.0	20
2	Surface Altitude	32-Bit Float	m	-1000 .. 10000	1
3	Snow/Ice Percent Coverage	32-Bit Float	N/A	0.0 .. 100.0	1
4	Fire Percent Coverage	32-Bit Float	N/A	0.0 .. 100.0	1
5	Total Aerosol Visible Optical Depth @ 0.63 microns	32-Bit Float	N/A	0.0 .. 2.0	1
6	Total Aerosol Visible Optical Depth @ 1.6 microns	32-Bit Float	N/A	0.0 .. 2.0	1
7	Aerosol Percent Coverage	32-Bit Float	N/A	0.0 .. 20.0	1
	TOA Fluxes for Clear-sky (mean, stdev, num obs)				
8	Clear-sky TOA SW Flux	32-Bit Float	Wm^{-2}	0.0 .. 800.0	27
9	Clear-sky TOA LW Flux	32-Bit Float	Wm^{-2}	0.0 .. 400.0	27
10	Clear-sky TOA WN Flux	32-Bit Float	Wm^{-2}	0.0 .. 800.0	27
11	Clear-sky TOA Albedo	32-Bit Float	N/A	0.0 .. 1.0	27
	TOA Fluxes for Total-sky (mean, stdev, num obs)				
12	Total-sky TOA SW Flux	32-Bit Float	Wm^{-2}	0.0 .. 800.0	27
13	Total-sky TOA LW Flux	32-Bit Float	Wm^{-2}	0.0 .. 400.0	27
14	Total-sky TOA WN Flux	32-Bit Float	Wm^{-2}	0.0 .. 800.0	27
15	Total-sky TOA Albedo	32-Bit Float	N/A	0.0 .. 1.0	27

Table 2.12-2. ZAVG Grid Data (2 of 3)

Field No.	Field Name	Data Type	Units	Range	No. of Components
	Atmospheric Flux Profile for Clear-sky for 4 Layers - sfc, 500hpa, 70hpa, & TOA (mean, stdev, num obs)				
17	Clear-sky Upward SW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	108
18	Clear-sky Downward SW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	108
19	Clear-sky Upward LW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 700.0	108
20	Clear-sky Downward LW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 600.0	108
	Atmospheric Flux Profile for Total-sky for 4 Layers - sfc, 500hpa, 70hpa, & TOA (mean, stdev, num obs)				
21	Total-sky Upward SW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	108
22	Total-sky Downward SW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	108
23	Total-sky Upward LW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 700.0	108
24	Total-sky Downward LW Flux Profile	32-Bit Float	Wm^{-2}	0.0 .. 600.0	108
25	Number of Atmospheric Layers	32-Bit Float	N/A	0 .. 4	9
26	Pressure - Atmospheric Layer	32-Bit Float	hPa	0 .. 1100	36
	Flux Adjustments Clear-sky - sfc, TOA (mean, stdev, num obs)				
27	Clear-sky Downward Sfc SW Flux Adj	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	27
28	Clear-sky Downward Sfc LW Flux Adj	32-Bit Float	Wm^{-2}	-500.0 .. 500.0	27
29	Clear-sky Upward Sfc SW Flux Adj	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	27
30	Clear-sky Upward Sfc LW Flux Adj	32-Bit Float	Wm^{-2}	-500.0 .. 500.0	27
31	Clear-sky Upward TOA SW Flux Adj	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	27
32	Clear-sky Upward TOA LW Flux Adj	32-Bit Float	Wm^{-2}	-500.0 .. 500.0	27
	Flux Adjustments Total-sky - sfc, TOA (mean, stdev, num obs)				
33	Total-sky Downward Sfc SW Flux Adj	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	27
34	Total-sky Downward Sfc LW Flux Adj	32-Bit Float	Wm^{-2}	-500.0 .. 500.0	27
35	Total-sky Upward Sfc SW Flux Adj	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	27
36	Total-sky Upward Sfc LW Flux Adj	32-Bit Float	Wm^{-2}	-500.0 .. 500.0	27
37	Total-sky Upward TOA SW Flux Adj	32-Bit Float	Wm^{-2}	-1400.0 .. 1400.0	27
38	Total-sky Upward TOA LW Flux Adj	32-Bit Float	Wm^{-2}	-500.0 .. 500.0	27
	Clear-sky Adjustment Parameters (mean, stdev, num obs)				
39	Clear-sky Adj Precipitable Water	32-Bit Float	cm	-10.0 .. 10.0	27
40	Clear-sky Adj Suface Albedo	32-Bit Float	N/A	-1.0 .. 1.0	27
41	Clear-sky Adj Aerosol Optical Depth	32-Bit Float	N/A	-2.0 .. 2.0	27
42	Clear-sky Adj Skin Temperature	32-Bit Float	k	175.0 .. 375.0	27
	Surface Data				
43	Spectral Albedo	32-Bit Float	N/A	0.0 .. 1.0	54
44	Broadband Surface Albedo	32-Bit Float	N/A	0.0 .. 1.0	9
45	LW Surface Emissivity	32-Bit Float	N/A	0.0 .. 1.0	9
46	WN Surface Emissivity	32-Bit Float	N/A	0.0 .. 1.0	9
47	Imager_based Surf Skin Temp	32-Bit Float	k	175.0 .. 375.0	9
48	Photosynthetically Active Radiation	32-Bit Float	Wm^{-2}	0.0 .. 780.0	9
49	Direct/Diffuse Ratio at Surface, mean	32-Bit Float	N/A	0.0 .. 30	9
50	Corrected Initial Broadband Surf Albedo	32-Bit Float	N/A	0.0 .. 1.0	9
	Angular Model SceneTypes				
51	Angular Model Incident Solar Flux	32-Bit Float	N/A	0.0 .. 1400.0	9
52	Angular Model Fractional Area Coverage	32-Bit Float	percent	0.0 .. 100	108
53	Angular Model Albedo, mean, stdev	32-Bit Float	N/A	0.0 .. 1.0	216
54	Anugular Model LW Flux, mean, stdev	32-Bit Float	Wm^{-2}	0.0 .. 400.0	216

Table 2.12-2. ZAVG Grid Data (3 of 3)

Field No.	Field Name	Data Type	Units	Range	No. of Components
	Column Averaged Cloud Properties for 5 Weightings -TOA SW, TOA LW, SFC LW, LWP, & IWP (mean, stdev, num obs)				
55	Col Wtd Total Cld Area Fraction	32-Bit Float	percent	0.0 .. 100.0	45
56	Col Wtd Cld Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	135
57	Col Wtd Cld Effective Temperature	32-Bit Float	K	100.0 .. 350.0	135
58	Col Wtd Cld Effective Height	32-Bit Float	km	0.0 .. 20.0	135
59	Col Wtd Cld Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	135
60	Col Wtd Cld Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	135
61	Col Wtd Cld Particle Phase	32-Bit Float	N/A	1.0 .. 2.0	135
62	Col Wtd Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	135
63	Col Wtd Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	135
64	Col Wtd Water Particle Radius	32-Bit Float	µm	0.0 .. 40.0	135
65	Col Wtd Ice Particle Effective Diam	32-Bit Float	µm	0.0 .. 300.0	135
66	Col Wtd Cld Visible Optical Depth - lin	32-Bit Float	N/A	0.0 .. 100.0	135
67	Col Wtd Cld Visible Optical Depth - log	32-Bit Float	N/A	0.0 .. 100.0	135
68	Col Wtd Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	135
69	Col Wtd Cld Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	135
	Adjustment Parameters for Column-Averaged Data for 5 Weightings - TOA SW, TOA LW, SFC LW, LWP, & IWP (mean, stdev, num obs)				
70	Col Wtd Adj Optical Depth - log	32-Bit Float	N/A	-400.0 .. 400.0	135
71	Col Wtd Adj Cld Fractional Area	32-Bit Float	N/A	-1.0 .. 1.0	135
72	Col Wtd Adj Cld Effective Temperature	32-Bit Float	K	100.0 .. 350.0	135
	Monthly Only Cloud Properties for 4 Layers -H, UM, LM, & L (mean, stdev, num obs)				
73	Cld Layer Total Cld Area Fraction	32-Bit Float	percent	0.0 .. 100.0	4
74	Cld Layer Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	12
75	Cld Layer Effective Temperature	32-Bit Float	K	100.0 .. 350.0	12
76	Cld Layer Effective Height	32-Bit Float	km	0.0 .. 20.0	12
77	Cld Layer Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	12
78	Cld Layer Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	12
79	Cld Layer Particle Phase	32-Bit Float	N/A	1.0 .. 2.0	12
80	Cld Layer Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	12
81	Cld Layer Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	12
82	Cld Layer Water Particle Radius	32-Bit Float	µm	0.0 .. 40.0	12
83	Cld Layer Ice Particle Effective Diam	32-Bit Float	µm	0.0 .. 300.0	12
84	Cld Layer Visible Optical Depth - lin	32-Bit Float	N/A	0.0 .. 100.0	12
85	Cld Layer Visible Optical Depth - log	32-Bit Float	N/A	0.0 .. 100.0	12
86	Cld Layer Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	12
87	Cld Layer Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	12
	Adjustment Parameters for 4 Layers - H, UM, LM, & L (mean, stdev, num obs)				
88	Adj Cld Layer Optical Depth	32-Bit Float	N/A	-400.0 .. 400.0	12
89	Adj Cld Layer Fractional Area	32-Bit Float	N/A	-1.0 .. 1.0	12
90	Adj Cld Layer Effective Temperature	32-Bit Float	K	100.0 .. 350.0	12
	Overlap Data for 11 cloud conditions - clear, L, LM, UM, H, H/UM, H/LM, H/L, UM/LM, UM/L, LM/L (mean, stdev, num obs)				
91	Overlap Condition Weighted Area Fraction	32-Bit Float	percent	0.0 .. 100.0	11

Total Bits / Record: **153856**
Total Records / File: **181**
Total Bits / File: **27847936**

Total Bytes / Record: **19232**
Total Bytes / File: **3480992**

2.13 Monthly Gridded Single Satellite TOA and Surface Fluxes/Clouds (SFC)

EOSDIS Product Code: CER12

The Monthly Gridded Single Satellite Fluxes and Clouds (SFC) archival data product contains hourly single satellite flux and cloud parameters averaged over 1.0-degree regions. Input to the SFC Subsystem is the Single Satellite CERES Footprint TOA and Surface Fluxes, Clouds (SSF) archival data product. Each SFC covers a single month swath from a single CERES instrument mounted on one satellite. The product is written in HDF and contains metadata as well as gridded science data. The science data are Vdata with multiple records. Each record contains spatially averaged data for an individual region.

The major categories of data output on the SFC are as follows:

- Region data
- Total-sky radiative fluxes at TOA and surface
- Clear-sky radiative fluxes at TOA and surface
- Column-averaged cloud properties
- Angular model scene classes
- Surface-only data

A complete listing of metadata and science parameters for this data product can be found in Table 2.13-1 through Table 2.13-16.

Level: 3
Type: Archival
Frequency: 1/Month

Time Interval Covered
File: Month
Record: Hour

Portion of Globe Covered
File: Gridded Satellite Swath
Record: 1.0-Deg Equal-angle Region

Portion of Atmosphere Covered
File: TOA and Surface

SFC Metadata

The types of SFC metadata are summarized in Table 2.13-1 and contain information which need only be recorded once per product. The CERES metadata are listed in Appendix B. Table B-1 lists the CERES Baseline Header Metadata and Table B-2 lists the CERES_metadata Vdata. The SFC product-specific metadata parameters are listed in Table 2.13-2.

Table 2.13-1. SFC Metadata Summary

HDF Name	Description Table	Records	Number of Fields
CERES Baseline Header Metadata	Table B-1	1	36
CERES_metadata Vdata	Table B-2	1	14
SFC Product Specific Metadata	Table 2.13-2	1	2

Table 2.13-2. SFC Product-specific Metadata

Item	Parameter Name	Description	DataType	Units	Range
1	ZoneBeginning	Beginning zone number	I4	N/A	1 .. 180
2	ZoneEnding	Ending zone number	I4	N/A	1 .. 180

All of the FSW science data are organized into various Vdata Structures, which are summarized in Table 2.13-3. Table 2.13-4 through Table 2.13-16 contain a list of parameters within each Vdata, including the field number, the field name, the data type, the units, the range, and the number of components within each field.

The size of each Vdata is based on the SFC HDF product which consist of 18 files containing data for 10 1.0-degree equal-angle zones in each file. The number of records per Vdata is defined as n where n varies for each file. Sizing estimates are based on anticipated TRMM sampling.

Table 2.13-3. SFC Vdata Summary

Vdata Name	Description Table	Records	Number of Fields	Vdata Size (MB)
Time and Position Data	Table 2.13-4	n	6	97.1
Regional Identification Data	Table 2.13-5	n	3	48.6
Other Regional Parameters	Table 2.13-6	n	4	372.2
TOA FLuxes (mean std num_obs)	Table 2.13-7	n	8	388.4
Surface Clear-sky Flux (mean std num_obs)	Table 2.13-8	n	9	437.0
Surface Total-Sky Flux (mean std num_obs)	Table 2.13-9	n	9	437.0
Emissivity	Table 2.13-10	n	2	32.4
Column Weighted Cloud Data - SW TOA (mean std num_obs)	Table 2.13-11	n	15	695.9
Column Weighted Cloud Data - LW TOA (mean std num_obs)	Table 2.13-12	n	15	695.9
Column Weighted Cloud Data - LW SRF (mean std num_obs)	Table 2.13-13	n	15	695.9
Column Weighted Cloud Data - LWP (mean std num_obs)	Table 2.13-14	n	15	695.9
Column Weighted Cloud Data - IWP (mean std num_obs)	Table 2.13-15	n	15	695.9
Angular Model Scene Type Data for 12 Scenes	Table 2.13-16	n	6	987.2
Vdata TOTAL SIZE				**5842.4**

Table 2.13-4. Time and Position Data

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Julian Time	32-Bit Float	day	2 440 000.0 .. 2 480 000.0	1
2	Sun Colatitude	32-Bit Float	deg	0.0 .. 180.0	1
3	Sun Longitude	32-Bit Float	deg	0.0 .. 360.0	1
4	Relative Azimuth Angle	32-Bit Float	deg	0.0 .. 360.0	1
5	Cos. Solar Zenith Angle	32-Bit Float	N/A	0.0 .. 1.0	1
6	Spacecraft Zenith Angle	32-Bit Float	deg	0.0 .. 90.0	1

Table 2.13-5. Regional Identification Data

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Region Number	32-Bit Float	N/A	1 .. 64800	1
2	Hour Box Number	32-Bit Float	N/A	1 .. 744	1
3	Num. Footprints in Region	32-Bit Float	N/A	1 .. 40	1

Table 2.13-6. Other Regional Parameters

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Alt. of Srf. above Sea	32-Bit Float	m	-1000.0 .. 10000.0	1
2	Surface Type Percentage	32-Bit Float	percent	0.0 .. 100.0	20
3	Snow/Ice Percentage	32-Bit Float	percent	0.0 .. 100.0	1
4	Precipitable Water	32-Bit Float	cm	0.0001 .. 10.0	1

Table 2.13-7. TOA FLuxes (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	SW TOA Clear-sky	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
2	LW TOA Clear-sky	32-Bit Float	Wm^{-2}	0.0 .. 500.0	3
3	WN TOA Clear-sky	32-Bit Float	Wm^{-2}	10.0 .. 400.0	3
4	ALB TOA Clear-sky	32-Bit Float	N/A	0.0 .. 1.0	3
5	SW TOA Total-Sky	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
6	LW TOA Total-Sky	32-Bit Float	Wm^{-2}	0.0 .. 500.0	3
7	WN TOA Total-Sky	32-Bit Float	Wm^{-2}	10.0 .. 400.0	3
8	ALB TOA Total-Sky	32-Bit Float	N/A	0.0 .. 1.0	3

Table 2.13-8. Surface Clear-sky Flux (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Downward SW Flux, Model A	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
2	Downward LW Flux, Model A	32-Bit Float	Wm^{-2}	0.0 .. 700.0	3
3	SW Net Flux, Model A	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
4	LW Net Flux, Model A	32-Bit Float	Wm^{-2}	-250.0 .. 50.0	3
5	Downward WN Flux, Model A	32-Bit Float	Wm^{-2}	0.0 .. 250.0	3
6	Downward SW Flux, Model B	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
7	Downward LW Flux, Model B	32-Bit Float	Wm^{-2}	0.0 .. 700.0	3
8	SW Net Flux, Model B	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
9	LW Net Flux, Model B	32-Bit Float	Wm^{-2}	-250.0 .. 50.0	3

Table 2.13-9. Surface Total-sky Flux (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Downward SW Flux, Model A	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
2	Downward LW Flux, Model A	32-Bit Float	Wm^{-2}	0.0 .. 700.0	3
3	SW Net Flux, Model A	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
4	LW Net Flux, Model A	32-Bit Float	Wm^{-2}	-250.0 .. 50.0	3
5	Downward WN Flux, Model A	32-Bit Float	Wm^{-2}	0.0 .. 250.0	3
6	Downward SW Flux, Model B	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
7	Downward LW Flux, Model B	32-Bit Float	Wm^{-2}	0.0 .. 700.0	3
8	SW Net Flux, Model B	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	3
9	LW Net Flux, Model B	32-Bit Float	Wm^{-2}	-250.0 .. 50.0	3

Table 2.13-10. Emissivity

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	LW Surface	32-Bit Float	N/A	0.0 .. 1.0	1
2	WN Surface	32-Bit Float	N/A	0.0 .. 1.0	1

Table 2.13-11. Column Weighted Cloud Data - SW TOA (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	μm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	μm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.13-12. Column Weighted Cloud Data - LW TOA (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	μm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	μm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.13-13. Column Weighted Cloud Data - LW SRF (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	μm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	μm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.13-14. Column Weighted Cloud Data - LWP (mean std num_obs) (1 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3

Table 2.13-14. Column Weighted Cloud Data - LWP (mean std num_obs) (2 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	μm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	μm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.13-15. Column Weighted Cloud Data - IWP (mean std num_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Area Coverage Percentage	32-Bit Float	percent	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	3
10	Water Particle Radius	32-Bit Float	μm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	μm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 100.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	0.0 .. 100.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.13-16. Angular Model Scene Type Data for 12 Scenes

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
1	Incident Solar Flux	32-Bit Float	N/A	0.0 .. 1400.0	1
2	Area Coverage	32-Bit Float	percent	0.0 .. 100.0	12
3	Albedo (mean)	32-Bit Float	N/A	0.0 .. 1.0	12
4	Albedo (std)	32-Bit Float	N/A	0.0 .. 1.0	12
5	LW (mean)	32-Bit Float	Wm^{-2}	0.0 .. 400.0	12
6	LW (std)	32-Bit Float	Wm^{-2}	0.0 .. 400.0	12

2.14 Monthly TOA and SRB Averages (SRBAVG)

EOSDIS Product Code: CER06

The SRBAVG product contains monthly and monthly hourly regional, zonal, and global averages of the TOA and surface LW and SW fluxes and the observed cloud conditions for each 1-degree equal-angle region. This product differs from the AVG product in three ways. First, the surface fluxes have been calculated from the TOA fluxes using parameterizations provided by the science team, instead of using the models provided by the SARB Subsystem. Secondly, no flux fields are calculated at levels between TOA and the surface. Lastly, the regional TOA fluxes are calculated using two methods.

SRBAVG is an archival product produced by Subsystem 10. There is one produced for each spacecraft and one for each combination of spacecraft. This product is written in HDF-EOS and contains metadata as well as gridded science data.

SRBAVG is composed of the following structures:

On a Regional, Zonal, and Global Basis:

- Regional parameters
- Total-sky radiative fluxes at TOA and surface
- Clear-sky radiative fluxes at TOA and surface
- Angular model scene types
- Column-averaged cloud properties for five weighting schemes: TOA SW, TOA LW, SFC LW, LWP and IWP
- Surface data

A complete listing of metadata and gridded science parameters for this data product can be found in Table 2.14-1 through Table 2.14-5.

Level: 3
Type: Archival
Frequency: 1/ Month

Time Interval Covered
File: 1 Month
Record: 1 Month

Portion of Globe Covered
File: Entire Globe
Record: 1-Deg Regions

Portion of Atmosphere Covered
File: Surface and TOA

SRBAVG Metadata

The types of SRBAVG metadata are summarized in Table 2.14-1 and contain information which need only be recorded once per product. The CERES metadata are listed in Appendix B. Table B-1 lists the CERES Baseline Header Metadata and Table B-2 lists the CERES_metadata Vdata.

Table 2.14-1. SRBAVG Metadata Summary

HDF Name	Description Table	Records	Number of Fields
CERES Baseline Header Metadata	Table B-1	1	36
CERES_metadata science data	Table B-2	1	14

All of the SRBAVG science data are organized into the HDF-EOS Grid data type contained in two files, SRBAVG1 and SRBAVG2, which are shown in Tables 2.14-2 through 2.14-5 below. Each table contains a list of the parameters within each grid, including the field number, the field name, the data type, the units, the range, and the number of components within each field.

Table 2.14-2. SRBAVG1 Regional Grid Data (1 of 2)

Field No.	Field Name	Data Type	Units	Range	No. of Components
	Region Parameters				
1	Surface Type Percent Coverage	32-Bit Float	percent	0.0 .. 100.0	20
2	Surface Altitude	32-Bit Float	km	-1000.0 .. 10000	1
3	Snow/Ice Percent Coverage	32-Bit Float	percent	0.0 .. 100.0	1
4	Precipitable Water	32-Bit Float	cm	0.0001 .. 10.0	1
	Total-sky TOA Fluxes - ERBE method (mean, stdev, num obs)				
5	Total-sky TOA SW Flux - ERBE	32-Bit Float	Wm^{-2}	0.0 .. 800.0	75
6	Total-sky TOA LW Flux - ERBE	32-Bit Float	Wm^{-2}	0.0 .. 400.0	75
7	Total-sky TOA WN Flux - ERBE	32-Bit Float	Wm^{-2}	0.0 .. 800.0	75
8	Total-sky TOA Albedo - ERBE	32-Bit Float	N/A	0.0 .. 1.0	75
	Total-sky TOA Fluxes - GEO method (mean, stdev, num obs)				
9	Total-sky TOA SW Flux - GEO	32-Bit Float	Wm^{-2}	0.0 .. 800.0	75
10	Total-sky TOA LW Flux - GEO	32-Bit Float	Wm^{-2}	0.0 .. 400.0	75
11	Total-sky TOA WN Flux - GEO	32-Bit Float	Wm^{-2}	0.0 .. 800.0	75
12	Total-sky TOA Albedo - GEO	32-Bit Float	N/A	0.0 .. 1.0	75
	Clear-sky TOA Fluxes (mean, stdev, num obs)				
13	Clear-sky TOA SW Flux	32-Bit Float	Wm^{-2}	0.0 .. 800.0	75
14	Clear-sky TOA LW Flux	32-Bit Float	Wm^{-2}	0.0 .. 400.0	75
15	Clear-sky TOA WN Flux	32-Bit Float	Wm^{-2}	0.0 .. 800.0	75
16	Clear-sky TOA Albedo	32-Bit Float	N/A	0.0 .. 1.0	75

Table 2.14-2. SRBAVG1 Regional Grid Data (2 of 2)

Field No.	Field Name	Data Type	Units	Range	No. of Components
	Surface Fluxes - Sfc_Down Total-sky (mean, stdev, num obs)				
17	Tot-sky Sfc Down SW Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
18	Tot-sky Sfc Down LW Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 700.0	75
19	Tot-sky Sfc Down SW Flux - Mod B	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
20	Tot-sky Sfc Down LW Flux - Mod B	32-Bit Float	Wm^{-2}	0.0 .. 700.0	75
21	Tot-sky Sfc Down WN Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 700.0	75
	Surface Fluxes - Sfc_Net Total-sky (mean, stdev, num obs)				
22	Tot-sky Sfc Net SW Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
23	Tot-sky Sfc Net LW Flux - Mod A	32-Bit Float	Wm^{-2}	-250.0 .. 50.0	75
24	Tot-sky Sfc Net SW Flux - Mod B	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
25	Tot-sky Sfc Net LW Flux - Mod B	32-Bit Float	Wm^{-2}	-250.0 .. 50.0	75
	Surface Fluxes - Sfc_Down Clear-sky (mean, stdev, num obs)				
26	Clr-sky Sfc Down SW Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
27	Clr-sky Sfc Down LW Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 700.0	75
28	Clr-sky Sfc Down SW Flux - Mod B	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
29	Clr-sky Sfc Down LW Flux - Mod B	32-Bit Float	Wm^{-2}	0.0 .. 700.0	75
30	Clr-sky Sfc Down WN Flux - Mod A	32-Bit Floa	Wm^{-2}	0.0 .. 700.0	75
	Surface Fluxes - Sfc_Net Clear-sky (mean, stdev, num obs)				
31	Clr-sky Sfc Net SW Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
32	Clr-sky Sfc Net LW Flux - Mod A	32-Bit Float	Wm^{-2}	-250.0 .. 50.0	75
33	Clr-sky Sfc Net SW Flux - Mod B	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
34	Clr-sky Sfc Net LW Flux - Mod B	32-Bit Float	Wm^{-2}	-250.0 .. 50.0	75
	Surface Data				
35	LW Surface Emissivity	32-Bit Float	N/A	0.0 .. 1.0	25
36	WN Surface Emissivity	32-Bit Float	N/A	0.0 .. 1.0	25
	Region Parameters				
37	Surface Altitude	32-Bit Float	km	-1000.0 .. 10000	1
38	Surface Type Percent Coverage	32-Bit Float	percent	0.0 .. 100.0	20
39	Snow/Ice Percent Coverage	32-Bit Float	percent	0.0 .. 100.0	1
40	Precipitable Water	32-Bit Float	cm	0.0001 .. 10.0	1
	Total-sky TOA Fluxes - ERBE method (mean, stdev, num obs)				
41	Total-sky TOA SW Flux - ERBE	32-Bit Float	Wm^{-2}	0.0 .. 800.0	75
42	Total-sky TOA LW Flux - ERBE	32-Bit Float	Wm^{-2}	0.0 .. 400.0	75
43	Total-sky TOA WN Flux - ERBE	32-Bit Float	Wm^{-2}	0.0 .. 800.0	75
44	Total-sky TOA Albedo - ERBE	32-Bit Float	N/A	0.0 .. 1.0	75
	Total-sky TOA Fluxes - GEO method (mean, stdev, num obs)				
45	Total-sky TOA SW Flux - GEO	32-Bit Float	Wm^{-2}	0.0 .. 800.0	75
46	Total-sky TOA LW Flux - GEO	32-Bit Float	Wm^{-2}	0.0 .. 400.0	75
47	Total-sky TOA WN Flux - GEO	32-Bit Float	Wm^{-2}	0.0 .. 800.0	75
48	Total-sky TOA Albedo - GEO	32-Bit Float	N/A	0.0 .. 1.0	75
	Clear-sky TOA Fluxes (mean, stdev, num obs)				
49	Clear-sky TOA SW Flux	32-Bit Float	Wm^{-2}	0.0 .. 800.0	75
50	Clear-sky TOA LW Flux	32-Bit Float	Wm^{-2}	0.0 .. 400.0	75
51	Clear-sky TOA WN Flux	32-Bit Float	Wm^{-2}	0.0 .. 800.0	75
52	Clear-sky TOA Albedo	32-Bit Float	N/A	0.0 .. 1.0	75

Table 2.14-3. SRBAVG1 Zonal and Global Grid Data

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Components
	Surface Fluxes - Sfc_Down Total-sky (mean, stdev, num obs)				
53	Tot-sky Sfc Down SW Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
54	Tot-sky Sfc Down LW Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 700.0	75
55	Tot-sky Sfc Down SW Flux - Mod B	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
56	Tot-sky Sfc Down LW Flux - Mod B	32-Bit Float	Wm^{-2}	0.0 .. 700.0	75
57	Tot-sky Sfc Down WN Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 700.0	75
	Surface Fluxes - Sfc_Net Total-sky (mean, stdev, num obs)				
58	Tot-sky Sfc Net SW Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
59	Tot-sky Sfc Net LW Flux - Mod A	32-Bit Float	Wm^{-2}	-250.0 .. 50.0	75
60	Tot-sky Sfc Net SW Flux - Mod B	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
61	Tot-sky Sfc Net LW Flux - Mod B	32-Bit Float	Wm^{-2}	-250.0 .. 50.	75
	Surface Fluxes - Sfc_Down Clear-sky (mean, stdev, num obs)				
62	Clr-sky Sfc Down SW Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
63	Clr-sky Sfc Down LW Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 700.0	75
64	Clr-sky Sfc Down SW Flux - Mod B	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
65	Clr-sky Sfc Down LW Flux - Mod B	32-Bit Float	Wm^{-2}	0.0 .. 700.0	75
66	Clr-sky Sfc Down WN Flux - Mod A	32-Bit Floa	Wm^{-2}	0.0 .. 700.0	75
	Surface Fluxes - Sfc_Net Clear-sky (mean, stdev, num obs)				
67	Clr-sky Sfc Net SW Flux - Mod A	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
68	Clr-sky Sfc Net LW Flux - Mod A	32-Bit Float	Wm^{-2}	-250.0 .. 50.0	75
69	Clr-sky Sfc Net SW Flux - Mod B	32-Bit Float	Wm^{-2}	0.0 .. 1400.0	75
70	Clr-sky Sfc Net LW Flux - Mod B	32-Bit Float	Wm^{-2}	-250.0 .. 50.0	75
	Surface Data				
71	LW Surface Emissivity	32-Bit Float	N/A	0.0 .. 1.0	25
72	WN Surface Emissivity	32-Bit Float	N/A	0.0 .. 1.0	25

Total Bits/Record: **74336**
Total Records/File: **64981**
Total Bits/File: **4830427616**
Total Bytes/Record: **9292**
Total Bytes/File : **603803452**

Table 2.14-4. SRBAVG2 Regional Grid Data

Field No.	Field Name (Parameter)	Data Type	Units	Range	No. of Components
	Angular Model Scene Types				
1	Angular Model Incident Solar Flux	32-Bit Float	N/A	0.0 .. 1400.0	25
2	Angular Model Fractional Area Coverage	32-Bit Float	percent	0.0 .. 100.0	300
3	Angular Model Albedo, mean, stdev	32-Bit Float	N/A	0.0 .. 1.0	600
4	Angular Model LW Flux, mean, stdev	32-Bit Float	Wm^{-2}	0.0 .. 400.0	600
	Weighted_Cloud Properties for 5 Weightings - TOA SW, TOA LW, SFC LW, LWP, & IWP (mean, stdev, num obs)				
5	Col Wtd Total Cld Area Fraction	32-Bit Float	N/A	0.0 .. 100.0	125
6	Col Wtd Cld Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	375
7	Col Wtd Cld Effective Temperature	32-Bit Float	K	100.0 .. 350.0	375
8	Col Wtd Cld Effective Height	32-Bit Float	km	0.0 .. 20.0	375
9	Col Wtd Cld Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	375
10	Col Wtd Cld Bottom Pressure	32-Bit Float	hPa	0.0 .. 1100.0	375
11	Col Wtd Cld Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	375
12	Col Wtd Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	375
13	Col Wtd Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	375
14	Col Wtd Water Particle Radius	32-Bit Float	micron	0.0 .. 40.0	375
15	Col Wtd Ice Particle Effective Diam	32-Bit Float	micron	0.0 .. 300.0	375
16	Col Wtd Cld Visible Optical Depth - lin	32-Bit Float	N/A	0.0 .. 100.0	375
17	Col Wtd Cld Visible Optical Depth - log	32-Bit Float	N/A	0.0 .. 100.0	375
18	Col Wtd Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	375
19	Col Wtd Cld Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	375

Table 2.14-5. SRBAVG2 Zonal and Global Grid Data

Field No.	Field Name (Parameter)	Data Type	Units	Range	No. of Components
	Angular_Model Scene_Types				
20	Angular Model Incident Solar Flux	32-Bit Float	N/A	0.0 .. 1400	25
21	Angular Model Fractional Area Coverage	32-Bit Float	percent	0.0 .. 100.0	300
22	Angular Model Albedo, mean, stdev	32-Bit Float	N/A	0.0 .. 1.0	600
23	Angular Model LW Flux, mean, stdev	32-Bit Float	Wm^{-2}	0.0 .. 400.0	600
24	**Weighted_Cloud Properties for 5 Weightings - TOA SW, TOA LW, SFC LW, LWP, & IWP (mean, stdev, num obs)**				
25	Col Wtd Total Cld Area Fraction	32-Bit Float	N/A	0.0 .. 100.0	125
26	Col Wtd Cld Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	375
27	Col Wtd Cld Effective Temperature	32-Bit Float	K	100.0 .. 350.0	375
28	Col Wtd Cld Effective Height	32-Bit Float	km	0.0 .. 20.0	375
29	Col Wtd Cld Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	375
30	Col Wtd Cld Bottom Pressure	32-Bit Float	hPa	0.0 .. 1100.0	375
31	Col Wtd Cld Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	375
32	Col Wtd Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	375
33	Col Wtd Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	375
34	Col Wtd Water Particle Radius	32-Bit Float	micron	0.0 .. 40.0	375
35	Col Wtd Ice Particle Effective Diam	32-Bit Float	micron	0.0 .. 300.0	375
36	Col Wtd Cld Visible Optical Depth - lin	32-Bit Float	N/A	0.0 .. 100.0	375
37	Col Wtd Cld Visible Optical Depth - log	32-Bit Float	N/A	0.0 .. 100.0	375
38	Col Wtd Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	375
	Col Wtd Cld Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	375

Total Bits / Record: **220800**
Total Records / File: **64981**
Total Bits / File: **14347804800**
Total Bytes / Record: **27600**
Total Bytes / File: **1793475600**
Total Bytes / Product: **2397279052**

2.15 Gridded Geostationary Narrowband Radiances (GGEO)

EOSDIS Product Code: CERX14

The GGEO product is a single file containing metadata, a header record, and multiple data records. The metadata are the CERES Baseline Header Metadata listed in Table B-1 of Appendix B. The header record contains the data starting and ending dates.

Each data record, called an hourbox, contains data particular to a single grid region and hour. The number of hourboxes on the file is constant and is determined by the number of data hours per day, the maximum number of days per month, and the number of regions in the grid (8 hours per day x 31 days per month x 64800 regions on globe = 16,070,400 hourboxes). Hourboxes for which there are no International Satellite Cloud Climatology Project (ISCCP) data are filled with default values.

A listing of the parameters contained within each data record can be found in Table 2.15-1. Following is a brief explanation of the parameters.

- The Region Number and Hour Number identify the hourbox.
- The Satellite Number identifies the satellite which collected the hourbox radiance data.
- The Time parameter gives the Greenwich mean time (GMT) time for the "key" pixel in the hourbox (the pixel which lies closest to the region centroid).
- The three angle measurements are derived from the centroid of the region at the time indicated in the Time parameter.
- The visible and infrared radiance statistics give the mean, variance, and number for the pixels within the hourbox.

Level: 3
Type: Ancillary
Frequency: Monthly

Time Interval Covered
File: Monthly
Record: Every Third Hour

Portion of Globe Covered
File: Entire Globe
Record: 1-Deg Equal-angle Regions

Portion of Atmosphere Covered
File: TOA

Table 2.15-1. Gridded GEO Narrowband Radiances (GGEO)

Description	Parameter Num	Unit	Range	Elements/ Record	Bits/ Elem	Elem Num	Bits/ Rec
GGEO							
GGEO Header							
Data Starting Date			N/A	N/A	1	32	32
Data Ending Date			N/A	N/A	1	32	32
GGEO Data Record							
Satellite and Hourbox ID							
Satellite Number	1	N/A	N/A	1	32	1	32
Region Number	2	N/A	1 .. 64800	1	32	2	32
Hour Number	3	N/A	1 .. 744	1	32	3	32
Time	4	hhmmss	0 .. 235959	1	32	4	32
Cos of Satellite Zenith Angle	5	N/A	-1.0 .. 1.0	1	32	5	32
Cos of Solar Zenith Angle	6	N/A	-1.0 .. 1.0	1	32	6	32
Relative Azimuth Angle	7	deg	0.0 .. 180.0	1	32	7	32
visible radiance: mean, var, num obs	8	$W\ m^{-2}sr^{-1}$	0.0 .. 20.0	3	32	8	96
infrared radiance: mean, var, num obs	9	$W\ m^{-2}sr^{-1}\mu m^{-1}$	0.0 .. 600.0	3	32	11	96

Total Meta Bits/File:	**160**
Total Data Bits/Record:	**416**
Total Records/File:	**10 914 976**
Total Data Bits/File:	**4 540 630 016**
Total Bits/File:	**4 540 630 176**
Total Data Bytes/Record:	**52**
Total Data Bytes/File:	**567 578 752**
Total Files/Product:	**1**

2.16 Meteorological, Ozone, and Aerosol Data (MOA)

EOSDIS Product Code: CERX06

The CERES archival product Meteorological, Ozone, and Aerosol Data (MOA) is produced by the CERES Regrid MOA Subsystem. Each MOA file contains meteorological, ozone, and aerosol data for 1 hour, and is used by several of the CERES subsystems. Data on the MOA file are derived from several data sources external to the CERES system, such as the Data Assimilation Office (DAO), NOAA, and various other meteorological satellites. These data have various horizontal and temporal resolutions. The Regrid MOA Subsystem interpolates the aerosol and ozone data horizontally to conform with the horizontal resolution of the meteorological data. An index number is assigned to each of the possible meteorological horizontal grids and the number of global regions, records and file sizes will also change accordingly. Profile data are interpolated vertically to conform with CERES requirements. The MOA file also contains column precipitable water data measured by the Special Sensor Microwave/Imager (SSM/I) on their native grid (0.5-deg x 0.5-deg). All data are temporally interpolated to provide data to the CERES processing system on an hourly basis.

The MOA contains:

- Surface pressure, geopotential height, skin temperature and surface u-vector and v-vector wind data
- Vertical profiles of temperature and humidity for 58 atmospheric levels
- Vertical profiles for 18 atmospheric levels below the tropopause of u-vector and v-vector wind data
- Tropopause height
- Air mass index
- Column precipitable water based on humidity profiles
- Column precipitable water based on microwave measurements
- Column averaged relative humidity
- Vertical profile of ozone mixing ratios for 58 atmospheric levels
- Column ozone
- Aerosol optical depth

A complete listing of parameters for this data product can be found in Table 2.16-1.

Level: 3
Type: Archival
Frequency: 1/Hour

Time Interval Covered
File: 1 hour
Record: 1 hour

Portion of Globe Covered
File: Global
Record: One region

Portion of Atmosphere Covered
File: Surface to TOA

Table 2.16-1. Meteorological, Ozone, and Aerosol (MOA)

Description	Parameter Number	Units	Range	Elements/ Record	Bits/ Elem	Elem Num
Header						
Date and Hour		N/A	ASCII string	1	216	
MOA Processing Date		N/A	ASCII string	1	216	
MOA Grid Index		N/A	1 .. 1	1	16	
Number of MOA Regions		N/A	13104 .. 13104	1	32	
Temperature, Humidity, and Ozone Profile Fixed Pressure Levels		hPa	0 .. 1100	58	32	
Wind Speed Profile Pressure levels		hPa	0 .. 1100	18	32	
MOA Regional Record						
MOA Region Number	1	N/A	1 .. 13104	1	32	1
Surface Pressure	2	hPa	0 .. 1100	1	32	2
Surface Geopotential Height	3	m	-100 .. 10000	1	32	3
Surface Skin Temperature	4	K	175 .. 375	1	32	4
Surface Wind Speed, U-Vector	5	m sec-1	-100 .. 100	1	32	5
Surface Wind Speed, V-Vector	6	m sec-1	-100 .. 100	1	32	6
Flag, Sea Surface State	7	N/A	0 .. 9	1	32	7
Flag, Source Surface Data	8	N/A	0 .. 4	1	32	8
Temperature Profiles	9	K	175 .. 375	58	32	9
Specific Humidity Profiles	10	g kg-1	0.001 .. 30.000	58	32	67
Wind Speed Profile, U-Vector	11	m sec-1	-100 .. 100	18	32	125
Wind Speed Profile, V-Vector	12	m sec-1	-100 .. 100	18	32	143
Flag, Source Meteorological Profiles	13	N/A	0 .. 4	1	32	161
Tropopause Height	14	hPa	50 .. 450	1	32	162
Air Mass Index	15	N/A	0 .. 10	1	32	163
Column Precipitable Water	16	cm	0.001 .. 10.000	1	32	164
Column Averaged Relative Humidity	17	N/A	0 .. 100	1	32	165
Microwave Precipitable Water	18	g cm^{-2}	0.001 .. 10.000	1	32	166
Microwave Precipitable Water, std	19	g cm^{-2}	TBD	1	32	167
Flag, Source Microwave Column Precipitable Water	20	N/A	0 .. 6	1	32	168
Ozone Mass Mixing Ratio Profiles	21	g g^{-1}	0.0 .. 0.00005	58	32	169
Flag, Source Ozone Profile Data	22	N/A	0 .. 2	1	32	227
Column Ozone	23	DU	0 .. 500	1	32	228
Flag, Source Column Ozone	24	N/A	0 .. 2	1	32	229
Optical Depth, Total Column	25	N/A	0 .. 2	1	32	230
Flag, Source Optical Depth, Total Column	26	N/A	0 .. 1	1	32	231
SSM/I Regional Water Vapor Data						
Microwave Precipitable Water for SSM/I Region		g cm^{-2}	0.001 .. 10.000	1	32	

Total Meta Bits/File:	**544**
Total Data Bits/MOA Regional Record:	**7392**
Total MOA Regional Records/File:	**13104**
Total MOA Regional Records Data Bits/File:	**96864768**
Total Data Bits/SSM/I Record (200 Regions)	**6400**
Total SSM/I Records	**1296**
Total SSM/I Data Bits/File	**8294400**
Total Bits/File:	**105159712**

Total Megabytes/File:	**12.5**
Total Megabytes/Day:	**300**
Total Megabytes/Month:	**9300**
Total Gigabytes/Month:	**9.1**

3.0 Internal Data Products

This section describes the internal CERES data products which are permanently archived at the Langley DAAC. Each subsection contains a brief overview of the purpose and content of the data product followed by one or more tables which list every parameter contained in the product. The following data attributes are described in the overview sections:

- Level - The EOS data products are defined in terms of "levels"[1]
- Type - Data type (Archival, Internal, or Ancillary)
- Frequency - How often the product is received or produced
- Time Interval Covered -

  File - Time period covered within this file
  Record - Time period covered within one record of this file
- Portion of Globe Covered -

  File - Portion of the globe covered within this file
  Record - Portion of the globe covered within a record of this file
- Portion of Atmosphere Covered -

  File - Portion of the atmosphere covered within this file (Surface, Top-of-the-Atmosphere (TOA), etc.)

Additional tables may contain the following attributes for each parameter:

- Description - A textual description of the parameter
- Parameter Number - Arbitrary number assigned to the parameter
- Units - Units of the parameter value
- Range - Range of values for the parameter
- Elements/Record - Elements per record for this parameter (array definition)
- Bits/Element - Number of bits used to describe this parameter
- Elem Num - Element Number, a numbering of each element in the file/record

Total file sizes are also provided. The bolded entries within the file are names for the group of parameters which follow.

---

1. **Level 0:** raw instrument data at full sensor resolution.
   Level 1A: raw instrument data at full sensor resolution, time-referenced, and annotated with ancillary information (including radiometric calibration coefficients and geolocation parameters such as platform ephemeris) computed and appended but not applied to the Level 0 data.
   Level 1B: Level 1A data processed to sensor units and geolocated.
   Level 2: derived geophysical variables at the same resolution and location as the Level 1 source data.
   Level 3: geophysical variables mapped on uniform space-time grids, usually with some completeness and consistency.
   Level 4: model output or results from analyses of lower level data, e.g., variables derived from multiple measurements.

3.1 Instrument Earth Scans (IES)

EOSDIS Product Code: CER09

The IES data product contains one hour of data from a single CERES scanner. The data records are ordered in time with a separate index that sorts the records by along-track angle relating each footprint position to the spacecraft's suborbital point at the start of the hour. The spatial ordering of records using this index will ease the comparison of CERES data with cloud imager data in Subsystem 4. The footprint record is the basic data structure for this data product. This record contains the following kinds of information:

1) Time of Observation
2) Geolocation data (at both the Top-of-Atmosphere (TOA) and at Earth's surface)
3) Filtered radiances (at satellite altitude), with associated quality measures
4) Spacecraft orbital data
5) Footprint viewing geometric data

The IES data product contains only measurements that view the Earth. For the Tropical Rainfall Measuring Mission (TRMM) mission, this means that approximately 225 Earth-viewing footprints (records) are stored on the IES from each 3.3-second half-scan. We have used an estimate of the number of 3.3-second half-scans per hour (approximately 1091) times the number of Earth-viewing measurements in a half-scan (TRMM estimate is 225, EOS estimate is 195) to arrive at our IES product sizing. For TRMM, this is estimated as 245475 measurements per IES data product, and for EOS the estimate is 212745 measurements. The larger of these two measures is used to determine product sizing. The summary of HDF structures is shown in Table 3.1-1. The metadata are listed in Appendix B, Table 3.1-2, and Table 3.1-3. The complete listings of science parameters for this data product can be found in Tables 3.1-4 and 3.1-5.

Level: 1b
Type: Internal
Frequency: 1/Hour

Time Interval Covered
File: 1 Hour
Record: 1/100-Second

Portion of Globe Covered
File: Satellite Swath
Record: 1 CERES Footprint

Portion of Atmosphere Covered
File: Satellite Altitude

Instrument Earth Scans (IES) Definition

Table 3.1-1 summarizes the contents of each type of structure contained within an IES file.

Table 3.1-1. IES HDF Structure Summary

HDF Name	Description Table	Records	Number of Fields	Nominal Size (MBytes)
CERES Baseline Header Metadata	Table B-1	1	36	
CERES_metadata Vdata	Table B-2	1	14	
IES Product-specific Metadata	Table 3.1-2	1	11	
IES Header Vdata	Table 3.1-3	1	22	
Along Track Sort Index	Table	n: 1..212,745	2	1.7
IES Record	Table 3.1-5	n: 1..212,745	30	28.9
Total Size (MB)				30.6

The CERES metadata are listed in Appendix B. Table B-1 lists the CERES Baseline Header Metadata and Table B-2 list the Vdata Metadata. IES-specific metadata parameters are listed in Tables 3.1-2 and 3.1-3.

Table 3.1-2. IES Product-specific Metadata

Item	Parameter Name	Units	Range	Data Type
1	ScanMode	N/A	RapsOnly, FapsOnly, Raps/Faps, XtrtOnly, Raps/Faps/Xtrt, Xtrt/Raps, Xtrt/Faps	s(14)
2	Second Time Constant Mode	N/A	Off, On	s(3)
3	Ephemeris Data Used	N/A	Real, Pred, Sim	s(4)
4	Attitude Data Used	N/A	Real, Sim	s(4)
5	Percent Total Channel Bad	N/A	0.0 .. 100.0	F11.6
6	Percent Window Channel Bad	N/A	0.0 .. 100.0	F11.6
7	Percent Short Wave Channel Bad	N/A	0.0 .. 100.0	F11.6
8	Percent FAPS	N/A	0.0 .. 100.0	F11.6
9	Percent RAPS	N/A	0.0 .. 100.0	F11.6
10	Percent Transitional	N/A	0.0 .. 100.0	F11.6
11	Percent Crosstrack	N/A	0.0 .. 100.0	F11.6
12	TOA_Model_Used	N/A	CERES-TOA or WGS 84	s(9)
13	Number Input Files	N/A	1 .. n	U32Int

Table 3.1-3 lists the parameters in the IES Header Vdata. The columns contain the field number, the field or parameter name, the data type, the units, and the range.

Table 3.1-3. IES Header Vdata

Field No	Field Name	Data Type	Units	Range
1	Whole_Julian_Day	64-Bit Float	day	2449353 .. 2458500
2	Fractional_Julian_Day	64-Bit Float	day	-0.01 .. 1.01
3	Hour_Number	U32 Integer	N/A	0 .. 23
4	Colatitude of Subsatellite Point at Surface at Hour Start	32-Bit Float	deg	0.0 .. 180.0
5	Longitude of Subsatellite Point at Surface at Hour Start	32-Bit Float	deg	0.0 .. 360.0
6	Colatitude of Subsatellite Point at Surface at Hour End	32-Bit Float	deg	0.0 .. 180.0
7	Longitude of Subsatellite Point at Surface at Hour End	32-Bit Float	deg	0.0 .. 360.0
8	Along-track of Satellite at Hour End	32-Bit Float	deg	0.0 .. 360.0
9	Number_of_Footprints	U32 Integer	N/A	0 .. 245475
10	Earth-Sun Distance at Hour Start	32-Bit Float	AU	0.98 .. 1.02
11	Satellite_Position_X	64-Bit Float	km	6600.0 .. 8000.0
12	Satellite_Position_Y	64-Bit Float	km	6600. 0.. 8000.0
13	Satellite_Position_Z	64-Bit Float	km	6600.0 .. 8000.0
14	Satellite_Velocity_X	64-Bit Float	km sec^{-1}	-10.0 .. 10.0
15	Satellite_Velocity_Y	64-Bit Float	km sec^{-1}	-10.0 .. 10.0
16	Satellite_Velocity_Z	64-Bit Float	km sec^{-1}	-10.0 .. 10.0
17	N_Vector_X	64-Bit Float	N/A	0.0 .. 1.0
18	N_Vector_Y	64-Bit Float	N/A	0.0 .. 1.0
19	N_Vector_Z	64-Bit Float	N/A	0. 0.. 1.0
20	Satellite_Type	U32 Integer	N/A	0 = TRMM, 1 = EOS-AM1, 2 = EOS-AM2, 3 = EOS-PM1, 4 = EOS-PM2
21	Instrument_Type	U32 Integer	N/A	0 = PFM, 1 = FM1, 2 = FM2,3 = FM3, 4 = FM4, 5 = FM5
22	Instrument_Scan_Mode	U32 Integer	N/A	0 = Crosstrack, 1 = RAPS, 2 = FAPS, 3 = Transitional

The Along-track Sort Index is shown in Table 3.1-4. The columns contain the field number, the field or parameter name, the data type, the units, and the range.

Table 3.1-4. Along-track Sort Index

Field No.	Field Name	Data Type	Units	Range
1	Footprint Record Index	U32 Integer	N/A	1 .. n
2	Along Track Angle	32-Bit Float	N/A	-20.0 .. 360.0

Table 3.1-5 lists the parameters in an IES Record. The columns contain the field number, the field or parameter name, the data type, the units, and the range.

Table 3.1-5. IES Record

Field No.	Field Name / Parameter	Data Type	Units	Range
1	Colatitude of CERES FOV at TOA	32-Bit Float	deg	0.0 .. 180.0
2	Longitude of CERES FOV at TOA	32-Bit Float	deg	0.0 .. 360.0
3	Colatitude of CERES FOV at Surface	32-Bit Float	deg	0.0 .. 180.0
4	Longitude of CERES FOV at Surface	32-Bit Float	deg	0.0 .. 360.0
5	CERES Viewing Zenith at Surface	32-Bit Float	deg	0.0 .. 90.0
6	CERES Solar Zenith at Surface	32-Bit Float	deg	0.0 .. 180.0
7	CERES Relative Azimuth at Surface	32-Bit Float	deg	0.0 .. 360.0
8	CERES Viewing Azimuth at Surface wrt North	32-Bit Float	deg	0.0 .. 360.0
9	Cross-track Angle of CERES FOV at Surface	32-Bit Float	deg	-90.0 .. 90.0
10	Along-track Angle of CERES FOV at Surface	32-Bit Float	deg	-20.0 .. 360.0
11	Cone Angle of CERES FOV at Satellite	32-Bit Float	deg	0.0 .. 90.0
12	Clock Angle of CERES FOV at Satellite wrt Inertial Velocity	32-Bit Float	deg	0.0 .. 360.0
13	Rate of Change of Cone Angle	32-Bit Float	deg sec^{-1}	-100.0 .. 100.0
14	Rate of Change of Clock Angle	32-Bit Float	deg sec^{-1}	-10.0 .. 10.0
15	X Component of Satellite Inertial Velocity	64-Bit Float	km sec^{-1}	-10.0 .. 10.0
16	Y Component of Satellite Inertial Velocity	64-Bit Float	km sec^{-1}	-10.0 .. 10.0
17	Z Component of Satellite Inertial Velocity	64-Bit Float	km sec^{-1}	-10.0 .. 10.0
18	Radius of Satellite from Center of Earth at Observation	64-Bit Float	km	6000.0 .. 8000.0
19	CERES TOT Filtered Radiance, Upwards	32-Bit Float	W $m^{-2}sr^{-1}$	0.0 .. 700.0
20	CERES SW Filtered Radiance, Upwards	32-Bit Float	W $m^{-2}sr^{-1}$	-10.0 .. 510.0
21	CERES WN Filtered Radiance, Upwards	32-Bit Float	W $m^{-2}sr^{-1}$	0.0 .. 50.0
22	Colatitude of Subsatellite Point at Surface at Observation	32-Bit Float	deg	0.0 .. 180.0
23	Longitude of Subsatellite Point at Surface at Observation	32-Bit Float	deg	0.0 .. 360.0
24	Colatitude of Subsolar Point at Surface at Observation	32-Bit Float	deg	0.0 .. 180.0
25	Longitude of Subsolar Point at Surface at Observation	32-Bit Float	deg	0.0 .. 360.0
26	Scan Sample Number	U16 Integer	N/A	1 .. 660
27	Relative Packet Number	U16 Integer	N/A	0 .. 32767
28	Time of Observation	64-Bit Float	day	2449353.0 .. 2458500.0
29	Radiance and mode flags	U32 Integer	Table 3.1-6	0 .. 65535
30	Absolute Packet Number	U32 Integer	N/A	0 .. 65535

Radiance and Mode Quality Flag Definition

The status flag is a 32-bit word where a single bit or slice corresponds to a particular quality assurance or status flag. Every sample has an associated status flag. The bit ordering of the status word is shown below in Figure 3.1-1. The individual flags are defined in Table 3.1-6. This flag is included in the BDS, IES, SSF, and CRS products.

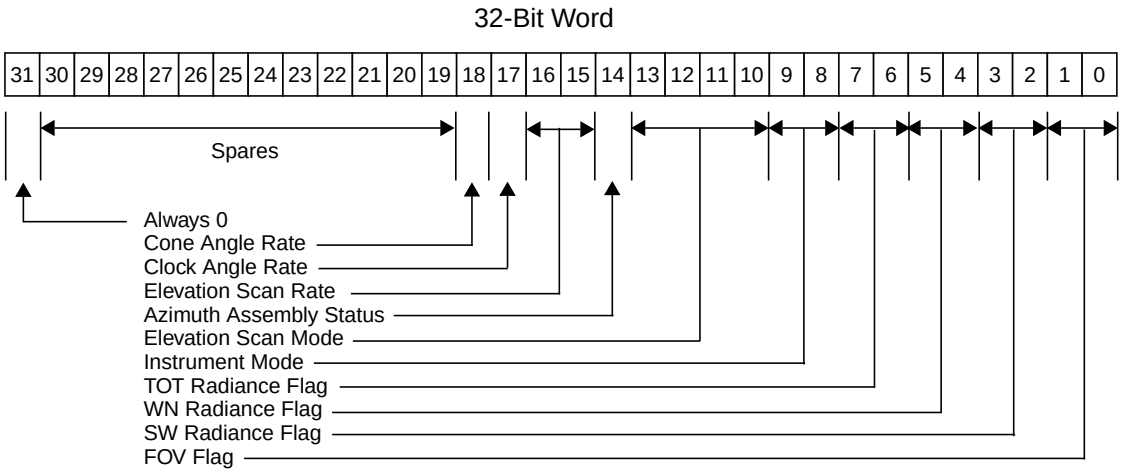


Figure 3.1-1. Radiance and Mode Flags

Table 3.1-6. Radiance and Mode Quality Flags Definition

Bits	Flag Parameter	Definition
0 .. 1	CERES FOV Flag	00 = Fully Earth Viewing 01 = Hit TOA, Missed Earth 10 = Reserved 11 = Missed TOA and Earth
2 .. 3	SW Filtered Radiance Flag	00 = Good 01 = Suspect 10 = Bad 11 = Reserved
4 .. 5	WN Filtered Radiance Flag	00 = Good 01 = Suspect 10 = Bad 11 = Reserved
6 .. 7	TOTl Filtered Radiance Flag	00 = Good 01 = Suspect 10 = Bad 11 = Reserved
8 .. 9	Azimuth Scan Plane	00 = Crosstrack 01 = RAPS (Biaxial, Rotating Azimuth Plane) 10 = FAPS (Fixed Azimuth Plane) 11 = Transitional
10 .. 13	Elevation Scan Profile	0000 = Normal Earth Scan 0001 = Short Earth Scan 0010 = MAM Scan 0011 = NADIR Scan 0100 = Stowed Profile 0101 = Other Profile
14	Azimuth Motion Status	0 = Fixed 1 = In Motion
15 .. 16	Elevation Scan Rate	00 = Nominal 01 = Fast 10 = Stopped 11 = Undefined
17	Clock Angle Rate	0 = Good 1 = Bad
18	Cone Angle Rate	0 = Good 1 = Bad
19 .. 30	Spares	TBD
31	N/A	Always 0

3.2 ERBE-like Daily Data Base (EDDB/EID-6)

EOSDIS Product Code: CERX02

The EID-6 product is generated daily by the ERBE-like Inversion Subsystem (2.0). It contains regional averages of several parameters on the ERBE 2.5-degree equal-angle grid. Table 3.2-2 shows each parameter passed from the ERBE-like Inversion to Instantaneous TOA Subsystem (2.0) on the EID-6 to the ERBE-like Averaging to Monthly TOA Fluxes Subsystem (3.0).

Level: 2
Type: Internal
Frequency: 1/Day

Time Interval Covered
File: Day
Record: N/A

Portion of Globe Covered
File: Regional
Record: Individual Region

Portion of Atmosphere Covered
File: TOA

EDDB/EID-6 Metadata

The metadata structures contain information which need only be recorded once per daily product. The CERES metadata are listed in Appendix B. Table B-1 lists the CERES Baseline Header Metadata and Table B-2 lists the parameters in the Vdata Metadata Table. As explained in Appendix B, the CERES Baseline Header Metadata includes either the bounding rectangle or GRing attributes. The spatial boundaries of the EDDB/EID-6 are defined with the bounding rectangle. The EDDB/EID-6 also contains Product-specific Metadata, which are shown in Table 3.2-1. ERBE-like Daily Regional Averages are shown in Table 3.2-2.

Table 3.2-1. EDDB/EID-6 Product-specific Metadata

Item	Parameter Name	Records	Units	Range	Data Type
1	EID6ProductionDate	1	N/A	N/A	ASCII string

Table 3.2-2. ERBE-like Daily Regional Averages (EDDB/EID-6) (1 of 2)

Description	Parameter Number	Units	Range	Elements/ Record	Bits/ Elem	Elem Num
EDDB						
EDDB_File_Header						
EDDB File Header		N/A		TBD	TBD	
EDDB_Regional_Data_Records						
Region number	1	N/A	1 .. 10368	1	64	1
Julian day	2	day	2449353 .. 2458500	1	64	2
Julian time	3	day	0 .. 1	1	64	3
Regional_Average_Estimates						
SW flux average value	4	W/m^2	0 .. 1400	1	64	4
LW flux average value	5	W/m^2	0 .. 400	1	64	5
Regional_SW_Statistics						
SW flux number of values	6	N/A	0 .. 500	1	64	6
SW flux standard deviation	7	W/m^2	0 .. 1400	1	64	7
SW flux minimum value	8	W/m^2	0 .. 1400	1	64	8
SW flux maximum value	9	W/m^2	0 .. 1400	1	64	9
Regional_LW_Statistics						
LW flux number of values	10	N/A	0 .. 500	1	64	10
LW flux standard deviation	11	W/m^2	0 .. 400	1	64	11
LW flux minimum value	12	W/m^2	0 .. 400	1	64	12
LW flux maximum value	13	W/m^2	0 .. 400	1	64	13
Geo_Scene						
Geographic Scene Type	14	N/A	1 .. 5	1	64	14
Clear-sky fraction	15	N/A	0 .. 1	1	64	15
Partly-cloudy fraction	16	N/A	0 .. 1	1	64	16
Mostly-cloudy fraction	17	N/A	0 .. 1	1	64	17
Overcast fraction	18	N/A	0 .. 1	1	64	18

Table 3.2-2. ERBE-like Daily Regional Averages (EDDB/EID-6) (2 of 2)

Description	Parameter Number	Units	Range	Elements/ Record	Bits/ Elem	Elem Num
Albedos						
Albedo for Clear-sky	19	N/A	0 .. 1	1	64	19
Albedo for partly-cloudy	20	N/A	0 .. 1	1	64	20
Albedo for mostly-cloudy	21	N/A	0 .. 1	1	64	21
Albedo for overcast	22	N/A	0 .. 1	1	64	22
Angular_Averages						
Average of cosines of solar zenith angles	23	N/A	0 .. 1	1	64	23
Average of spacecraft zenith angles	24	deg	0 .. 90	1	64	24
Average of relative azimuth angles	25	deg	0 .. 180	1	64	25
Clear-sky_Statistics						
Clear-sky albedo standard deviation	26	N/A	0 .. 1	1	64	26
Clear-sky LW flux average value	27	W/m^2	0 .. 400	1	64	27
Clear-sky LW flux standard deviation	28	W/m^2	0 .. 400	1	64	28
Clear-sky LW flux number of values	29	N/A	0 .. 500	1	64	29
Spares						
Spare	30	N/A	N/A	1	64	30
Spare	31	N/A	N/A	1	64	31

Total Meta Bits/File:	**TBD**
Total Data Bits/Record:	**1984**
Total Records/File (TRMM):	**27597**
Total Data Bits/File:	**54752448**
Total Bits/File:	**54752448**
Total MB/File:	**6.5**
Total Data Bits/Record:	**1984**
Total Records/File (EOS-AM):	**72845**
Total Data Bits/File:	**144524480**
Total Bits/File:	**144524480**
Total MB/File:	**17.2**
Total Data Bits/Record:	**1984**
Total Records/File (EOS-PM):	**72597**
Total Data Bits/File:	**141423488**
Total Bits/File:	**141423488**
Total MB/File:	**16.9**

Note: The sizing estimate for the EDDB/EID6 in the “Internal Products Summary” Table is for EOS-AM.

4.0 Ancillary Data Products

This section describes the ancillary CERES data products which are permanently archived at the Langley DAAC. Each subsection contains a brief overview of the purpose and content of the data product followed by one or more tables which list every parameter contained in the product. The following data attributes are described in the overview sections:

- Level - The EOS data products are defined in terms of "levels"[1]
- Type - Data type (Archival, Internal, or Ancillary)
- Frequency - How often the product is received or produced
- Time Interval Covered -

  File - Time period covered within this file
  Record - Time period covered within one record of this file
- Portion of Globe Covered -

  File - Portion of the globe covered within this file
  Record - Portion of the globe covered within a record of this file
- Portion of Atmosphere Covered -

  File - Portion of the atmosphere covered within this file (Surface, Top-of-the-Atmosphere (TOA), etc.)

Additional tables may contain the following attributes for each parameter:

- Description - A textual description of the parameter
- Parameter Number - Arbitrary number assigned to the parameter
- Units - Units of the parameter value
- Range - Range of values for the parameter
- Elements/Record - Elements per record for this parameter (array definition)
- Bits/Element - Number of bits used to describe this parameter
- Elem Num - Element Number, a numbering of each element in the file/record

Total file sizes are also provided. The bolded entries within the file are names for the group of parameters which follow.

---

1. **Level 0:** raw instrument data at full sensor resolution.
   Level 1A: raw instrument data at full sensor resolution, time-referenced, and annotated with ancillary information (including radiometric calibration coefficients and geolocation parameters such as platform ephemeris) computed and appended but not applied to the Level 0 data.
   Level 1B: Level 1A data processed to sensor units and geolocated.
   Level 2: derived geophysical variables at the same resolution and location as the Level 1 source data.
   Level 3: geophysical variables mapped on uniform space-time grids, usually with some completeness and consistency.
   Level 4: model output or results from analyses of lower level data, e.g., variables derived from multiple measurements.

4.1 MODIS Cloud Imager Data (CID_MODIS)

EOSDIS Product Code: CERX04

MODIS Cloud Imager Data (CID_MODIS) from the EOS spacecraft is a Level-1B data set with nineteen of the MODIS channels. CID_MODIS consists of two or more data sets. The first is the Level-1B data set, which contains the calibrated radiances; and the second is the companion Geolocation data set. The sizes listed in the following data description reflect the estimated number of scan line records (200) in 5 minutes of data. The files are written in Hierarchical Data Format (HDF) and are composed of Scientific Data Sets (SDS) and Vdatas.

The MODIS Level-1B HDF Structure Summary, Table 4.1-1, lists the types and names of HDF structures contained in the Level-1B product along with the names of the structures. A complete listing of parameters for the Level 1B data product can be found in Tables 4.1-2 through 4.1-3. The MODIS Geolocation HDF Structure Summary, Table 4.1-4, lists the names and types of HDF structures contained in the geolocation product. A complete listing of the parameters for the MODIS Geolocation product can be found in Tables 4.1-4 and 4.1-5. For more information on the MODIS Project, see Reference 6.

It is assumed that only Earth-viewing radiances and uncertainties and any information needed to interpret these values from the Level-1B product will be sent to the LaRC DAAC. The channels currently requested by the CERES Science Team are

Channels	Micron	Resolution (km)	Channels	Micron	Resolution (km)
Channel 1	0.645	0.25 & 1	Channel 26	1.38	1
Channel 6	1.64	1	Channel 27	6.7	1
Channel 7	2.13	1	Channel 29	8.55	1
Channel 17	0.91	1	Channel 31	11.0	1
Channel 18	0.93	1	Channel 32	12.0	1
Channel 19	0.94	1	Channel 33	13.3	1
Channel 20	3.75	1	Channel 34	13.6	1
Channel 23	4.0	1	Channel 35	13.9	1
Channel 24	4.46	1	Channel 36	14.2	1
Channel 25	4.52	1			

Level: 1-B
Type: Ancillary
Frequency: 1 per 5.0-Min

Time Interval Covered
File: 5.0-Min
Record: Instantaneous

Portion of Globe Covered
File: Satellite Swath
Record: .25 - 1.0-km by .25 - 1.0-km

Portion of Atmosphere Covered
File: Satellite Altitude

Table 4.1-1. MODIS Level-1B HDF Structure Summary

HDF Name	HDF Structure Type	Num Records	Table Number	Size (bytes)
MODIS Core Metadata	HDF Annotations	1	Reference 6	10 000
MODIS Archive Metadata	HDF Annotations	1	Reference 6	10 000
MODIS Product Specific Metadata	HDF Annotations	1	Reference 6	10 000
MODIS Swath Data	Vdata Structure	1	Table 4.1-2	72
MODIS Level 1-B SDS	SDSs	1 .. 1044	Table 4.1-3	294 693 396
Total MODIS Level-1B Bytes/File:				**294 723 468**

Table 4.1-2. MODIS Level-1B Swath Data Vdata

Field Name	Description	Field Num	Num Records	Data Type	Units	Range
Scan Number	Scan number	1	1	32-bit integer	N/A	1 .. 200
Complete Scan Flag	1 = Complete scan , 0 = Incomplete scan	2	1	32-bit integer	N/A	0 .. 1
Total Frames	Total number of frames in scan	3	1	32-bit integer	N/A	TBD
EV_Frames	Total number of earth view frames	4	1	32-bit integer	N/A	TBD
SD_Frames	Total number of solar diffuser frames	5	1	32-bit integer	N/A	TBD
SRCA_Frames	Total number of SRCA frames	6	1	32-bit integer	N/A	TBD
BB_Frames	Total number of blackbody frames	7	1	32-bit integer	N/A	TBD
SV_Frames	Total number of space view frames	8	1	32-bit integer	N/A	TBD
Scan Type	Type of scan (day, night, mixed)	9	1	8-bit character	N/A	N/A
Scan Start Time	Start time of scan	10	1	64-bit float	TBD	TBD
Mirror Side	TBD	11	1	8-bit integer	N/A	1 .. 2
Scan Data Presence	TBD	12	1	32-bit integer	TBD	TBD
Missing Packets	TBD	13	1	32-bit integer	TBD	TBD
Packets with Bad CRC	TBD	14	1	32-bit integer	TBD	TBD
Discarded Packets	TBD	15	1	32-bit integer	TBD	TBD
Moon in SV Port	TBD	16	1	8-bit integer	TBD	0 .. 1
On-Orbit Maneuver	TBD	17	1	8-bit integer	TBD	0 .. 1
No. SV Outliers	TBD	18	1	32-bit integer	TBD	0 .. 15
No. BB Outliers	TBD	19	1	32-bit integer	TBD	0 .. 15
No. thermistor outliers	TBD	20	1	32-bit integer	TBD	0 .. 12

Table 4.1-3. MODIS Level-1B Science Data Sets

SDS Name	Description	Rank	Dimensions	Data Type	Units	Range
Latitude	Subset of the geodetic latitude	2	{2000, 271} scan x pixel	32-bit float	deg	-90 .. 90
Longitude	Subset of the geodetic longitude	2	{2000, 271} scan x pixel	32-bit float	deg	-180 .. 180
Dimensions	Values of the various dimensions in the product	1	{45}	32-bit integer	N/A	N/A
Slope_and_Offset	Values needed to convert scaled instrument data to radiances	2	{38, 8} band x scale quantity	32-bit float	N/A	N/A
SD sector Pixel quality	Solar diffuser pixel quality	3	{200, 30, 10} scan x SD frame x track	16-bit integer	TBD	TBD
SRCA sector Pixel quality	SRCA pixel quality	3	{200, 40, 10} scan x SRCA frame x track	16-bit integer	TBD	TBD
BB sector Pixel quality	Blackbody pixel quality	3	{200, 50, 10} scan x BB frame x track	16-bit integer	TBD	TBD
SV sector Pixel quality	Space view pixel quality	3	{200, 30, 10} scan x SV frame x track	16-bit integer	TBD	TBD
Earth sector Pixel quality	Earth View pixel quality	3	{200, 1354, 10} scan x EV frame x track	16-bit integer	TBD	TBD
EV_250_RefSB	Band 1 radiances at 1/4 km resolution	3	{1, 8000, 5416} band x scan x pixel	16-bit integer	W $m^{-2}sr^{-1}\mu m^{-1}$	TBD
EV_250_RefSB_ Uncert_Indexes	Band 1 uncertainty indexes at 1/4 km resolution	3	{1, 8000, 5416} band x scan x pixel	8-bit integer	N/A	TBD
EV_250_Aggr1km_RefSB	Band 1 radiances at 1 km resolution	3	{1, 2000, 1354} band x scan x pixel	16-bit integer	W $m^{-2}sr^{-1}\mu m^{-1}$	TBD
EV_250_Aggr1km_RefSB _Uncert_Indexes	Band 1 uncertainty indexes at 1 km resolution	3	{1, 2000, 1354} band x scan x pixel	8-bit integer	N/A	TBD
EV_500_Aggr1km_RefSB	Band 6, 7 radiances at 1 km resolution	3	{2, 2000, 1354} band x scan x pixel	16-bit integer	W $m^{-2}sr^{-1}\mu m^{-1}$	TBD
EV_500_Aggr1km_RefSB _Uncert_Indexes	Band 6, 7 uncertainty indexes at 1 km resolution	3	{2, 2000, 1354} band x scan x pixel	8-bit integer	N/A	TBD
EV_1KM_RefSB	Band 17, 18, 19, 26 radiances at 1 km resolution	3	{4, 2000, 1354} band x scan x pixel	16-bit integer	W $m^{-2}sr^{-1}\mu m^{-1}$	TBD
EV_1KM_RefSB_ Uncert_Indexes	Band 17, 18, 19, 26 uncertainty indexes at 1 km resolution	3	{4, 2000, 1354} band x scan x pixel	8-bit integer	N/A	TBD
EV_1KM_Emissive	Band 20, 23, 24, 25, 27, 29, 31, 32, 33, 34, 35, 36 radiances at 1 km resolution	3	{12, 2000, 1354} band x scan x pixel	16-bit integer	W $m^{-2}sr^{-1}\mu m^{-1}$	TBD
EV_1KM_Emissive_ Uncert_Indexes	Band 20, 23, 24, 25, 27, 29, 31, 32, 33, 34, 35, 36 uncertainty indexes at 1 km resolution	3	{12, 2000, 1354} band x scan x pixel	8-bit integer	N/A	TBD

Table 4.1-4. MODIS Geolocation HDF Structure Summary

HDF Name	HDF Structure Type	Num Records	Table Number	Size (bytes)
MODIS Geolocation Core Metadata	HDF Annotations	1	Reference 6	10 000
MODIS Geolocation Archive Metadata	HDF Annotations	1	Reference 6	10 000
MODIS Geolocation Product Specific Metadata	HDF Annotations	1	Reference 6	10 000
MODIS Geolocation Swath Structural Metadata	HDF Annotations	1	Reference 6	10 000
MODIS Geolocation Data	SDS	39	Table 4.1-5	59 678 050
Total MODIS Geolocation Bytes/File:				**59 718 050**

Table 4.1-5. MODIS Geolocation Science Data Sets (1 of 2)

SDS Name	Description	Rank	Dimensions	Data Type	Units	Range
Focal_length	Focal length for detectors	1	{37} band	64-bit float	mm	TBD
band_position	Scan IFOV Offsets of band trailing edges with respect to the Optical Center	1	{37} band	64-bit float	TBD	TBD
detector_space	Nominal detector spacing in the cross-scan direction	1	{37} band	64-bit float	mm	TBD
detector_offsets	Offsets of detector positions from nominal locations on the focal plane	2	{37, 2} band x {scan, track}	64-bit float	mm	TBD
T_offset	Offsets of the first sample for a band to time of 1km frame	1	{37} band	64-bit float	TBD	TBD
num_samples	Number of samples per frame for each band.	1	{37} band	16-bit integer	N/A	N/A
Scan number	Scan number in granule	1	{200} scan	16-bit integer	N/A	N/A
EV frames	Number of Earth view frames in scan	1	{200} scan	16-bit integer	N/A	N/A
SD frames	Number of solar diffuser frames in scan	1	{200} scan	16-bit integer	N/A	N/A
SV frames	Number of space view frames in scan	1	{200} scan	16-bit integer	N/A	N/A
EV start time	Earth view start time (TAI)	1	{200} scan	64-bit float	sec	TBD
SD start time	Solar diffuser view start time (TAI)	1	{200} scan	64-bit float	sec	TBD
SV start time	Space view start time (TAI)	1	{200} scan	64-bit float	sec	TBD
SD Sun zenith	Sun vector zenith angle in SD frame	1	{200} scan	32-bit float	deg	TBD
SD Sun azimuth	Sun vector azimuth angle in SD frame (clockwise rotation about SD Z axis with respect to SD Y axis)	1	{200} scan	32-bit float	deg	TBD
Moon Vector	Moon unit vector in instrument frame	2	{200, 3} scan x vector dimen-sion	32-bit float	TBD	TBD
sun_ref	Unit Sun vector in ECR frame at scan center time	2	{200, 3} scan x vector dimen-sion	32-bit float	TBD	TBD
Mirror side	Mirror side	1	{200} scan	16-bit integer	TBD	TBD

Table 4.1-5. MODIS Geolocation Science Data Sets (2 of 2)

SDS Name	Description	Rank	Dimensions	Data Type	Units	Range
num_impulse	Number of mirror encoder samples for this scan	1	{200} scan	8-bit integer	TBD	TBD
impulse_enc	Mirror angles from encoder data.	2	{200, 25} scan x encoder values	64-bit float	N/A	N/A
impulse_time	Mirror encoder sample times from start of scan	2	{200, 25} scan x encoder values	64-bit float	sec	TBD
L1 scan quality	L1A scan quality flags	2	{200, 4} scan x flag	32-bit integer	N/A	N/A
Geo scan quality	Geolocation scan quality flags	2	{200, 4} scan x flag	8-bit integer	N/A	N/A
EV center time	Earth view center frame time (TAI)	1	{200} scan	64-bit float	sec	TBD
orb_pos	ECR orbit position at scan center time	2	{200, 3} scan x vector dimension	64-bit float	m	TBD
orb_vel	ECR orbit velocity at scan center time	2	{200, 3} scan x vector dimension	64-bit float	m sec^{-1}	TBD
T_inst2ECR	instrument-to-ECR frame transformation matrix at scan center time	3	{200, 3, 3} scan x vector x vector dimension	64-bit float	TBD	TBD
attitude_angles	Spacecraft attitude at scan center time expressed in the Orbital Reference frame (roll, pitch, yaw)	2	{200, 3} scan x vector dimension	64-bit float	deg	TBD
ang_rates	Spacecraft attitude rates in spacecraft reference frame (roll, pitch, yaw)	2	{200, 3} scan x vector dimension	32-bit float	deg sec^{-1}	TBD
Longitude	Geodetic longitude	2	{2000, 1354} scan x pixel	32-bit float	deg	-180 .. 180
Latitude	Geodetic latitude	2	{2000, 1354} scan x pixel	32-bit float	deg	-90 .. 90
Height	Height above ellipsoid	2	{2000, 1354} scan x pixel	16-bit integer	m	TBD
SensorZenith	Sensor (spacecraft) zenith angle	2	{2000, 1354} scan x pixel	16-bit integer	deg	0 .. 180
SensorAzimuth	Sensor (spacecraft) azimuth angle	2	{2000, 1354} scan x pixel	16-bit integer	deg	-180 .. 180
Range	Slant range (to spacecraft)	2	{2000, 1354} scan x pixel	16-bit integer	m	TBD
SolarZenith	Solar zenith angle	2	{2000, 1354} scan x pixel	16-bit integer	deg	0 .. 180
SolarAzimuth	Solar azimuth angle	2	{2000, 1354} scan x pixel	16-bit integer	deg	-180 .. 180
Land/SeaMask	EOS Land/Sea Mask	2	{2000, 1354} scan x pixel	8-bit integer	N/A	N/A
gflags	Geolocation flags	2	{2000, 1354} scan x pixel	8-bit integer	N/A	N/A

CID_MODIS Instrument Data

Total Bytes/File :	**294 ,723,468**
Total Mbytes/File:	**281.1**
Total Mbytes/Hour:	**3,372.2**
Total Mbytes/Day:	**80,948**

CID_MODIS Geolocation Data

Total Bytes/File:	**59,748,050**
Total Mbytes/File:	**56.98**
Total Mbytes/Hour:	**683.8**
Total Mbytes/Day:	**16,410**

CID_MODIS Total Data /Volume

TotalMbytes/Granule:	**338.1**
Total Mbytes/Hour:	**057.0**
Total Mbytes/Day:	**97,367**
Total Mbytes/Month:	**3,018,378**

4.2 VIRS Cloud Imager Data (CID_VIRS)

EOSDIS Product Code: CERX05

The VIRS Cloud Imager Data (CID_VIRS) are Level-1B data from the five VIRS channels on the TRMM spacecraft. The data coverage is one orbit; however, the orbit files will be processed on an hourly basis. The sizes listed in the following data description reflect the estimated number of scan line records in 1 hour (11,817). The product is written in Hierarchical Data Format (HDF). It contains Vdata and Scientific Data Sets (SDS), which hold data for all of the scan line records. The VIRS HDF Structure Summary Table 4.2-1 lists the type of HDF structure along with the name of the structure. A complete listing of parameters for this data product can be found in Tables 4.2-2 and 4.2-3. The VIRS Level-1B product is described in more detail in the Level 1 File Specifications - Volume 3 (Reference 5). The five VIRS channels are

Channels	Micron	Resolution
Channel 1	0.63	2-km
Channel 2	1.60	2-km
Channel 3	3.75	2-km
Channel 4	10.80	2-km
Channel 5	12.00	2-km

Level: 1-B
Type: Ancillary
Frequency: 1/Hour

Portion of Globe Covered
File: Satellite Swath
Record: 2-km by 2-km

Time Interval Covered
File: 1 Hour
Record: Instantaneous

Portion of Atmosphere Covered
File: Satellite Altitude

Table 4.2-1. VIRS HDF Structure Summary

HDFName	HDF Structure Type	Num Records	Table Number	Size (bits)
VIRS Core Metadata	HDF Annotations	1	Reference 5	80 000
VIRS Product Specific Metadata	HDF Annotations	1	Reference 5	80 000
VIRS Swath Data for product decoding	HDF Vgroup	1	None	40 000
Scan Time	Vdata Structures	1 .. 11, 817	Table 4.2-2	756 288
Scan Status	Vdata Structures	1 .. 11, 817	Table 4.2-3	1 796 184
Navigation	Vdata Structures	1 .. 11, 817	Table 4.2-4	8 319 168
Geolocation	SDS Data Structures	1 .. 11, 817	Table 4.2-5	197 391 168
Calibration Counts	SDS Data Structures	1 .. 11, 817	Table 4.2-5	5 672 160
Local Direction	SDS Data Structures	1 .. 11, 817	Table 4.2-5	20 419 776
Channels	SDS Data Structures	1 .. 11, 817	Table 4.2-5	246 738 960
Total VIRS Megabytes/File:				**57.37**

Table 4.2-2. Scan Time VData

Field Name	Description	Field Num	Num Records	Data Type	Units	Range
scanTime	Time of the scan	1	1 .. 11, 817	64-bit float	sec	0 .. 86400

Table 4.2-3. Scan Status VData

Field Name	Description	Field Num	Num Records	Data Type	Units	Range
missing	Missing Information Flag	1	1 .. 11, 817	8-bit integer	N/A	0 .. 2
validity	Status Mode Flag	2	1 .. 11, 817	8-bit integer	N/A	N/A
qac	Quality and Accounting Capsule	3	1 .. 11, 817	8-bit integer	N/A	N/A
geoQuality	Geolocation Quality	4	1 .. 11, 817	8-bit integer	N/A	N/A
ch1Quality	Quality of Channel Data	5	1 .. 11, 817	8-bit integer	N/A	N/A
ch2Quality	Quality of Channel Data	6	1 .. 11, 817	8-bit integer	N/A	N/A
ch3Quality	Quality of Channel Data	7	1 .. 11, 817	8-bit integer	N/A	N/A
ch4Quality	Quality of Channel Data	8	1 .. 11, 817	8-bit integer	N/A	N/A
ch5Quality	Quality of Channel Data	9	1 .. 11, 817	8-bit integer	N/A	N/A
scOrient	Current Spacecraft Orientation	10	1 .. 11, 817	8-bit integer	N/A	0 .. 4
acsMode	Current ACS Mode	11	1 .. 11, 817	8-bit integer	N/A	0 .. 8
yawUpdateS	Yaw Update Status	12	1 .. 11, 817	8-bit integer	N/A	0 .. 2
virsInstS	VIRS Instrument Status	13	1 .. 11, 817	8-bit integer	N/A	0 .. 3
virsMode	VIRS Mode	14	1 .. 11, 817	8-bit integer	N/A	0 .. 3
virsAbnCon	VIRS Abnormal Conditions	15	1 .. 11, 817	8-bit integer	N/A	N/A
fractOrbitN	Fractional Orbit Number	16	1 .. 11, 817	32-bit float	N/A	N/A

Table 4.2-4. VIRS Navigation VData

Field Name	Description	Field Num	Num Records	Data Type	Units	Range
scPosX	Spacecraft Geocentric Position	1	1 .. 11, 817	32-bit float	m	TBD
scPosY	Spacecraft Geocentric Position	2	1 .. 11, 817	32-bit float	m	TBD
scPosZ	Spacecraft Geocentric Position	3	1 .. 11, 817	32-bit float	m	TBD
scVelX	Spacecraft Geocentric Velocity	4	1 .. 11, 817	32-bit float	m sec-1	TBD
scVelY	Spacecraft Geocentric Velocity	5	1 .. 11, 817	32-bit float	m sec-1	TBD
scVelZ	Spacecraft Geocentric Velocity	6	1 .. 11, 817	32-bit float	m sec-1	TBD
scLat	Spacecraft Geodetic Position	7	1 .. 11, 817	32-bit float	deg	TBD
scLon	Spacecraft Geodetic Position	8	1 .. 11, 817	32-bit float	deg	TBD
scAlt	Spacecraft Geodetic Position	9	1 .. 11, 817	32-bit float	m	TBD
scAttRoll	Spacecraft Geocentric Attitude	10	1 .. 11, 817	32-bit float	deg	TBD
scAttPitch	Spacecraft Geocentric Attitude	11	1 .. 11, 817	32-bit float	deg	TBD
scAttYaw	Spacecraft Geocentric Attitude	12	1 .. 11, 817	32-bit float	deg	TBD
att1	Sensor Orientation Matrix	13	1 .. 11, 817	32-bit float	N/A	N/A
att2	Sensor Orientation Matrix	14	1 .. 11, 817	32-bit float	N/A	N/A
att3	Sensor Orientation Matrix	15	1 .. 11, 817	32-bit float	N/A	N/A
att4	Sensor Orientation Matrix	16	1 .. 11, 817	32-bit float	N/A	N/A
att5	Sensor Orientation Matrix	17	1 .. 11, 817	32-bit float	N/A	N/A
att6	Sensor Orientation Matrix	18	1 .. 11, 817	32-bit float	N/A	N/A
att7	Sensor Orientation Matrix	19	1 .. 11, 817	32-bit float	N/A	N/A
att8	Sensor Orientation Matrix	20	1 .. 11, 817	32-bit float	N/A	N/A
att9	Sensor Orientation Matrix	21	1 .. 11, 817	32-bit float	N/A	N/A
green HourAng	Greenwich Hour Angle	22	1 .. 11, 817	32-bit float	deg	TBD

Table 4.2-5. VIRS Science Data Sets

SDS Name	Description	Rank	Dimensions	Data Type	Units	Range
geolocation	Earth location of the center of the field-of-view	3	(11817, 261, 2) scan line x pixel x (latitude, longitude)	32-bit float	deg	-90 .. 90 -180 .. 180
calCounts	Raw calibration counts	4	(11817, 3, 2, 5) scan line x {blackbody, space view, solar diffuser} x data word x channel	16-bit integer	count	N/A
local Direction	Angles to the satellite and sun from the center of the field of view	4	(11817, 27, 2, 2)scan line x pixel x {satellite, sun} x {zenith angle, azimuth angle}.	16-bit integer	deg	TBD
channels	Radiances	3	(11817, 261, 5) scan line x pixel x channel	16-bit integer	mW $cm^{-2}sr^{-1}$ μm^{-1}	TBD

4.3 Surface Map (SURFMAP)

EOSDIS Product Code: CERX07

The Surface Map (SURFMAP) product is a composite of various products each containing a different surface condition. The individual products each contain a single parameter arranged on a global 1/6-degree by 1/6-degree equal-angle grid (2160x1080 = 2,332,800 cells).

The SURFMAP products are updated at different frequencies, depending on the type of data. See Table 4.3-1 for a list of the individual products and their update frequency, units, and sizes. The last entry in the table is a static ASCII file of surface directional models and other relevant surface information.

Level: 3
Type: Ancillary
Frequency: Variable

Portion of Globe Covered
File: Entire Globe
Record: 1/6-Deg by 1/6-Deg

Time Interval Covered
File: Variable
Record: Variable

Portion of Atmosphere Covered
File: Surface

Table 4.3-1. SURFMAP Product

Data Type	Description	Update Frequency	Units	Range	Bits/ Element	Size in MB
SURFMAP(ECO)	IGBP Ecosystem map	1 / mission	N/A	0 .. 18	8	2.33
SURFMAP(TER)	Characteristic Terrain Map	1 / mission	N/A	0 .. 99	8	2.33
SURFMAP(DEM)	Digital elevation map	1 / mission	m	-120 .. 8000	16	4.66
SURFMAP(EM03.75)	Emissivity Map for 3.75 micron channel	1 / mission	N/A	.0 .. 1.0	8	2.33
SURFMAP(EM10.80)	Emissivity Map for 10.80 micron channel	1 / mission	N/A	.0 .. 1.0	8	2.33
SURFMAP(EM11.90)	Emissivity Map for 11.90 micron channel	1 / mission	N/A	.0 .. 1.0	8	2.33
SURFMAP(EMBR)	Emissivity Map for 0.2 - 50 micron channel (Broadband)	1 / mission	N/A	.0 .. 1.0	8	2.33
SURFMAP(EMWN)	Emissivity Map for 8 - 12 micron channel (Window)	1 / mission	N/A	.0 .. 1.0	8	2.33
SURFMAP(ERBE)	ERBE scene id map	1 / mission	N/A	1 .. 6	8	2.33
SURFMAP(ICE)	Ice map	1 / day	percent	0 .. 100	8	2.33
SURFMAP(SNOW)	Snow map	1 / day	in	0 .. 255	8	2.33
SURFMAP(H2O)	Percent water content map	1 / mission	percent	0 .. 100	8	2.33
SURFMAP(LIB)	Surface Models	1/mission	N/A	--	--	~5K
Total SURFMAP Size						**28.8**

4.4 Geostationary Narrowband Radiances (GEO)

EOSDIS Product Code: CERX09

Currently, CERES will use geostationary satellite data collected by the International Satellite Cloud Climatology Project (ISCCP).

The ISCCP B1 dataset consists of a narrowband infrared channel radiance (near 10.8 micrometer) and a narrowband visible channel radiance (near 0.68 micrometer). The radiances are sampled at about 10-km resolution every 3 hours. These data are in the form of eight- or ten-bit counts that can be converted to radiances using either nominal, normalized, or updated calibration formulae.

There are four sets of B1 data currently available. Others may be added in the future as other satellites are launched. The four sets currently available are

1) Geostationary Meteorological Satellite (GMS) in GMS format
2) Meteorological Satellite (METEOSAT) in METEOSAT format
3) Geostationary Operational Environmental Satellite (GOES-8) in Canadian format
4) GOES-9 in McIDAS format

These data will be provided by EOSDIS which will acquire them from NOAA, the designated archive center for ISCCP B1 data. The data volume is as follows:

1) GMS: eight 3480 cartridges
2) METEOSAT: eight 3480 cartridges
3) GOES-8: fifteen 3480 cartridges
4) GOES-9: seven 3480 cartridges

Each 3480 cartridge holds about 200 MB, so the data volume will be about 7.6 GB per month. NOAA will package these data in 8-millimeter tape format.

Level: 1B
Type: Ancillary
Frequency: Every Third Hour

Portion of Globe Covered
File: 1 Hemisphere
Record: 10-km Pixel

Time Interval Covered
File: 1 Hour
Record: Instantaneous

Portion of Atmosphere Covered
File: TOA

NOTE: Geostationary products are produced by the International Satellite Cloud Climatology Project (Reference 7). They are used by, but are not archived by, the CERES Project.

4.5 Aerosol Data (APD)

EOSDIS Product Code: CERX10

The ancillary data product, Aerosol Product Data (APD), is input to the CERES Regrid Meteorological, Ozone, and Aerosol Data Subsystem. The APD is the source of backup climatological total column aerosol optical depth data, and is made up of one data file for each month. The first record of each file is based on global three-hourly data provided by Dr. Rachel Pinker that are monthly averaged over two years. These averages are on a 2.5° equal-area grid. The second record of each file is based on monthly data provided by Dr. Larry Stowe that are also averaged over two years. These averages are on a 1.0° equal-angle grid for the area between 70S and 70N. The Regrid Meteorological, Ozone, and Aerosol Data Subsystem interpolates these data horizontally to conform with the MOA horizontal grid, and then stores the value from one source on the MOA product.

Level: 3
Type: Ancillary
Frequency: Monthly

Portion of Globe Covered
File: Global
Record: One region

Time Interval Covered
File: Monthly
Record: Monthly

Portion of Atmosphere Covered
File: Total column

Table 4.5-1. APD File Sizes

Source	Size (Monthly)
University of Maryland, College Park (Dept. of Meteorology) (Pinker) and NOAA/NESDIS (Stowe)	406 KB

4.6 Gridded Analysis Product (GAP)

EOSDIS Product Code: CERX12

The external ancillary data product, Gridded Analysis Product (GAP), is input to the CERES Regrid Meteorological, Ozone, and Aerosol Data Subsystem. The GAP is made up of multiple files that contain vertical profiles of temperature, specific humidity, and wind speed profiles as a function of pressure, along with surface temperature and pressure. Prior to the EOS-AM launch, these data are available from the Data Assimilation Office (DAO) on a 2.0° latitude x 2.5° longitude grid. DAO's diagnostic products are available every three hours, while their prognostic products are available every 6 hours. The Regrid Meteorological, Ozone, and Aerosol Data Subsystem interpolates these data temporally and vertically to conform with CERES processing requirements. The DAO Input Products are shown in Table 4.6-1.

Level: 3
Type: Ancillary
Frequency: Every 3 or 6 hours

Portion of Globe Covered
File: Global
Record: 2° x 2.5° region

Time Interval Covered
File: Every 3 or 6 hours
Record: Every 3 or 6 hours

Portion of Atmosphere Covered
File: Surface to TOA

Table 4.6-1. DAO Input Products

DAO File Name	DAO File Size (Daily)	Temporal Resolution	Products Used by CERES
ceres_dao_trmm.pave.yyyymmdd	419 KB	Three-hourly	Surface pressure
ceres_dao_trmm.phis.yyyymmdd	209 KB	Six-hourly	Surface height
ceres_dao_trmm.ps.yyyymmdd	209 KB	Six-hourly	Surface pressure
ceres_dao_trmm.q10m.yyyymmdd	419 KB	Three-hourly	Specific humidity at 10 meters
ceres_dao_trmm.sphu.yyyymmdd	3774 KB	Six-hourly	Vertical profiles of specific humidity
ceres_dao_trmm.t10m.yyyymmdd	419 KB	Three-hourly	Temperature at 10 meters
ceres_dao_trmm.tg.yyyymmdd	209 KB	Six-hourly	Ground Temperature
ceres_dao_trmm.tmpu.yyyymmdd	3774 KB	Six-hourly	Vertical profiles of temperature
ceres_dao_trmm.tropp.yyyymmdd	209 KB	Six-hourly	Tropopause height
ceres_dao_trmm.u10m.yyyymmdd	419 KB	Three-hourly	Wind speed u-vectors at 10 meters
ceres_dao_trmm.uwnd.yyyymmdd	3774 KB	Six-hourly	Vertical profiles of wind speed u-vectors
ceres_dao_trmm.v10m.yyyymmdd	419 KB	Three-hourly	Wind speed v-vectors at 10 meters
ceres_dao_trmm.vwnd.yyyymmdd	3774 KB	Six-hourly	Vertical profiles of wind speed v-vectors
TOTAL SIZE	**18.027 MB**		

4.7 Microwave Humidity (MWH)

EOSDIS Product Code: CERX13

The external ancillary data product, Microwave Humidity (MWH), is input to the CERES Regrid Meteorological, Ozone, and Aerosol Data Subsystem. The MWH is the source of the column precipitable water as measured by the Spectral Sensor Microwave/Imager (SSM/I) microwave instrument. These data have a 0.5° latitude x 0.5° longitude horizontal resolution. The column precipitable water data are stored on the MOA files in their original resolution to conform with CERES processing requirements. MWH file size is shown in Table 4.7-1.

Level: 3
Type: Ancillary
Frequency: Daily

Portion of Globe Covered
File: Global
Record: One region

Time Interval Covered
File: Daily
Record: Daily

Portion of Atmosphere Covered
File: Total column

Table 4.7-1. MWH File Sizes

Source	Size (Daily)
Global Hydrology Resource Ceter (GHRC)	2.14 MB

4.8 Ozone Profile Data (OPD)

EOSDIS Product Code: CERX11

The external ancillary data product, Ozone Profile Data (OPD), is input to the CERES Regrid Meteorological, Ozone, and Aerosol Data Subsystem. The OPD is the source of total column ozone data. Daily files for NCEP/Stratospheric Monitoring-Group Ozone Blended Analysis (SMOBA) data are the primary input data source. These data have a 2.5° latitude x 2.5° longitude equal-angle horizontal resolution on 24 vertical profile levels and total column values. As a backup source, daily data from Earth Probe-Total Ozone Mapping Spectrometer (EP-TOMS) may be used. These data have a 1.25° latitude x 1.25° longitude equal-angle horizontal resolution of *only* total column values. The Regrid Meteorological, Ozone, and Aerosol Data Subsystem interpolates these data temporally, horizontally and vertically to conform with CERES processing requirements. OPD file sizes are shown in Table 4.8-1.

Level: 3
Type: Ancillary
Frequency: Daily

Portion of Globe Covered
File: Global
Record: One region

Time Interval Covered
File: Daily
Record: Daily

Portion of Atmosphere Covered
File: 300hPa to TOA

Table 4.8-1. OPD File Sizes

Source	Size (Daily)
SMOBA	2.430 MB
EP-TOMS	0.163 MB

References

1. HDF User's Guide, Version 4.0, February 1996 (from NCSA)
   URL: http://eosweb/HBDOCS/hdf.html
2. PGS Toolkit User's Guide for the ECS Project, Version 1 Final, May 1994
3. Cloud's and the Earth's Radiant Energy System (CERES) Bi-directional Scans (BDS) Collection Document, Draft; July 1998;
   URL: http://asd-www.larc.nasa.gov/ceres/collect_guide/list.html
4. TRW DRL 64, 55067.300.0080D; In-flight Measurement Analysis (Revision D); 12 September 1995
5. TSDIS Science Users Interface Control Specification Volume 3, Level 1 File Specifications, Release 3.06, July 8, 1998
   URL: http://www-tsdis.gsfc.nasa.gov/tsdis/tsdis.html
6. MODIS Level 1B lkm Earth View Data Product Specification, Version 2.0, Release 1, March 1997.
   URL: http://ltpwww.gsfc.nasa.gov/MODIS/MODIS.html
7. ISCCP URL: http://isccp.giss.nasa.gov/

APPENDIX A
Acronyms and Abbreviations

Appendix A
Acronyms, Abbreviations and Unit Definitions

ADM	Angular Distribution Model
APD	Aerosol Profile Data
AVG	Monthly Regional Radiative Fluxes and Clouds
BDS	Bidirectional Scan
CADM	CERES Angular Distribution Model
CCSDS	Consultative Committee for Space Data Systems
CERES	Clouds and the Earth's Radiant Energy System
CID	Cloud Imager Data
CRH	Clear Reflectance History
CRS	Clouds and Radiative Swath
DAAC	Distributed Active Archive Center
DAO	Data Assimilation Office
DMS	Data Management System
EDDB	ERBE-Like Daily Database Product
EOS	Earth Observing System
EOS-AM	EOS Morning Crossing (Ascending) Mission
EOS-PM	EOS Afternoon Crossing (Descending) Mission
EOSDIS	Earth Observing System Data and Information System
EP-TOMS	Earth Probe - Total Ozone Mapping Spectrometer
ERBE	Earth Radiation Budget Experiment
ERBS	Earth Radiation Budget Satellite
FOV	Field-of-View
FSW	Monthly Single Satellite Fluxes and Clouds
GAP	Gridded Analysis Product
GB	Giga Byte
GEO	Geostationary Narrowband Radiances
GGEO	Gridded GEO Narrowband Radiances
GHRC	Global Hydrology Research Center
GMS	Geostationary Meteorological Satellite
GMT	Greenwich Mean Time
GOES	Geostationary Operational Environmental Satellite
H	High
HDF	Hierarchical Data Format
IES	Instrument Earth Scans
IGBP	International Geosphere Biosphere Programme
IMS	Information Management System
INSTR	Instrument

ISCCP	International Satellite Cloud Climatology Project
IWC	Ice Water Content
IWP	Ice Water Path
LaRC	Langley Research Center
L	Low
LM	Lower Middle
LW	Longwave
LWC	Liquid Water Content
LWP	Liquid Water Path
MB	Mega Byte
METEOSAT	Meteorological Satellite
MOA	Meteorological, Ozone, and Aerosols
MODIS	Moderate Resolution Imaging Spectrometer
MWH	Microwave Humidity
NASA	National Aeronautics and Space Administration
NCEP	National Centers for Environmental Predictions
NOAA	National Oceanic and Atmospheric Administration
OPD	Ozone Profile Data
RAPS	Rotating Azimuth Plane Scan
SARB	Surface and Atmospheric Radiation Budget
SDS	Scientific Data Set
SFC	Monthly Gridded Single Satellite TOA and Surface Fluxes and Clouds
SMOBA	Stratospheric Monitoring Group Ozone Blended Analysis
SRB	Surface Radiation Budget
SRBAVG	Monthly Averages for Top-of-Atmosphere and Surface Radiation Budget
SSF	Single Satellite CERES Footprint TOA and Surface Fluxes, Clouds
SSM/I	Special Sensor Microwave/Imager
SURFMAP	Surface Map
SW	Shortwave
SYN	Synoptic Radiative Fluxes and Clouds
TBD	To be determined
TISA	Time Interpolation and Spatial Averaging
TOA	Top-of-the-Atmosphere
TOMS	Total Ozone Mapping Spectrometer
TRMM	Tropical Rainfall Measuring Mission
UM	Upper Middle
VIRS	Visible Infrared Scanner
WN	Window
Xtrt	Crosstrack
ZAVG	Monthly Zonal and Global Radiative Fluxes and Clouds

Unit Definitions

Units	Definition
AU	Astronomical Unit
cm	centimeter
count	count, counts
day	day, Julian date
deg	degree
deg sec^{-1}	degrees per second
DU	Dobson Unit
fraction	fraction 0..1
g kg^{-1}	gram per kilogram
g m^{-2}	gram per square meter
hhmmss	hour, minute, second
hour	hour
hPa	hectoPascals
in-oz	inch-ounce
K	Kelvin
km	kilometer, kilometers
km sec^{-1}	kilometers per second
m	meter
mA	milliamp, milliamps
micron	micrometer, micron
msec	millisecond
mW $cm^{-2}sr^{-1}\mu m^{-1}$	milliWatts per square centimeter per steradian per micron
m sec^{-1}	meter per second
N/A	not applicable, none, unitless, dimensionless
percent	percent, percentage 0..100
rad	radian
sec	second
volt	volt, volts
W h m^{-2}	Watt hour per square meter

Units	Definition
$W^2\ m^{-4}$	square Watt per meter to the 4th
$W\ m^{-2}$	Watt per square meter
$W\ m^{-2}sr^{-1}$	Watt per square meter per steradian
$W\ m^{-2}sr^{-1}\mu m^{-1}$	Watt per square meter per steradian per micron
°C	degrees centigrade
μm	micrometer, micron

APPENDIX B
CERES Metadata

Appendix B
CERES Metadata

This section describes the metadata that are written to all CERES HDF products. Table B-1 describes the CERES Baseline Header Metadata that are written on both HDF and binary direct access output science data products. The parameters are written in HDF structures for CERES HDF output products and are written as 80-byte records for binary direct access output products. Some parameters may be written in multiple records. Table B-2 describes the CERES_metadata Vdata parameters which are a subset of the CERES Baseline Header Metadata and are also written to all CERES HDF output products.

Table B-1 lists the item number, parameter name, units, range or allowable values, the data type, and the maximum number of elements. Note that there are two choices for parameters 22-25 and two choices for parameters 26-29. The choices depend on whether the product is described by a bounding rectangle or by a GRing. Abbreviations used in the Data Type field are defined as:

s = string	date = yyyy-mm-dd
F = float	time = hh:mm:ss.xxxxxxZ
I = integer	datetime = yyyy-mm-ddThh:mm:ss.xxxxxxZ

Table B-1. CERES Baseline Header Metadata (1 of 2)

Item	Parameter Name	Units	Range	Data Type	No. of Elements
1	ShortName	N/A	N/A	s(8)	1
2	VersionID	N/A	0 .. 255	I3	1
3	CERPGEName	N/A	N/A	s(20)	1
4	SamplingStrategy	N/A	CERES, TRMM-PFM-VIRS, AM1-FM1-MODIS, TBD	s(20)	1
5	ProductionStrategy	N/A	Edition, Campaign, DiagnosticCase, PreFlight, TBD	s(20)	1
6	CERDataDateYear	N/A	1997 .. 2050	s(4)	1
7	CERDataDateMonth	N/A	1 .. 12	s(2)	1
8	CERDataDateDay	N/A	1 .. 31	s(2)	1
9	CERHrOfMonth	N/A	1 .. 744	s(3)	1
10	RangeBeginningDate	N/A	1997-11-19 .. 2050-12-31	date	1
11	RangeBeginningTime	N/A	00:00:00.000000Z .. 24:00:00:000000Z	time	1
12	RangeEndingDate	N/A	1997-11-19 .. 2050-12-31	date	1
13	RangeEndingTime	N/A	00:00:00.000000Z .. 24:00:00:000000Z	time	1
14	AssociatedPlatformShortName	N/A	TRMM, AM1, PM1, TBD	s(20)	1-4

Table B-1. CERES Baseline Header Metadata (2 of 2)

Item	Parameter Name	Units	Range	Data Type	No. of Elements
15	AssociatedInstrumentShortName	N/A	PFM, FM1, FM2, FM3, FM4, FM5, TBD	s(20)	1-4
16	LocalGranuleID	N/A	N/A	s(80)	1
17	PGEVersion	N/A	N/A	s(10)	1
18	CERProductionDateTime	N/A	N/A	datetime	1
19	LocalVersionID	N/A	N/A	s(60)	1
20	ProductGenerationLOC	N/A	SGI_xxx, TBD	s(255)	1
21	NumberofRecords	N/A	1 .. 9 999 999 999	I10	1
22	WestBoundingCoordinate	deg	-180.0 .. 180.0	F11.6	1
23	NorthBoundingCoordinate	deg	-90.0 .. 90.0	F11.6	1
24	EastBoundingCoordinate	deg	-180.0 .. 180.0	F11.6	1
25	SouthBoundingCoordinate	deg	-90.0 .. 90.0	F11.6	1
22	GRingPointLatitude	deg	-90.0 .. 90.0	F11.6	5
23	GRingPointLongitude	deg	-180.0 .. 180.0	F11.6	5
24	GRingPointSequenceNo	N/A	0 .. 99999	I5	5
25	ExclusionGRingFlag	N/A	Y (= YES), N (= NO)	s(1)	1
26	CERWestBoundingCoordinate	deg	0.0 .. 360.0	F11.6	1
27	CERNorthBoundingCoordinate	deg	0.0 .. 180.0	F11.6	1
28	CEREastBoundingCoordinate	deg	0.0 .. 360.0	F11.6	1
29	CERSouthBoundingCoordinate	deg	0.0 .. 180.0	F11.6	1
26	CERGRingPointLatitude	deg	0.0 .. 180.0	F11.6	5
27	CERGRingPointLongitude	deg	0.0 .. 360.0	F11.6	5
28	GRingPointSequenceNo	N/A	0 .. 99999	I5	5
29	ExclusionGRingFlag	N/A	Y (= YES), N (= NO)	s(1)	1
30	AutomaticQualityFlag	N/A	Passed, Failed, or Suspect	s(64)	1
31	AutomaticQualityFlagExplanation	N/A	N/A	s(255)	1
32	QAGranuleFilename	N/A	N/A	s(255)	1
33	ValidationFilename	N/A	N/A	s(255)	1
34	ImagerShortName	N/A	VIRS, MODIS, TBD	s(20)	1
35	InputPointer	N/A	N/A	s(255)	800
36	NumberInputFiles	N/A	1 .. 9999	I4	1

Table B-2 describes the CERES_metadata Vdata parameters which are written to all CERES HDF output science products. The table lists the item number, parameter name, units, range or allowable values, and the parameter data type where s (x) denotes a string of x characters.

Table B-2. CERES_metadata Vdata

Item	Parameter Name	Units	Range	Data Type
1	ShortName	N/A	N/A	s(32)
2	RangeBeginningDate	N/A	1997-11-19 .. 2050-12-31	s(32)
3	RangeBeginningTime	N/A	00:00:00.000000Z .. 24:00:00:000000Z	s(32)
4	RangeEndingDate	N/A	1997-11-19 .. 2050-12-31	s(32)
5	RangeEndingTime	N/A	00:00:00.000000Z .. 24:00:00:000000Z	s(32)
6	AutomaticQualityFlag	N/A	Passed, Failed, or Suspect	s(64)
7	AutomaticQualityFlagExplanation	N/A	N/A	s(256)
8	AssociatedPlatformShortName	N/A	TRMM, EOS AM-1, EOS PM-1, TBD	s(32)
9	AssociatedInstrumentShortName	N/A	PFM, FM1, FM2, FM3, FM4, FM5, TBD	s(32)
10	LocalGranuleID	N/A	N/A	s(96)
11	LocalVersionID	N/A	N/A	s(64)
12	CERProductionDateTime	N/A	N/A	s(32)
13	NumberofRecords	N/A	1 .. 9 999 999 999	4-byte integer
14	ProductGenerationLOC	N/A	SGI_xxx, TBD	s(256)