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

Data Products Catalog

Release 5
Version 3
February 2009



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

Data Management System

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Version 3**

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Document Revision Record

The Document Revision Record contains information for approved and implemented changes to the entire Data Products Catalog (DPC). The table lists the date that the revised DPC was created and a short description of the revision.

Revision Date	Release Number	Description of Revision
08/1994	R1V1	TRMM Pre-launch Version
01/1997	R2V1	TRMM Launch Version
07/1998	R3V1	TRMM Launch Version including HDF organization
03/2000	R3V2	Updated for product parameter and/or format changes. Supports all launches.
10/2002	R3V3	Updated format to comply with standards.
07/2003	R4V1	Updated the following sections: SSF, CRS, FSW, SFC, SRBAVG, and INSTR.
08/2003	R4V2	Updated the SSF section.
10/2003	R4V3	Updated the CRS section.
11/2003	R4V4	Updated the FSW and SFC sections.
03/2004	R4V5	Updated the BDS, CRS, ES-4, ES-8, ES-9, and SRBAVG sections.
04/2004	R4V6	Updated the FSW section.
08/2004	R4V7	Updated the SSF section.
09/2004	R4V8	Updated the FSW, SFC, and SSF sections.
04/2005	R4V9	Updated the FSW section.
06/2005	R4V10	Updated the SRBAVG section.
07/2005	R4V11	Updated the CRS section.
11/2005	R4V12	Updated the BDS section.
02/2006	R4V13	Updated the GEO and GGEO sections.
03/2006	R4V14	Updated the MOA section.
05/2007	R4V15	Updated the AVG, SYN, ZAVG, CRS, and FSW sections.
02/2008	R4V16	Updated the SSF-Ed2 and CRS sections.
02/2008	R4V17	Updated the SRBAVG section.
06/2008	R4V18	Added the new SYNI and TSI Data Product Catalog sections and changed section numbering of TISA GGEO and SARB MOA that was affected by this addition.
08/2008	R4V19	Updated the AVG, ZAVG, and SYN sections.
10/2008	R4V20	Added the new VIIRS and ISCCP-D2like-Day/Nit Data Product Catalog sections and changed section numbering of SURFMAP, GEO, APD, GAP, MWH, OPD, SYN, AVG, ZAVG, and SRBAVG sections to accommodate the insertion of the VIIRS and ISCCP-D2like-Day/Nit sections. Also added the ISCCP-D2like-GEO Data Product Catalog section.
10/2008	R5V1	The DFD chart has been modified to add the ISCCP-D2like products.
11/2008	R5V2	Updated "Product Version" category in AVG, SYN, and ZAVG sections.

Revision Date	Release Number	Description of Revision
02/2009	R5V3	Updated "Product Version" category in SSF-Ed2 section and added "NPP" to applicable areas in the INSTR section.

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 primary science products.

This Data Products Catalog is intended to give an overview of the primary, internal, and ancillary data products which are used or produced by the Data Management System. All CERES products are permanently stored by the Langley TRMM and Terra Information System (LATIS) DAAC. Primary data products are those that become available for distribution to the scientific community upon verification by the CERES Science Team. Internal and ancillary data products are available to the CERES Data Management System for use in producing the primary products. Additional details are given in the Collection Guide for each primary data product.

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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 - 5 μm), a total channel (0.3 - 200 μm), and an infrared window channel (8 - 12 μm). 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 TRMM satellite carries one CERES instrument while the EOS satellites carry two CERES instruments, one operating in a fixed azimuth plane scanning mode (FAPS) for continuous Earth sampling and the other operating in a rotating azimuth plane scan mode (RAPS) for improved angular sampling.

A high-level view of the CERES Data Management System (DMS) is illustrated by the CERES Top Level Data Flow Diagram shown in [Figure 1-1](#). 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 primary (archival), internal, or ancillary data products. Boxes with arrows entering a circle are input data sources for the subsystem, while boxes 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 1-1](#). 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. [Figure 1-1](#) 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 [Figure 1-1](#) 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.

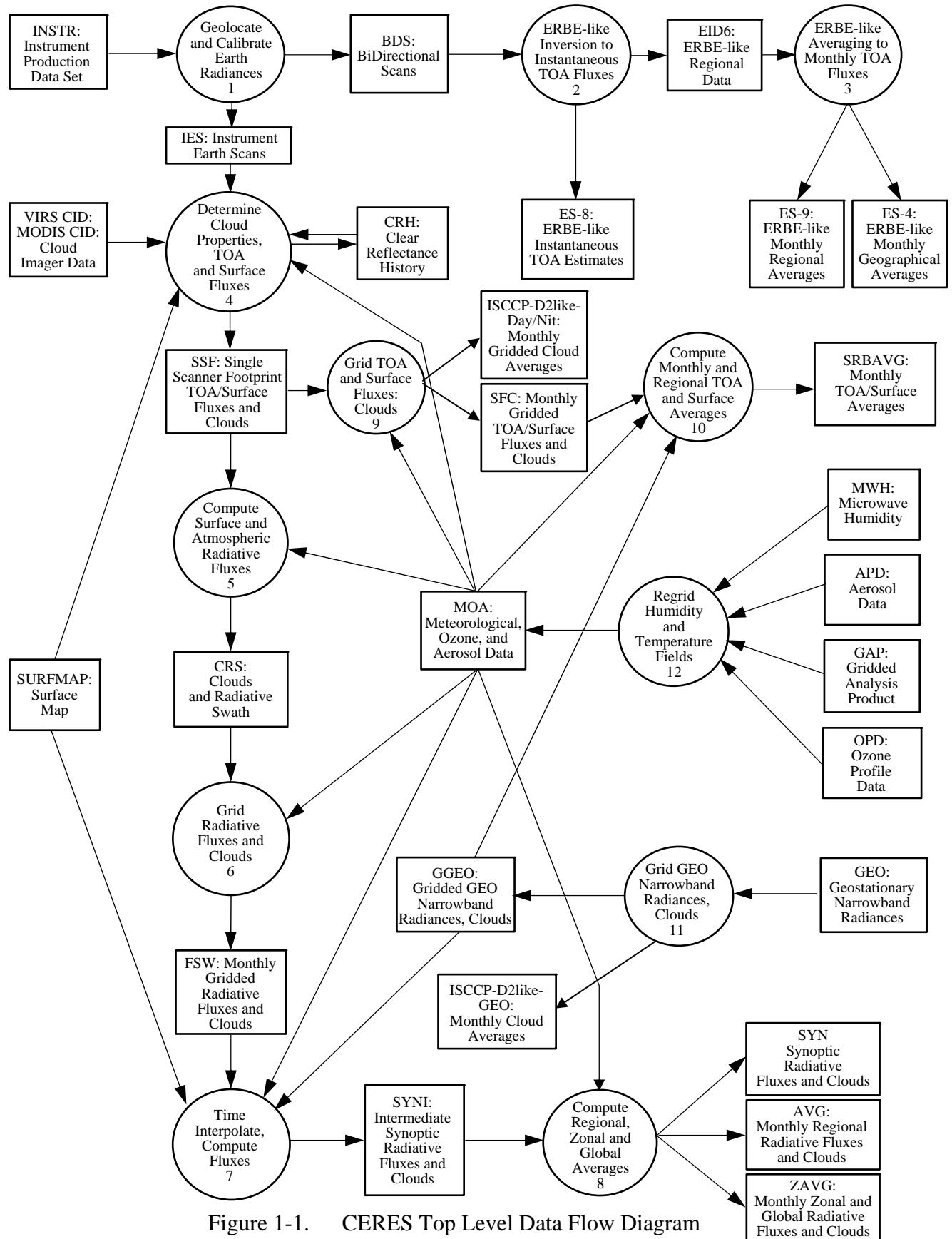


Figure 1-1. CERES Top Level Data Flow Diagram

Modified Date: October 2008

Table 1.0-1. Scenario Key

Key	Scenario (Production Rate)
A	One per each instrument operating in fixed and/or rotating azimuth scan mode
B	One per each satellite (regardless of the number of instruments)
C	One per each instrument plus all instruments combined
D	One per mission (regardless of the number of instruments and satellites)
E	One per TRMM satellite (VIRS imager data)
F	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](#): Primary Products: Output products which are permanently stored by the Langley TRMM and Terra Information System (LATIS) DAAC, are formatted in HDF or HDF-EOS format, and are available for distribution to the scientific community.

[Table 1.0-4](#): Internal Products: CERES Level 0 input data and output products which are produced and used by the Data Management System, are stored by the LATIS DAAC, and are not available for distribution.

[Table 1.0-5](#): Ancillary Products: Input products which contain non-CERES data needed to interpret the CERES measurements and are not available for distribution.

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 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 products.

Table 1.0-3. Primary Archival Products Summary

Sub Sys	Product Codes		Name	Frequency	Size, MB	Monthly Size, MB	Key	
	CERES	EOSDIS					Scenario	Format
1	BDS	CER01	Bidirectional Scans	1/Day	844.7	26186	A	H
2	ES-8	CER02	ERBE-like Instantaneous TOA Estimates	1/Day	480.2	14886	A	E
3	ES-9	CER03	ERBE-like Monthly Regional Averages	1/Month	1099.1	1099	C	H
3	ES-4	CER13	ERBE-like Monthly Geographical Averages	1/Month	27.1	27	C	H
4	SSF	CER11	Single Scanner Footprint TOA/Surface Fluxes and Clouds	1/Hour	257.6	191677	A	H
5	CRS	CER04	Clouds and Radiative Swath	1/Hour	353.9	263308	A	H
6	FSW	CER05	Monthly Gridded Radiative Fluxes and Clouds	1/Month	20349.4	20349	C	H
7	SYN	CER07	Synoptic Radiative Fluxes and Clouds	1/Day	1920.2	59526	C	E
8	AVG	CER08	Monthly Regional Radiative Fluxes and Clouds	1/Month	1188.5	1189	C	E
8	ZAVG	CER15	Monthly Zonal and Global Radiative Fluxes and Clouds	1/Month	3.3	3	C	E
9	SFC	CER12	Monthly Gridded TOA/Surface Fluxes and Clouds	1/Month	11068.7	11069	C	H
10	SRBAVG	CER06	Monthly TOA/Surface Averages	1/Month	4722.2	4722	C	E

Table 1.0-4. Internal Products Summary

Sub Sys	Product Code		Name	Frequency	Size, MB	Monthly Size, MB	Key	
	CERES	EOSDIS					Scenario	Format
1	INSTR	CERX00	Instrument Production Data Set	1/Day	89.0	2759	A	B
1	IES	CER09	Instrument Earth Scans	1/Hour	33.8	25148	A	H
2	EID-6	CERX02	ERBE-like Regional Data	1/Day	17.2	533	A	B
4	CRH	CER16	Clear Reflectance History	1/Day	17.8	552	B	B
11	GGEO	CERX14	Gridded GEO Narrowband Radiances	1/Month	472.8	479	D	B
12	MOA	CERX06	Meteorological, Ozone, and Aerosol Data	1/Hour	43.8	5431.2	D	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_VIRS	CERX05	VIRS Cloud Imager Data	1/Hour	57.4	42706	E	H
4	CID_MODIS	CERX04	MODIS Cloud Imager Data	1/5mins	338.1	3018378	F	H
4	SURFMAP	CERX07	Surface Map	Variable	28.8	162	D	B
1	GEO	CERX09	Geostationary Narrowband Radiances	8/Day/ Satellite	7.7	7600	D	B
2	APD	CERX10	Aerosol Data	1/Month	.4	.4	D	B
2	GAP	CERX12	Gridded Analysis Product	4-8/Day	103.6	128495	D	B
2	MWH	CERX13	Microwave Humidity	1/Day	2.1	65	D	B
2	OPD	CERX11	Ozone Profile Data	1/Day	2.4	74	D	B

Introduction Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

Introduction Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none">• Updated format to comply with standards.	All

2.0 Primary Archival Data Products

This section describes the CERES primary output data products that are permanently stored by the Langley TRMM and Terra Information System (LATIS) DAAC and are available for distribution to the scientific community. 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
- Frequency - How often the product is received or produced
- Configuration Code - Unique identifier that defines the software and input file versions used to produce the products
- 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.

Primary Archival Data Products Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

Primary Archival Data Products Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none">• Updated format to comply with standards.	All

2.1 Bidirectional Scans (BDS)

The BiDirectional Scans (BDS) product contains 24 hours of instantaneous Level-1b CERES data for a single scanner instrument. The BDS contains instantaneous radiance measurements recorded every 0.01-second for views of space, internal calibration, solar calibration and Earth. It contains all elevation scan modes which include the normal Earth scan and the short Earth scan modes and both the fixed and rotating azimuth plane scan modes.

The BDS product includes:

- Filtered broadband radiances for the total, shortwave, and window channels for each 0.01 second measurement
- Geolocation and viewing geometry for every Earth-viewing measurement
- Instrument status, engineering temperatures and voltages for each 6.6 second scan
- Sun geometry, satellite position and velocity for each scan
- All raw engineering and status data from the instrument

A more detailed listing of the data parameters for this product can be found in the BDS Collection Guide: http://asd-www.larc.nasa.gov/ceres/collect_guide/list.html (Reference 3).

Level: 1B

Frequency: 1/Day

Portion of Atmosphere Covered: Satellite Altitude

Time Interval Covered:

File: 24 Hours

Record: Single 6.6-Second Scans

Portion of Globe Covered:

File: Satellite Altitude

Record: N/A

Product Version:

TRMM: Edition1-CV, Edition3 ++ see NOTE

Terra: Edition1, Edition1-CV, Edition2, Edition3 ++ see NOTE

Aqua: Edition1, Edition1-CV, Edition2, Edition3 ++ see NOTE

NOTE: The Slow Mode and Drift Corrected Counts SDSs are only available on Edition1 BDS products with a configuration code of 027025 or greater and Edition2 BDS products with a configuration code of 028028 or greater. Solar and Lunar Azimuth and Elevation Angle SDSs are only available on Edition1-CV BDS products and Edition2 BDS products with a configuration code of 031033 or higher and Edition3. In addition, the Satellite-Celestial Vdata parameters for Solar and Lunar Beta and Eta Angles along with Earth-Moon Distance, Moon Colatitude at start of record and Moon Longitude at start of record are only available for Edition1-CV BDS products, Edition2 BDS products with a configuration code of 031033 or higher and Edition3 BDS products.

Bidirection Scans (BDS) Definition

Table 2.1-1 summarizes the contents and estimated product size of each data structure type contained within an BDS file. Each BDS product contains three metadata structures, 35 SDS structures, and eight VData structures.

Table 2.1-1. BDS HDF Structure Summary

Name	Description Table	Records	Number of Fields	Nominal Size (Bytes)
CERES Baseline Header Metadata	Table B-1	1	36	~25907
CERES_metadata Vdata	Table B-2	1	14	~1024
BDS Product-specific Metadata	Table 2.1-2	1	11	~66
BDS SDS Summary	Table 2.1-3	1 .. 13091	47	1,249,567,630
BDS Vdata Summary	Table 2.1-4	1 .. 13091	185	32,230,162
Total Size (Bytes):				1,281,824,789
Total Size (MBytes, including ~0.2% HDF overhead; 1MByte = 1024²Bytes):				1,224.89

BDS Metadata

The BDS product includes three data structures. These include the CERES Baseline Header Metadata and the CERES_metadata Vdata parameters, which are listed in [Appendix B](#). The BDS-specific metadata parameters 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	XtrkOnly, RapsOnly, FapsOnly, Raps/Faps, Xtrk/Raps, Xtrk/Faps, Xtrk/Raps/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	uint32

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](#).

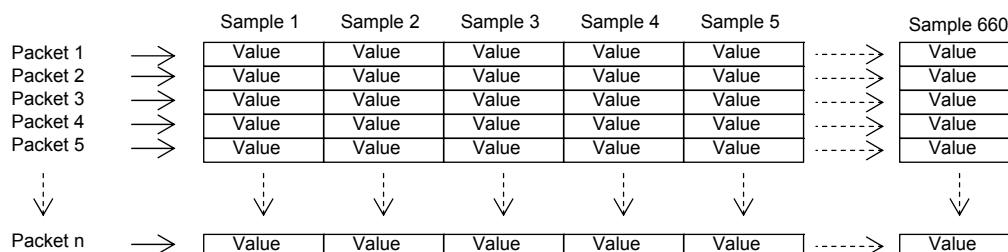


Figure 2.1-1. BDS SDS Schematic

[Table 2.1-3](#) summarizes the contents of each SDS structure contained within the BDS file (listed in alphabetical order by their SDS structure name). All SDS parameters have an HDF Rank = 2 and the maximum number of SDS elements corresponds to the number of rows by the number of columns. Data types are referenced by their HDF classification (e.g. Char8, Float32, Float64, Int8, UInt8, Int16, UInt16, Int32, UInt32, Int64, UInt64).

Table 2.1-3. BDS SDS Summary

SDS Name	Maximum SDS Elements	Data Type	Range	Units	Maximum Size (Bytes)
Raw Instrument Status Data	13091x185	uint16	Reference 3	N/A	4,843,670
Julian Date and Time	13091x2	float64	2449353.0 .. 2458500.0	day	209,456
Azimuth Position Count	13091x660	uint16	0 .. 4095	count	17,280,120
Elevation Position Count	13091x660	uint16	0 .. 4095	count	17,280,120
Radiance and Mode Flags	13091x660	uint32	Table 3.2-1	N/A	34,560,240
Secondary Sample Level QA Flags	13091x660	uint32	Reference 3	N/A	34,560,240
Primary Scan Level QA Flags	13091x660	uint32	Reference 3	N/A	34,560,240
Secondary Scan Level QA Flags	13091x660	uint32	Reference 3	N/A	34,560,240
Converted Azimuth Angles	13091x660	float32	0.0 .. 360.0	deg	34,560,240
Converted Elevation Angles	13091x660	float32	0.0 .. 260.0	deg	34,560,240
CERES Viewing Zenith at Surface	13091x660	float32	0.0 .. 90.0	deg	34,560,240
CERES Solar Zenith at Surface	13091x660	float32	0.0 .. 180.0	deg	34,560,240
CERES Relative Azimuth at Surface	13091x660	float32	0.0 .. 360.0	deg	34,560,240
Colatitude of CERES FOV at Surface	13091x660	float32	0.0 .. 180.0	deg	34,560,240
Longitude of CERES FOV at Surface	13091x660	float32	0.0 .. 360.0	deg	34,560,240

Table 2.1-3. BDS SDS Summary

SDS Name	Maximum SDS Elements	Data Type	Range	Units	Maximum Size (Bytes)
Cone Angles	13091x660	float32	0.0 .. 90.0	deg	34,560,240
Clock Angles	13091x660	float32	0.0 .. 360.0	deg	34,560,240
Cone Angle Rates	13091x660	float32	-100.0 .. 100.0	deg sec ⁻¹	34,560,240
Clock Angle Rates	13091x660	float32	-10.0 .. 10.0	deg sec ⁻¹	34,560,240
Colatitude of CERES FOV at TOA	13091x660	float32	0.0 .. 180.0	deg	34,560,240
Longitude of CERES FOV at TOA	13091x660	float32	0.0 .. 360.0	deg	34,560,240
CERES Viewing Zenith at TOA - Geocentric	13091x660	float32	0.0 .. 90.0	deg	34,560,240
CERES Solar Zenith at TOA - Geocentric	13091x660	float32	0.0 .. 180.0	deg	34,560,240
CERES Relative Azimuth at TOA - Geocentric	13091x660	float32	0.0 .. 360.0	deg	34,560,240
Sample Aligned Analog Data	13091x660	uint16	0 .. 4095	count	17,280,120
Drift Corrected SW Counts	13091x660	float32	0.0 .. 4095.0	count	34,560,240
Drift Corrected WN Counts	13091x660	float32	0.0 .. 4095.0	count	34,560,240
Drift Corrected TOT Counts	13091x660	float32	0.0 .. 4095.0	count	34,560,240
Shortwave Detector Output	13091x660	uint16	0 .. 4095	count	17,280,120
Window Detector Output	13091x660	uint16	0 .. 4095	count	17,280,120
Total Detector Output	13091x660	uint16	0 .. 4095	count	17,280,120
CERES SW Filtered Radiance Upwards	13091x660	float32	-10.0 .. 510.0	W m ⁻² sr ⁻¹	34,560,240
CERES WN Filtered Radiance Upwards	13091x660	float32	0.0 .. 50.0	W m ⁻² sr ⁻¹	34,560,240
CERES TOT Filtered Radiance Upwards	13091x660	float32	0.0 .. 700.0	W m ⁻² sr ⁻¹	34,560,240
Count Conversion SW Sample Offsets	4x660	float32	N/A	count	10,560
Count Conversion WN Sample Offsets	4x660	float32	N/A	count	10,560
Count Conversion TOT Sample Offsets	4x660	float32	N/A	count	10,560
SW Spaceclamp Values	13091x2	float32	N/A	count	104,728
WN Spaceclamp Values	13091x2	float32	N/A	count	104,728
TOT Spaceclamp Values	13091x2	float32	N/A	count	104,728
Solar Elevation Angles ²	13091x660	float32	0.0 .. 360.0	deg	34,560,240
Solar Azimuth Angles ²	13091x660	float32	0.0 .. 360.0	deg	34,560,240
Lunar Elevation Angles ²	13091x660	float32	0.0 .. 360.0	deg	34,560,240
Lunar Azimuth Angles ²	13091x660	float32	0.0 .. 360.0	deg	34,560,240
SW Slow Mode and Drift Corrected Counts ¹	13091x660	float32	0.0 .. 4095.0	count	34,560,240

Table 2.1-3. BDS SDS Summary

SDS Name	Maximum SDS Elements	Data Type	Range	Units	Maximum Size (Bytes)
WN Slow Mode and Drift Corrected Counts ¹	13091x660	float32	0.0 .. 4095.0	count	34,560,240
TOT Slow Mode and Drift Corrected Counts ¹	13091x660	float32	0.0 .. 4095.0	count	34,560,240
SDS Total Size (Bytes)					1,249,567,630
SDS Total Size (MBytes, plus a small HDF overhead percentage)					1194.06

¹ These SDSs are available on Aqua and Terra Edition1 BDSs beginning with CC-Code 027025 and Aqua and Terra Edition2 BDSs beginning with CC-Code 028028. These SDSs are also available on TRMM, Terra and Aqua Edition1-CV and Terra and Aqua Edition2 BDSs beginning with CC-Code 031033 and TRMM, Aqua and Terra Edition3 BDSs.

² These SDSs are available on TRMM, Aqua and Terra Edition1-CV BDSs and Terra and Aqua Edition2 BDSs beginning with CC-Code 031033 and TRMM, Aqua and Terra Edition3 BDSs.

BDS Vdata

The BDS contains eight Vdatas which are collections of records containing one or more fields. Each of the eight Vdatas contains *n* (1..10391) records of packet level data, and there is a one-to-one correspondence of the Vdatas record numbers to the BDS SDSs row numbers. [Table 2.1-4](#) summarizes each of the BDS Vdatas. Reference [3](#) provides detailed descriptions of the parameters.

Table 2.1-4. BDS Vdata Summary

Vdata Name	Number of Fields	Maximum Records	Number Bytes per Record	Maximum Size (Bytes)
Satellite-Celestial Data	18	13091	160	2,094,560
Converted Instrument Status Data	25	13091	88	1,152,008
Position Counts	12	13091	528	6,912,048
Temperature Counts	39	13091	450	5,890,950
Voltage and Torque Counts	24	13091	180	2,356,380
Converted Temperatures	35	13091	708	9,268,428
Converted Voltages and Torques	23	13091	348	4,555,668
Count Conversion Constants	9	1	120	120
Vdata Total Size (Bytes)				32,230,162
Vdata Total Size (MBytes, plus a small HDF overhead percentage)				30.80

BDS Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

BDS Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. 	All
1/16/04	R4V1	497	<ul style="list-style-type: none"> • Updated to add newly added SDSs. Also reordered the tables to match the order on the BDS. • Updated format to comply with standards. 	All
11/18/05	R4V2	599	<ul style="list-style-type: none"> • Updated to add newly added SDSs containing Solar and Lunar Azimuth and Elevation Angles along with updated Satellite-Celestial Vdata to add Solar and Lunar Beta and Eta Angles, Earth-Moon Distance, Colatitude of Moon at start of record and Longitude of Moon at start of record, per Reqt.# 1-5. • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) 	All All Sec. 2.1

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

The ERBE-like Instantaneous TOA Estimates (ES-8) product contains 24 hours of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-8 contains filtered radiances recorded every 0.01-second for the total (TOT), shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW and LW radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes with a scene identification algorithm and Angular Distribution Models (ADMs) which are "like" those used for the Earth Radiation Budget Experiment (ERBE). The TOA fluxes, scene identification, and angular geometry are included on the ES-8. Complete listings of metadata and science parameters are listed in [Tables 2.2-1 through 2.2-4](#).

A detailed listing of the data parameters for this product can be found in the ES-8 Collection Guide: http://asd-www.larc.nasa.gov/ceres/collect_guide/list.html (Reference 3).

Level: 2

Frequency: 1/Day

Portion of Atmosphere Covered: Satellite Altitude and TOA

Time Interval Covered:

File: 24 Hours

Record: 6.6-Seconds

Portion of Globe Covered:

File: Satellite Swath

Record: N/A

Product Version:

TRMM: Transient-Ops2, Edition2 ++ see NOTE

Terra: Edition1 ++ see NOTE, Edition2

Aqua: Edition1, Edition2

NOTE: The Spectral Response Functions Vdata is only available on ES-8 products with a configuration code greater than 021018.

ES-8 Metadata

Table 2.2-1 gives an overview of the ES-8 product. The metadata structures contain information which need only be recorded once per daily product. The CERES Baseline Header Metadata and the CERES_metadata Vdata are listed in Appendix B. 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 2.2-2.

Table 2.2-1. ES-8 Product Summary

HDF Name	Description	Number of Parameters	Nominal Size (MB)
CERES Baseline Header Metadata	See Table B-1	36	
CERES_metadata Vdata	See Table B-2	14	
ES-8 Product Specific Metadata	See Table 2.2-2	1	
ES-8 Vdata Summary	See Table 2.2-3	21	1.117
ES-8 SDS Summary	See Table 2.2-4	20	467.108
ES-8 Data Size (MB/Day)			468.225
ES-8 Meta Data Size (MB/Day)			0.880
ES-8 Total Product Size (MB/Day)			469.105
ES-8 Total Product Size with HDF Data Compression			293.5^a

a. GZIP Compression, Level 1

Table 2.2-2. ES-8 Product Specific Metadata

Item	Parameter Name	Records	Units	Range	Data Type
1	ES8_ProductionDate	1	N/A	N/A	ASCII string
2	NumOfCrosstrackRecords	1	N/A	0 .. 13092	Integer
3	NumOfRAPSRecords	1	N/A	0 .. 13092	Integer
4	NumOfAlongtrackRecords	1	N/A	0 .. 13092	Integer
5	NumOfTransitionalRecords	1	N/A	0 .. 13092	Integer
6	Software_SCCR_Number	1	N/A	N/A	ASCII string
7	Data_SCCR_Number	1	N/A	N/A	ASCII string

ES-8 Vdata Structures

The ES-8 contains 20 record-level parameters and one product-level parameter written by HDF-EOS as HDF Vdata structures. The record-level structures may be thought of as one-dimensional arrays dimensioned according to the number of 6.6-second records contained in the data-day; the maximum number of these records is 13,092 (since the time length of a record may vary, the maximum number of records on the ES-8 can be 13,092). The product-level parameter, Spectral Response Functions, structure contains six arrays, two arrays each for the shortwave, total, and window channels.

The parameters detailed in [Table 2.2-3](#) are:

- a) Time of Observation (Julian date and time)
- b) Earth-Sun distance
- c) Satellite position and velocity
- d) Satellite nadir position
- e) Sun position
- f) Spectral Response Functions

Table 2.2-3. ES-8 Vdata Summary

Parameter Name (Vdata Name)	Units	Range	Maximum Number of Vdata Elements	Data Type	Maximum Vdata Size (KB)
Time of Observation	day	2440000 .. 2480000	13092	64 bit real	102.27
Earth-Sun distance at record start	AU	0.98 .. 1.02	13092	64 bit real	102.27
X component of satellite position at record start	m	-8x10 ⁶ .. 8x10 ⁶	13092	32 bit real	51.14
X component of satellite position at record end	m	-8x10 ⁶ .. 8x10 ⁶	13092	32 bit real	51.14
Y component of satellite position at record start	m	-8x10 ⁶ .. 8x10 ⁶	13092	32 bit real	51.14
Y component of satellite position at record end	m	-8x10 ⁶ .. 8x10 ⁶	13092	32 bit real	51.14
Z component of satellite position at record start	m	-8x10 ⁶ .. 8x10 ⁶	13092	32 bit real	51.14
Z component of satellite position at record end	m	-8x10 ⁶ .. 8x10 ⁶	13092	32 bit real	51.14
X component of satellite velocity at record start	m sec ⁻¹	-1x10 ⁴ .. 1x10 ⁴	13092	32 bit real	51.14
X component of satellite velocity at record end	m sec ⁻¹	-1x10 ⁴ .. 1x10 ⁴	13092	32 bit real	51.14
Y component of satellite velocity at record start	m sec ⁻¹	-1x10 ⁴ .. 1x10 ⁴	13092	32 bit real	51.14
Y component of satellite velocity at record end	m sec ⁻¹	-1x10 ⁴ .. 1x10 ⁴	13092	32 bit real	51.14
Z component of satellite velocity at record start	m sec ⁻¹	-1x10 ⁴ .. 1x10 ⁴	13092	32 bit real	51.14
Z component of satellite velocity at record end	m sec ⁻¹	-1x10 ⁴ .. 1x10 ⁴	13092	32 bit real	51.14
Colatitude of satellite nadir at record start	deg	0 .. 180	13092	32 bit real	51.14
Colatitude of satellite nadir at record end	deg	0 .. 180	13092	32 bit real	51.14
Longitude of satellite nadir at record start	deg	0 .. 360	13092	32 bit real	51.14
Longitude of satellite nadir at record end	deg	0 .. 360	13092	32 bit real	51.14
Colatitude of Sun at observation	deg	0 .. 180	13092	32 bit real	51.14
Longitude of Sun at observation	deg	0 .. 360	13092	32 bit real	51.14
Spectral Response Functions: ^a					
SW channel wavelengths	μm	0 .. 200	632	32 bit real	0.002
SW spectral response values	N/A	-1 .. 1	632	32 bit real	0.002
TOT channel wavelengths	μm	0 .. 200	1051	32 bit real	0.004
TOT spectral response values	N/A	-1 .. 1	1051	32 bit real	0.004
WN channel wavelengths	μm	0 .. 200	871	32 bit real	0.003
WN spectral response values	N/A	-1 .. 1	871	32 bit real	0.003

Table 2.2-3. ES-8 Vdata Summary

Parameter Name (Vdata Name)	Units	Range	Maximum Number of Vdata Elements	Data Type	Maximum Vdata Size (KB)
Total Vdata Size (KB)					1125.08
Total Vdata Size (MB)					1.117

- a. NOTE: The Spectral Response Functions Vdata is only available on ES-8 products with a configuration code greater than 021018.

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 number of 6.6-second data records contained in the data-day; the maximum is 13,092 (since the time length of a record may vary, the maximum number of records on the ES-8 can be 13,092). For the measurement-level data, other than flag words, the second dimension corresponds to the number of measurements or footprints contained on a 6.6-second data record (660). There are 22 measurement-level, 32-bit flag words that contain a flag value in each of the right-most 30 bits (22 words x 30 bits/word = 660 bits). For these measurement-level flag words, the second dimension is 22. [Table 2.2-4](#) summarizes the content and size of each SDS contained within the ES-8 file.

The SDSs detailed in [Table 2.2-4](#) are:

- 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
- g) Flag words

Table 2.2-4. ES-8 SDS Summary

Parameter Name (SDS Name)	Units	Range	Maximum Number of SDS Elements	Data Type	Maximum SDS Size (KB)
Colatitude of CERES FOV at TOA	deg	0 .. 180	13092x660	32 bit real	33752.81
Longitude of CERES FOV at TOA	deg	0 .. 360	13092x660	32 bit real	33752.81
CERES TOT filtered radiance	W m ⁻² sr ⁻¹	-2 .. 700	13092x660	32 bit real	33752.81
CERES SW filtered radiance	W m ⁻² sr ⁻¹	-4 .. 510	13092x660	32 bit real	33752.81

Table 2.2-4. ES-8 SDS Summary

Parameter Name (SDS Name)	Units	Range	Maximum Number of SDS Elements	Data Type	Maximum SDS Size (KB)
CERES WN filtered radiance	$W m^{-2} sr^{-1} \mu m^{-1}$	-1 .. 15	13092x660	32 bit real	33752.81
CERES viewing zenith at TOA	deg	0 .. 90	13092x660	32 bit real	33752.81
CERES solar zenith at TOA	deg	0 .. 180	13092x660	32 bit real	33752.81
CERES relative azimuth at TOA	deg	0 .. 360	13092x660	32 bit real	33752.81
CERES SW unfiltered radiance	$W m^{-2} sr^{-1}$	-10 .. 510	13092x660	32 bit real	33752.81
CERES LW unfiltered radiance	$W m^{-2} sr^{-1}$	0 .. 200	13092x660	32 bit real	33752.81
CERES WN unfiltered radiance	$W m^{-2} sr^{-1} \mu m^{-1}$	0 .. 15	13092x660	32 bit real	33752.81
CERES SW flux at TOA	$W m^{-2}$	0 .. 1400	13092x660	32 bit real	33752.81
CERES LW flux at TOA	$W m^{-2}$	50 .. 450	13092x660	32 bit real	33752.81
ERBE scene identification at observation	N/A	0 .. 12.4	13092x660	32 bit real	33752.81
TOT channel flag words	N/A	N/A	13092x22	32 bit integer	1125.09
SW channel flag words	N/A	N/A	13092x22	32 bit integer	1125.09
WN channel flag words	N/A	N/A	13092x22	32 bit integer	1125.09
Scanner FOV flag words	N/A	N/A	13092x22	32 bit integer	1125.09
Rapid retrace flag words	N/A	N/A	13092x22	32 bit integer	1125.09
Scanner operations flag word	N/A	N/A	13092x3	32 bit integer	153.42
Total SDS Size (KB)					478318.21
Total SDS Size (MB)					467.108

Maximum Data Bits*: 3927600000
Maximum Data Size (MB)*: 468.2

* Note: Maximum sizes are based on 13,092 total 6.6-sec data records.

ES-8 Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

ES-8 Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated document to reflect new formats and to comply with standards. 	All
04/26/02	R3V2	341	<ul style="list-style-type: none"> • Updated LW Flux range from [0 .. 500] to [50 .. 450]. • Added the ES-8 Spectral Response Functions Vdata Summary table. • Moved Vdata parameter list from front page to ES-8 Vdata Structures section. • Moved SDS data listing from front page to ES-8 Scientific Data Sets section. • Updated format to comply with standards. 	Table 2.2-4 Table 2.2-3 Vdata SDS All
02/23/04	R4V1	503	<ul style="list-style-type: none"> • Updated product versions for Aqua Edition1 to include Edition2. • Supplied footnote for availability of Spectral Response Functions Vdata. • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) 	Section 2.2 Table 2.2-3 All Sec. 2.2

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

The ERBE-like Monthly Regional Averages (ES-9) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-9 is also produced for combinations of scanner instruments. All instantaneous shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-8 product for a month are sorted by 2.5-degree spatial regions, by day number, and by the local hour of observation. The mean of the instantaneous fluxes for a given region-day-hour bin is determined and recorded on the ES-9 along with other flux statistics and scene information. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is "like" the algorithm used for the Earth Radiation Budget Experiment (ERBE). The ES-9 also contains hourly average fluxes for the month and an overall monthly average for each region. These average fluxes are given for both clear-sky and total-sky scenes.

The ES-9 archival data product is created as an HDF file with six Vgroups and contains data for each 2.5-degree region observed during a month. There are 10,368 regions in the ERBE-Like data; therefore, there is a maximum of 10,368 records in the ES-9 data set. A summary of the contents of this data product can be found in [Table 2.3-1](#). The ES-9 product size shown in this table assumes that all 2.5-degree regions and all hourboxes contain data. Since the hourboxes are sparsely populated, sizing estimates per platform are 95 MB (TRMM), 260 MB (Terra), and 260 MB (Aqua). The sizing estimate for the ES-9 in the "Archival Products Summary" table is for Aqua. A more detailed listing of the data parameters for this product can be found in the ES-9 Collection Guide: http://asd-www.larc.nasa.gov/ceres/collect_guide/list.html (Reference 3).

Level: 3

Frequency: 1/Month

Portion of Atmosphere Covered: TOA

Time Interval Covered:

File: 1 Month

Record: Hourbox Data

Portion of Global Covered:

File: Global

Record: Regional

Product Version:

TRMM: Edition1, Edition2

Terra: Edition1, Edition2

Aqua: Edition1, Edition2

ES-9 Metadata

The content of the ES-9 is summarized in [Table 2.3-1](#). The metadata structures contain information which need only be recorded once per monthly product. The CERES Metadata are listed in [Appendix B](#). The ES-9 Product-specific Metadata are shown in [Table 2.3-2](#).

Table 2.3-1. 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 2.3-2	1	1	
ES-9 Vgroup Summary	See Table 2.3-3	1	6	1099.115
ES-9 TOTAL SIZE (MB/Month)				1099.115

Table 2.3-2. 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 1- or 2-dimensional arrays of spatially ordered records that are organized by Vgroups. An overview of each of these Vgroups is given in [Table 2.3-3](#). Detailed definitions of each parameter on the ES-9 may be found in the ES-9 Collection Guide (Reference 3).

Table 2.3-3. ES-9 Vgroup Summary

Vgroup Number	Vgroup Name	Description	Number of Records	Maximum SDS Size (MB)
1	Regional Summary Data	See Table 2.3-4	$10368^a \times 10^a$	0.396
2	Monthly (Day) Averages	See Table 2.3-5	$10368^a \times 28^b$	1.107
3	Monthly (Hour) Averages	See Table 2.3-5	$10368^a \times 28^b$	1.107
4	Daily Averages	See Table 2.3-5	$10368^a \times 31 \times 28^b$	34.330
5	Monthly Hourly Averages	See Table 2.3-5	$10368^a \times 24 \times 34^b$	32.273
6	Hourbox Data	See Table 2.3-5	$(10368 \times 744)^c \times 34^b$	1029.902
Total SDS size (MB)				1,099.115

- The first dimension of the SDS will equal the number of 2.5-degree regions contained on the ES-9.
- This dimension represents the number of SDS parameters contained in the Vgroup.
- The 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 "Number of hourboxes" from the Regional Summary Data Vgroup. 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 $10,368 \times 744 = 7,713,792$.

Table 2.3-4 lists the SDSs contained in the Regional Summary Data Vgroup.

Table 2.3-4. Regional Summary Data

Parameter Name
See Table 5-4 in ES-9 Collection Guide
Region number
Longitude
Colatitude
Geographic scene type
Scene fraction histogram (1)
Scene fraction histogram (2)
Scene fraction histogram (3)
Scene fraction histogram (4)
Number of hourboxes
Start position of hourbox data

Table 2.3-5 lists the SDSs contained in the Temporal Vgroups for each 2.5-deg region

Table 2.3-5. Temporal Vgroups for 2.5-deg Regions

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-9 Collection Guide	5-5	5-6	5-7	5-8	5-9	5-10	5-11	5-12
Region number	X	X	X	X	X	X	X	X
Solar constant, distance corrected					X	X		
Solar incidence	X	X	X	X	X	X	X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Longwave flux minimum value	X	X	X	X	X	X	X	X
Longwave flux maximum value	X	X	X	X	X	X	X	X
Longwave flux standard deviation	X	X	X	X	X	X	X	X
Number of hours of longwave flux			X	X	X	X		
Number of days of longwave flux	X	X					X	X
Longwave sum of estimates							X	X
Longwave sum of estimates squared							X	X
Shortwave flux	X	X	X	X	X	X	X	X
Shortwave flux minimum value	X	X	X	X	X	X	X	X

Table 2.3-5. Temporal Vgroups for 2.5-deg Regions

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Shortwave flux maximum value	X	X	X	X	X	X	X	X
Shortwave flux standard deviation	X	X	X	X	X	X	X	X
Number of hours of shortwave flux			X	X	X	X		
Number of days of shortwave flux	X	X					X	X
Shortwave sum of estimates							X	X
Shortwave sum of estimates squared							X	X
Albedo	X	X	X	X	X	X	X	X

Table 2.3-6 lists the SDSs contained in the Hourbox Data Vgroup.

Table 2.3-6. Hourbox Data

Parameter Name	Parameter Name
See Table 5-13 in ES-9 Collection Guide	
Region number	Longwave flux minimum value
Number of hourboxes	Longwave flux maximum value
Hourbox number	Longwave flux standard deviation
Time of observation	Number of longwave flux estimates
Scene fraction (1)	Longwave flux maximum difference
Scene fraction (2)	Shortwave flux
Scene fraction (3)	Shortwave flux minimum value
Scene fraction (4)	Shortwave flux maximum value
Albedo factor (1)	Shortwave flux standard deviation
Albedo factor (2)	Number of shortwave flux estimates
Albedo factor (3)	Shortwave flux maximum difference
Albedo factor (4)	Clear-sky longwave flux
Cosine of the solar zenith angle	Clear-sky longwave flux standard deviation
Satellite zenith angle	Number of clear-sky longwave flux estimates
Azimuth angle	Clear-sky albedo standard deviation
Solar incidence	Longitude
Longwave flux	Colatitude

ES-9 Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

ES-9 Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> Updated format to comply with standards. 	All
2/23/04	R4V1	503	<ul style="list-style-type: none"> Updated product versions for Aqua Edition1 to include Edition2. Updated format to comply with standards. The EOSDIS Product Code line was removed from the document. (6/17/2008) 	All All Sec. 2.3

2.4 ERBE-like Monthly Regional Averages (ES-4)

The ERBE-like Monthly Geographical Averages (ES-4) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The ES-4 is also produced for combinations of scanner instruments. For each observed 2.5-degree spatial region, the daily average, the hourly average over the month, and the overall monthly average of shortwave and longwave fluxes at the Top-of-the-Atmosphere (TOA) from the CERES ES-9 product are spatially nested up from 2.5-degree regions to 5- and 10-degree regions, to 2.5-, 5-, and 10-degree zonal averages, and to global monthly averages. For each nested area, the albedo and net flux are given. For each region, the daily average flux is estimated from an algorithm that uses the available hourly data, scene identification data, and diurnal models. This algorithm is "like" the algorithm used for the Earth Radiation Budget Experiment (ERBE).

The ES-4 archival data product is created as an HDF file which contains nine HDF Vgroups corresponding to regional, nested regional, zonal, and global averages (see [Table 2.4-3](#)). 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-degree regional data, which constitutes a maximum of 2,592 records. The third set of data is the 5-degree nested to 10-degree regional data, which constitutes up to 648 records. The fourth, fifth, and sixth sets of data are the 2.5-, 5-, and 10-degree zonally averaged data which constitute 72, 36, and 18 records, respectively. The seventh, eighth, and ninth sets of data are the 2.5-, 5-, and 10-degree globally averaged data which constitutes 1 record each. A summary of the contents of this data product can be found in [Table 2.4-1](#).

A more detailed listing of the data parameters for this product can be found in the ES-4 Collection Guide: http://asd-www.larc.nasa.gov/ceres/collect_guide/list.html (Reference 3).

Level: 3

Frequency: 1/Month

Portion of Atmosphere Covered: TOA

Time Interval Covered:

File: Month

Record: Month

Portion of Globe Covered:

File: Global

Record: Regional, Zonal, Global

Product Version:

TRMM: Edition1, Edition2

Terra: Edition1, Edition2

Aqua: Edition1, Edition2

ES-4 Metadata

The content of the ES-4 product is summarized in [Table 2.4-1](#). The metadata structures contain information which need only be recorded once per monthly product. The CERES Baseline Header Metadata and the CERES_metadata Vdata are listed in [Appendix B](#). The ES-4 Product-specific Metadata are shown in [Table 2.4-2](#).

Table 2.4-1. 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 2.4-2	1	
ES-4 Vgroup Summary	See Table 2.4-3	9	25.482
ES-4 Data Size (MB/Month)			25.5
ES-4 Metadata Size (MB/Month)			1.5
ES-4 TOTAL SIZE (MB/Month)			27.0

Table 2.4-2. ES-4 Product Specific Metadata

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

Table 2.4-3. ES-4 Vgroup Summary

Vgroup Number	Vgroup Name	Description	Number of Records	Total Size (MB)
1	2.5 Degree Regional	See Table 2.4-4	10368 (72 x 144)	19.232
2	5.0 Degree Nested Regional	See Table 2.4-5	2592 (36 x 72)	4.808
3	10.0 Degree Nested Regional	See Table 2.4-6	648 (18 x 36)	1.202
4	2.5 Degree Zonal	See Table 2.4-7	72	0.134
5	5.0 Degree Zonal	See Table 2.4-8	36	.067
6	10.0 Degree Zonal	See Table 2.4-9	18	.033
7	2.5 Degree Global	See Table 2.4-10	1	.002
8	5.0 Degree Global	See Table 2.4-11	1	.002
9	10.0 Degree Global	See Table 2.4-12	1	.002
Total Product Size (MB)				25.482

ES-4 Scientific Data Sets

The ES-4 contains science parameters written as HDF Scientific Data Sets (SDSs) which are 2- or 3-dimensional arrays of time ordered records. The ES-4 Collection Guide (Reference 3) gives a detailed description of the parameters contained on the ES-4 product.

Table 2.4-4 lists the SDSs contained in the 2.5-degree Regional Vgroup.

Table 2.4-4. 2.5 Degree Regional

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-5 lists the SDSs contained in the 5.0 Degree Nested Regional Vgroup.

Table 2.4-5. 5.0 Degree Nested Regional

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-12	5-13	5-14	5-15	5-16	5-17	5-18	5-19
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X

Table 2.4-5. 5.0 Degree Nested Regional

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-6 lists the SDSs contained in the 10.0 Degree Nested Regional Vgroup.

Table 2.4-6. 10.0 Degree Nested Regional

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-20	5-21	5-22	5-23	5-24	5-25	5-26	5-27
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-7 lists the SDSs contained in the 2.5-Degree Zonal Vgroup.

Table 2.4-7. 2.5-Degree Zonal

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-28	5-29	5-30	5-31	5-32	5-33	5-34	5-35
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-8 lists the SDSs contained in the 5.0-Degree Zonal Vgroup.

Table 2.4-8. 5.0-Degree Zonal

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-36	5-37	5-38	5-39	5-40	5-41	5-42	5-43
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X

Table 2.4-8. 5.0-Degree Zonal

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-9 lists the SDSs contained in the 10.0-Degree Zonal Vgroup.

Table 2.4-9. 10.0-Degree Zonal

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-44	5-45	5-46	5-47	5-48	5-49	5-50	5-51
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-10 lists the SDSs contained in the 2.5-Degree Global Vgroup.

Table 2.4-10. 2.5-Degree Global

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-52	5-53	5-54	5-55	5-56	5-57	5-58	5-59
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-11 lists the SDSs contained in the 5.0-Degree Global Vgroup.

Table 2.4-11. 5.0-Degree Global

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-60	5-61	5-62	5-63	5-64	5-65	5-66	5-67
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X

Table 2.4-11. 5.0-Degree Global

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

Table 2.4-12 lists the SDSs contained in the 10.0-Degree Global Vgroup.

Table 2.4-12. 10.0-Degree Global

Parameter Name	Temporal Vgroups							
	Monthly (Day) Averages		Monthly (Hour) Averages		Daily Averages		Monthly Hourly Averages	
Sky (Cloud Cover) Vgroup	Total	Clear	Total	Clear	Total	Clear	Total	Clear
Table in ES-4 Collection Guide	5-68	5-69	5-70	5-71	5-72	5-73	5-74	5-75
Solar incidence	X	X	X	X	X		X	X
Net radiant flux	X	X	X	X				
Longwave flux	X	X	X	X	X	X	X	X
Number of days of longwave flux							X	X
Number of hours of longwave flux					X	X		
Shortwave flux	X	X	X	X	X	X	X	X
Number of days of shortwave flux							X	X
Number of hours of shortwave flux					X	X		
Albedo	X	X	X	X	X	X	X	X
Geographic scene type	X	X	X	X	X	X	X	X
Longitude	X	X	X	X	X	X	X	X
Colatitude	X	X	X	X	X	X	X	X

ES-4 Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

ES-4 Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. 	All
2/23/04	R4V1	503	<ul style="list-style-type: none"> • Updated product versions for Aqua Edition1 to include Edition2. • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) 	All All Sec. 2.4

2.5 Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF)

The Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The SSF combines instantaneous CERES data with scene information from a higher-resolution imager such as Visible/Infrared Scanner (VIRS) on TRMM or Moderate-Resolution Imaging Spectroradiometer (MODIS) on Terra and Aqua. Scene identification and cloud properties are defined at the higher imager resolution and these data are averaged over the larger CERES footprint. For each CERES footprint, the SSF contains the number of cloud layers and for each layer the cloud amount, height, temperature, pressure, optical depth, emissivity, ice and liquid water path, and water particle size. The SSF also contains the CERES filtered radiances for the total, shortwave (SW), and window (WN) channels and the unfiltered SW, longwave (LW), and WN radiances. The SW, LW, and WN radiances at spacecraft altitude are converted to Top-of-the-Atmosphere (TOA) fluxes based on the imager defined scene. These TOA fluxes are used to estimate surface fluxes.

Only footprints with imager coverage are included on the SSF which is much less than the full set of footprints on the CERES ES-8 product. The number of possible footprints on an SSF depends on the elevation scan mode, azimuth scan mode, and height of the satellite. Since elevation and azimuth 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 2.5-2](#). A smaller number of footprints is used in SSF sizing estimates, namely the estimated maximum number of TRMM full Earth-view footprints per hour given a normal elevation scan and an along-track azimuth scan. Accounting for the need for imager coverage, the actual number of footprints is expected to be even smaller. This reduction of footprints due to lack of imager coverage is very evident when CERES is operating in a cross-track azimuth scan mode. A complete listing of parameters for this data product can be found in [Tables 2.5-3](#) to [Table 2.5-15](#).

A more detailed listing of the data parameters for this product can be found in the SSF Collection Guide: http://asd-www.larc.nasa.gov/ceres/collect_guide/list.html (Reference 3).

Level: 2

Frequency: 1/Hour

Portion of Atmosphere Covered: Surface to TOA

Time Interval Covered:

File: 1 Hour

Record: 1/100-Second

Portion of Globe Covered:

File: Satellite Swath

Record: 1 CERES Footprint

Product Version:

TRMM: Edition2B

Terra: Edition2B, Edition2F

Aqua: Edition1A, Edition1B, Ed2A-NoSW, Edition2A, Ed2B-NoSW, Edition2B,
Ed2C-NoSW, Edition2C, Ed2C-MOD-C4-Land-IGBP

SSF Metadata

SSF metadata includes the CERES Baseline Header Metadata and CERES_metadata Vdata, which are listed in [Appendix B](#). The SSF product-specific metadata parameters are listed in [Table 2.5-1](#) and the SSF_Header parameters are listed in [Table 2.5-2](#). For TRMM SSF products, the SSF ID (SSF-H1) will be set to 117 and will contain 131 SDS parameters (SSF-1 through SSF-131). For Terra and Aqua SSF products, the SSF ID will be set to 1117 and these products will contain an additional 29 MODIS aerosol SDS parameters (SSF-132 through SSF-160).

Table 2.5-1. SSF 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

Table 2.5-2. SSF_Header

Item	Description	Units	Range	Elements	Bytes/ Elem
SSF-H1	SSF ID	N/A	117 or 1117	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	Beta angle	deg	-90 .. 90	1	4
SSF-H10	Colatitude of subsatellite point at surface at hour start	deg	0 .. 180	1	4
SSF-H11	Longitude of subsatellite point at surface at hour start	deg	0 .. 360	1	4
SSF-H12	Colatitude of subsatellite point at surface at hour end	deg	0 .. 180	1	4
SSF-H13	Longitude of subsatellite point at surface at hour end	deg	0 .. 360	1	4
SSF-H14	Along-track angle of satellite at hour end	deg	0 .. 330	1	4
SSF-H15	Number of footprints in SSF product	N/A	0 .. 360000	1	4
SSF-H16	Subsystem 4.1 identification string	N/A	ASCII string	1	128
SSF-H17	Subsystem 4.2 identification string	N/A	ASCII string	1	128
SSF-H18	Subsystem 4.3 identification string	N/A	ASCII string	1	128
SSF-H19	Subsystem 4.4 identification string	N/A	ASCII string	1	128

Table 2.5-2. SSF_Header

Item	Description	Units	Range	Elements	Bytes/ Elem
SSF-H20	Subsystem 4.5 identification string	N/A	ASCII string	1	128
SSF-H21	Subsystem 4.6 identification string	N/A	ASCII string	1	128
SSF-H22	IES production date and time	N/A	ASCII string	1	24
SSF-H23	MOA production date and time	N/A	ASCII string	1	24
SSF-H24	SSF production date and time	N/A	ASCII string	1	24

SSF Scientific Data Sets

The SSF contains 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. The SDSs are divided into tables which map to Vgroups of the same name. [Table 2.5-3](#) to [Table 2.5-15](#) summarize the contents of each Vgroup and SDS contained within the SSF file. The MODIS land and ocean aerosol data (SDS parameters, SSF-132 through SSF-160) described in [Table 2.5-14](#) and [Table 2.5-15](#) are available only on Terra and Aqua SSF products.

(Note: the dimension n in the following tables is the number of footprints processed: Assuming n = 245475 for sizing)

Table 2.5-3. Time and Position

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-1	Time of observation	day	2440000 .. 2480000	n	64-bit real	1.87
SSF-2	Radius of satellite from center of Earth at observation	km	6000 .. 8000	n	64-bit real	1.87
SSF-3	X component of satellite inertial velocity	km sec ⁻¹	-10 .. 10	n	64-bit real	1.87
SSF-4	Y component of satellite inertial velocity	km sec ⁻¹	-10 .. 10	n	64-bit real	1.87
SSF-5	Z component of satellite inertial velocity	km sec ⁻¹	-10 .. 10	n	64-bit real	1.87
SSF-6	Colatitude of subsatellite point at surface at observation	deg	0 .. 180	n	32-bit real	0.94
SSF-7	Longitude of subsatellite point at surface at observation	deg	0 .. 360	n	32-bit real	0.94
SSF-8	Colatitude of subsolar point at surface at observation	deg	0 .. 180	n	32-bit real	0.94

Table 2.5-3. Time and Position

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-9	Longitude of subsolar point at surface at observation	deg	0 .. 360	n	32-bit real	0.94
SSF-10	Colatitude of CERES FOV at surface	deg	0 .. 180	n	32-bit real	0.94
SSF-11	Longitude of CERES FOV at surface	deg	0 .. 360	n	32-bit real	0.94
SSF-12	Scan sample number	N/A	1 .. 660	n	16-bit integer	0.47
SSF-13	Packet number	N/A	0 .. 13100	n	16-bit integer	0.47
SSF-14	Cone angle of CERES FOV at satellite	deg	0 .. 90	n	32-bit real	0.94
SSF-15	Clock angle of CERES FOV at satellite wrt inertial velocity	deg	0 .. 360	n	32-bit real	0.94
SSF-16	Rate of change of cone angle	deg sec ⁻¹	-300 .. 300	n	32-bit real	0.94
SSF-17	Rate of change of clock angle	deg sec ⁻¹	-20 .. 20	n	32-bit real	0.94
SSF-18	Along-track angle of CERES FOV at surface	deg	-30 .. 330	n	32-bit real	0.94
SSF-19	Cross-track angle of CERES FOV at surface	deg	-90 .. 90	n	32-bit real	0.94

Table 2.5-4. Viewing Angles

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-20	CERES viewing zenith at surface	deg	0 .. 90	n	32-bit real	0.94
SSF-21	CERES solar zenith at surface	deg	0 .. 180	n	32-bit real	0.94
SSF-22	CERES relative azimuth at surface	deg	0 .. 360	n	32-bit real	0.94
SSF-23	CERES viewing azimuth at surface wrt North	deg	0 .. 360	n	32-bit real	0.94

Table 2.5-5. Surface Map

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-24	Altitude of surface above sea level	m	-1000 .. 10000	n	32-bit real	0.94
SSF-25	Surface type index	N/A	1 .. 20	n x 8	16-bit integer	3.75
SSF-26	Surface type percent coverage	N/A	0 .. 100	n x 8	16-bit integer	3.75

Table 2.5-6. Scene Type

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-27	CERES SW ADM type for inversion process	N/A	0 .. 5000	n	16-bit integer	0.47
SSF-28	CERES LW ADM type for inversion process	N/A	0 .. 5000	n	16-bit integer	0.47
SSF-29	Cloud Classification	N/A	0 .. 32766	n	16-bit integer	0.47
SSF-30	Snow/ice percent coverage clear-sky overhead-sun vis albedo	N/A	0 .. 9999	n	16-bit integer	0.47

Table 2.5-7. Filtered Radiances

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-31	CERES TOT filtered radiance - upwards	$W m^{-2} sr^{-1}$	0 .. 700	n	32-bit real	0.94
SSF-32	CERES SW filtered radiance - upwards	$W m^{-2} sr^{-1}$	-10 .. 510	n	32-bit real	0.94
SSF-33	CERES WN filtered radiance - upwards	$W m^{-2} sr^{-1} mm^{-1}$	0 .. 15	n	32-bit real	0.94
SSF-34	Radiance and Mode flags	N/A	0 .. ($2^{31}-1$)	n	32-bit integer	0.94

Table 2.5-8. Unfiltered Radiances

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-35	CERES SW radiance - upwards	$W m^{-2} sr^{-1}$	-10 .. 510	n	32-bit real	0.94
SSF-36	CERES LW radiance - upwards	$W m^{-2} sr^{-1}$	0 .. 200	n	32-bit real	0.94
SSF-37	CERES WN radiance - upwards	$W m^{-2} sr^{-1}$	0 .. 60	n	32-bit real	0.94

Table 2.5-9. TOA and Surface Fluxes

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-38	CERES SW TOA flux - upwards	$W m^{-2}$	0 .. 1400	n	32-bit real	0.94
SSF-39	CERES LW TOA flux - upwards	$W m^{-2}$	0 .. 500	n	32-bit real	0.94
SSF-40	CERES WN TOA flux - upwards	$W m^{-2}$	0 .. 200	n	32-bit real	0.94

Table 2.5-9. TOA and Surface Fluxes

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-41	CERES downward SW surface flux - Model A	W m ⁻²	0 .. 1400	n	32-bit real	0.94
SSF-42	CERES downward LW surface flux - Model A	W m ⁻²	0 .. 700	n	32-bit real	0.94
SSF-43	CERES downward WN surface flux - Model A	W m ⁻²	0 .. 250	n	32-bit real	0.94
SSF-44	CERES net SW surface flux - Model A	W m ⁻²	0 .. 1400	n	32-bit real	0.94
SSF-45	CERES net LW surface flux - Model A	W m ⁻²	-250 .. 50	n	32-bit real	0.94
SSF-46	CERES downward SW surface flux - Model B	W m ⁻²	0 .. 1400	n	32-bit real	0.94
SSF-47	CERES downward LW surface flux - Model B	W m ⁻²	0 .. 700	n	32-bit real	0.94
SSF-48	CERES net SW surface flux - Model B	W m ⁻²	0 .. 1400	n	32-bit real	0.94
SSF-49	CERES net LW surface flux - Model B	W m ⁻²	-250 .. 50	n	32-bit real	0.94
SSF-50	CERES broadband surface albedo	N/A	0 .. 1	n	32-bit real	0.94
SSF-51	CERES LW surface emissivity	N/A	0 .. 1	n	32-bit real	0.94
SSF-52	CERES WN surface emissivity	N/A	0 .. 1	n	32-bit real	0.94

Table 2.5-10. Full Footprint Area

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-53	Number of imager pixels in CERES FOV	N/A	0 .. 32766	n	16-bit integer	0.47
SSF-54	Imager percent coverage	N/A	0 .. 100	n	16-bit integer	0.47
SSF-55	Imager viewing zenith over CERES FOV	deg	0 .. 90	n	32-bit real	0.94
SSF-56	Imager relative azimuth over CERES FOV	deg	0 .. 360	n	32-bit real	0.94
SSF-57	Surface wind - U-vector	m sec ⁻¹	-100 .. 100	n	32-bit real	0.94
SSF-58	Surface wind - V-vector	m sec ⁻¹	-100 .. 100	n	32-bit real	0.94
SSF-59	Surface skin temperature	K	175 .. 375	n	32-bit real	0.94
SSF-60	Column averaged relative humidity	N/A	0 .. 100	n	32-bit real	0.94
SSF-61	Precipitable water	cm	0.001 .. 10	n	32-bit real	0.94
SSF-62	Flag - Source of precipitable water	N/A	0 .. 120	n	16-bit integer	0.47
SSF-63	Cloud property extrapolation over cloudy area	N/A	0 .. 100	n	16-bit integer	0.47
SSF-64	Notes on general procedure	N/A	0 .. 32766	n	16-bit integer	0.47
SSF-65	Notes on cloud algorithms	N/A	0 .. 32766	n	16-bit integer	0.47

Table 2.5-11. Clear Footprint Area

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-66	Clear area percent coverage at subpixel resolution	N/A	0 .. 100	n	32-bit real	0.94
SSF-67	Cloud-mask clear-strong percent coverage	N/A	0 .. 100	n	16-bit integer	0.47
SSF-68	Cloud-mask clear-weak percent coverage	N/A	0 .. 100	n	16-bit integer	0.47
SSF-69	Cloud-mask snow/ice percent coverage	N/A	0 .. 100	n	16-bit integer	0.47
SSF-70	Cloud-mask aerosol B percent coverage	N/A	0 .. 100	n	16-bit integer	0.47
SSF-71	Flag - Type of aerosol B	N/A	0 .. 9999	n	16-bit integer	0.47
SSF-72	Cloud-mask percent coverage supplement	N/A	0 .. 32766	n	16-bit integer	0.47
SSF-73	Total aerosol A optical depth - visible	N/A	-1 .. 5	n	32-bit real	0.94
SSF-74	Total aerosol A optical depth - near IR	N/A	-1 .. 5	n	32-bit real	0.94
SSF-75	Aerosol A supplement 1	N/A	-1000 .. 1000	n	32-bit real	0.94
SSF-76	Aerosol A supplement 2	N/A	-1000 .. 1000	n	32-bit real	0.94
SSF-77	Aerosol A supplement 3	N/A	-1000 .. 1000	n	32-bit real	0.94
SSF-78	Aerosol A supplement 4	N/A	-1000 .. 1000	n	32-bit real	0.94
SSF-79	Imager-based surface skin temperature	K	175 .. 375	n	32-bit real	0.94
SSF-80	Vertical temperature change	K	-30 .. 90	n	32-bit real	0.94

Table 2.5-12. Cloudy Footprint Area

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-81	Clear/layer/overlap percent coverages	N/A	0 .. 100	n x 4	32-bit real	3.74
SSF-82	Note for cloud layer	N/A	0 .. (2 ³¹ -1)	n x 2	32-bit integer	1.87
SSF-83	Mean visible optical depth for cloud layer	N/A	0 .. 400	n x 2	32-bit real	1.87
SSF-84	Stddev of visible optical depth for cloud layer	N/A	0 .. 300	n x 2	32-bit real	1.87
SSF-85	Mean logarithm of visible optical depth for cloud layer	N/A	-6 .. 6	n x 2	32-bit real	1.87
SSF-86	Stddev of logarithm of visible optical depth for cloud layer	N/A	0 .. 6	n x 2	32-bit real	1.87

Table 2.5-12. Cloudy Footprint Area

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-87	Mean cloud infrared emissivity for cloud layer	N/A	0 .. 2	n x 2	32-bit real	1.87
SSF-88	Stddev of cloud infrared emissivity for cloud layer	N/A	0 .. 2	n x 2	32-bit real	1.87
SSF-89	Mean liquid water path for cloud layer (3.7)	g m ⁻²	0 .. 10000	n x 2	32-bit real	1.87
SSF-90	Stddev of liquid water path for cloud layer (3.7)	g m ⁻²	0 .. 8000	n x 2	32-bit real	1.87
SSF-91	Mean ice water path for cloud layer (3.7)	g m ⁻²	0 .. 10000	n x 2	32-bit real	1.87
SSF-92	Stddev of ice water path for cloud layer (3.7)	g m ⁻²	0 .. 8000	n x 2	32-bit real	1.87
SSF-93	Mean cloud top pressure for cloud layer	hPa	0 .. 1100	n x 2	32-bit real	1.87
SSF-94	Stddev of cloud top pressure for cloud layer	hPa	0 .. 600	n x 2	32-bit real	1.87
SSF-95	Mean cloud effective pressure for cloud layer	hPa	0 .. 1100	n x 2	32-bit real	1.87
SSF-96	Stddev of cloud effective pressure for cloud layer	hPa	0 .. 500	n x 2	32-bit real	1.87
SSF-97	Mean cloud effective temperature for cloud layer	K	100 .. 350	n x 2	32-bit real	1.87
SSF-98	Stddev of cloud effective temperature for cloud layer	K	0 .. 150	n x 2	32-bit real	1.87
SSF-99	Mean cloud effective height for cloud layer	km	0 .. 20	n x 2	32-bit real	1.87
SSF-100	Stddev of cloud effective height for cloud layer	km	0 .. 12	n x 2	32-bit real	1.87
SSF-101	Mean cloud base pressure for cloud layer	hPa	0 .. 1100	n x 2	32-bit real	1.87
SSF-102	Stddev of cloud base pressure for cloud layer	hPa	0 .. 600	n x 2	32-bit real	1.87
SSF-103	Mean water particle radius for cloud layer (3.7)	μm	0 .. 40	n x 2	32-bit real	1.87
SSF-104	Stddev of water particle radius for cloud layer (3.7)	μm	0 .. 20	n x 2	32-bit real	1.87
SSF-105	Mean ice particle effective diameter for cloud layer (3.7)	μm	0 .. 300	n x 2	32-bit real	1.87
SSF-106	Stddev of ice particle effective diameter for cloud layer (3.7)	μm	0 .. 200	n x 2	32-bit real	1.87

Table 2.5-12. Cloudy Footprint Area

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-107	Mean cloud particle phase for cloud layer (3.7)	N/A	1 .. 2	n x 2	32-bit real	1.87
SSF-108	Mean water particle radius for cloud layer (1.6)	μm	0 .. 40	n x 2	32-bit real	1.87
SSF-109	Mean ice particle effective diameter for cloud layer (1.6)	μm	0 .. 300	n x 2	32-bit real	1.87
SSF-110	Mean cloud particle phase for cloud layer (1.6)	N/A	1 .. 2	n x 2	32-bit real	1.87
SSF-111	Mean vertical aspect ratio for cloud layer (TBD)	N/A	0 .. 20	n x 2	32-bit real	1.87
SSF-112	Stddev of vertical aspect ratio for cloud layer (TBD)	N/A	0 .. 15	n x 2	32-bit real	1.87
SSF-113	Percentiles of visible optical depth for cloud layer	N/A	0 .. 400	n x 13 x 2	32-bit real	24.35
SSF-114	Percentiles of IR emissivity for cloud layer	N/A	0 .. 2	n x 13 x 2	32-bit real	24.35

Table 2.5-13. Footprint Imager Radiance Statistics

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-115	Imager channel central wavelength	μm	0.4 .. 15.0	n x 5	32-bit real	4.68
SSF-116	All subpixel clear area percent coverage	N/A	0 .. 100	n	32-bit real	0.94
SSF-117	All subpixel overcast cloud area percent coverage	N/A	0 .. 100	n	32-bit real	0.94
SSF-118	Mean imager radiances over clear area	W m ⁻² sr ⁻¹ μm ⁻¹	-1000 .. 1000	n x 5	32-bit real	4.68
SSF-119	Stddev of imager radiances over clear area	W m ⁻² sr ⁻¹ μm ⁻¹	0 .. 1000	n x 5	32-bit real	4.68
SSF-120	Mean imager radiances over overcast cloud area	W m ⁻² sr ⁻¹ μm ⁻¹	-1000 .. 1000	n x 5	32-bit real	4.68
SSF-121	Stddev of imager radiances over overcast cloud area	W m ⁻² sr ⁻¹ μm ⁻¹	0 .. 1000	n x 5	32-bit real	4.68
SSF-122	Mean imager radiances over full CERES FOV	W m ⁻² sr ⁻¹ μm ⁻¹	-1000 .. 1000	n x 5	32-bit real	4.68
SSF-123	Stddev of imager radiances over full CERES FOV	W m ⁻² sr ⁻¹ μm ⁻¹	0 .. 1000	n x 5	32-bit real	4.68

Table 2.5-13. Footprint Imager Radiance Statistics

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-124	5th percentile of imager radiances over full CERES FOV	$W m^{-2} sr^{-1} \mu m^{-1}$	-1000 .. 1000	n x 5	32-bit real	4.68
SSF-125	95th percentile of imager radiances over full CERES FOV	$W m^{-2} sr^{-1} \mu m^{-1}$	-1000 .. 1000	n x 5	32-bit real	4.68
SSF-126	Mean imager radiances over cloud layer 1 (no overlap)	$W m^{-2} sr^{-1} \mu m^{-1}$	-1000 .. 1000	n x 5	32-bit real	4.68
SSF-127	Stddev of imager radiances over cloud layer 1 (no overlap)	$W m^{-2} sr^{-1} \mu m^{-1}$	0 .. 1000	n x 5	32-bit real	4.68
SSF-128	Mean imager radiances over cloud layer 2 (no overlap)	$W m^{-2} sr^{-1} \mu m^{-1}$	-1000 .. 1000	n x 5	32-bit real	4.68
SSF-129	Stddev of imager radiances over cloud layer 2 (no overlap)	$W m^{-2} sr^{-1} \mu m^{-1}$	0 .. 1000	n x 5	32-bit real	4.68
SSF-130	Mean imager radiances over cloud layer 1 and 2 overlap	$W m^{-2} sr^{-1} \mu m^{-1}$	-1000 .. 1000	n x 5	32-bit real	4.68
SSF-131	Stddev of imager radiances over cloud layer 1 and 2 overlap	$W m^{-2} sr^{-1} \mu m^{-1}$	0 .. 1000	n x 5	32-bit real	4.68

The MODIS land aerosol parameters described in [Table 2.5-14](#) are only available on Terra and Aqua SSF products.

Table 2.5-14. MODIS Land Aerosols

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-132	Percentage of CERES FOV with MODIS land aerosol	N/A	0 .. 100	n	16-bit integer	0.47
SSF-133	PSF-wtd MOD04 cloud fraction land	N/A	0 .. 100	n	16-bit integer	0.47
SSF-134	PSF-wtd MOD04 aerosol types land	N/A	0 .. 9999	n	32-bit integer	0.94
SSF-135	PSF-wtd MOD04 dust weighting factor land	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-136	PSF-wtd MOD04 corrected optical depth land (0.470)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-137	PSF-wtd MOD04 corrected optical depth land (0.550)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-138	PSF-wtd MOD04 corrected optical depth land (0.659)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-139	MOD04 number pixels percentile land (0.659) in CERES FOV	N/A	0 .. (2 ³¹ -1)	n	32-bit integer	0.94
SSF-140	PSF-wtd MOD04 mean reflectance land (0.470)	N/A	0.0 .. 1.0	n	32-bit real	0.94

Table 2.5-14. MODIS Land Aerosols

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-141	PSF-wtd MOD04 mean reflectance land (0.659)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-142	PSF-wtd MOD04 mean reflectance land (0.865)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-143	PSF-wtd MOD04 mean reflectance land (2.130)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-144	PSF-wtd MOD04 mean reflectance land (3.750)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-145	PSF-wtd MOD04 std reflectance land (0.470)	N/A	0.0 .. 2.0	n	32-bit real	0.94

The MODIS ocean aerosol parameters described in [Table 2.5-15](#) are only available on Terra and Aqua SSF products.

Table 2.5-15. MODIS Ocean Aerosols

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-146	Percentage of CERES FOV with MODIS ocean aerosol	N/A	0 .. 100	n	16-bit integer	0.47
SSF-147	PSF-wtd MOD04 cloud fraction ocean	N/A	0 .. 100	n	16-bit integer	0.47
SSF-148	PSF-wtd MOD04 solution indices ocean small, average	N/A	0 .. 99999	n	32-bit integer	0.94
SSF-149	PSF-wtd MOD04 solution indices ocean large, average	N/A	0 .. 99999	n	32-bit integer	0.94
SSF-150	PSF-wtd MOD04 effective optical depth average ocean (0.470)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-151	PSF-wtd MOD04 effective optical depth average ocean (0.550)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-152	PSF-wtd MOD04 effective optical depth average ocean (0.659)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-153	PSF-wtd MOD04 effective optical depth average ocean (0.865)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-154	PSF-wtd MOD04 effective optical depth average ocean (1.240)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-155	PSF-wtd MOD04 effective optical depth average ocean (1.640)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-156	PSF-wtd MOD04 effective optical depth average ocean (2.130)	N/A	0.0 .. 5.0	n	32-bit real	0.94

Table 2.5-15. MODIS Ocean Aerosols

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-157	PSF-wtd MOD04 optical depth small average ocean (0.550)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-158	PSF-wtd MOD04 optical depth small average ocean (0.865)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-159	PSF-wtd MOD04 optical depth small average ocean (2.130)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-160	PSF-wtd MOD04 cloud condensation nuclei ocean, average	CCN cm ⁻²	0.0 .. 1*10 ¹⁰	n	32-bit real	0.94

Estimated GigaBytes / Day: 6.8

SSF Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

SSF Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> Updated document to reflect new formats and to comply with standards. 	All
6/21/02	R3V2	367	<ul style="list-style-type: none"> Changed range of SSF ID in SSF_Header. Added 2 tables for data available on Terra and Aqua products. Added explanation about differences between TRMM products and the Terra and Aqua products. Modified cover page to add information for all CERES satellites. Added Revision Record page. Updated format to comply with standards. 	SSF Metadata Tables 2.5-14 & 2.5-15 SSF Scientific Data Sets Cover page SSF Revision Record All
5/21/03	R3V3	438	<ul style="list-style-type: none"> Changed range of PSF-wtd MOD04 effective optical depths (SSF-136 to SSF-138; SSF-150 to SSF-159) from 0.0 .. 3.0 to 0.0 .. 5.0 based on changes to v003 MOD04 inputs starting with data date 01.Apr.2002. Added Beta1 data set for Aqua satellite. Updated format to comply with standards 	Tables 2.5-14 & 2.5-15 Cover page All
8/27/03	R3V4	463	<ul style="list-style-type: none"> Changed range for ADM geo (SSF-30) and removed the '(TBD)' in the parameter name. Updated format to comply with standards. 	Table 2.5-6 All
6/04/04	R4V1	533	<ul style="list-style-type: none"> Changed (SSF-30) SDS name from "ADM geo" to "Snow/ice percent coverage clear-sky overhead-sun vis albedo." Changed (SSF-29) SDS name from "CERES WN ADM type for inversion process" to "Cloud Classification." Changed (SSF-29) Range from "0 .. 5000" to "0 .. 32766." Updated format to comply with standards. 	Table 2.5-6 Table 2.5-6 Table 2.5-6 All

SSF Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
6/15/07	R4V2	659	<ul style="list-style-type: none"> • Added additional versions for Terra and Aqua. • The EOSDIS Product Code line was removed from the document. (6/17/2008) 	Product Version Section Sec. 2.5
5/28/08	R4V3	673	<ul style="list-style-type: none"> • Added Edition2C-MOD-C4-Land-IGBP version for Terra and Aqua. 	Product Version Section

2.6 Clouds and Radiative Swath (CRS)

The Clouds and Radiative Swath (CRS) product contains one hour of instantaneous Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The CRS contains all of the CERES SSF product data. For each CERES FOV on the SSF, the CRS also contains vertical flux profiles evaluated at five levels in the atmosphere: the surface, 500 hPa, 200 hPa, 70 hPa, and the TOA. After an initial pass through the radiative transfer model, the input parameters to the model are adjusted and a constrained pass through the model is made for both clear sky and total sky. If the FOV is overcast, clear sky fluxes are still calculated.

For the longwave, shortwave, and window channels, the CRS contains the upward and downward constrained vertical flux profiles for clear sky and total sky conditions evaluated at the five levels, along with pristine (no aerosols or clouds) and aerosol-free total sky fluxes evaluated at the surface and the TOA.

The initial flux profiles are not contained on the CRS unless constrained values are unavailable; however, the adjustments between the constrained and initial profiles for the following are included for clear sky, total sky, pristine, and aerosol-free total sky conditions:

- Longwave, shortwave, and window channel upward at the surface and the TOA.
- Longwave, shortwave, and window channel downward at the surface.

The adjustments to the model input parameters between the initial and the constrained passes are also contained on the CRS. The adjustable parameters include:

- Surface albedo and skin temperature.
- Total column precipitable water and upper tropospheric relative humidity.
- Aerosol optical depth.
- Cloud optical depth, fractional area, and effective temperature.

Level: 2

Frequency: 1/Hour

Portion of Atmosphere Covered: Surface to the TOA

Time Interval Covered:

File: 1 Hour

Record: 1/100-Second

Portion of Globe Covered:

File: Satellite Swath

Record: 1 CERES FOV

Product Version:

TRMM: Edition2B, Edition2C

Terra: Edition2A, Edition2B, Edition2F

Aqua: Edition2A, Edition2B, Edition2C

CRS Metadata

The types of CRS 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 CRS product-specific metadata parameters are listed in [Table 2.6-1](#) and the CRS_Header_Vdata parameters are listed in [Table 2.6-2](#).

Table 2.6-1. 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 2.6-2	1	3
CRS_Header Vdata	Table 2.6-2	1	25

Table 2.6-2. CRS_Header_Vdata

Item	Description	Units	Range	Elements	Bytes/Elem
CRS-H1	SSF ID	N/A	112 .. 200	1	4
CRS-H2	Character name of CERES instrument	N/A	ASCII string	1	4
CRS-H3	Day and Time at hour start	N/A	ASCII string	1	28
CRS-H4	Character name of satellite	N/A	ASCII string	1	4
CRS-H5	Character name of high resolution imager instrument	N/A	ASCII string	1	8
CRS-H6	Number of imager channels	N/A	1 .. 20	1	4
CRS-H7	Central wavelengths of imager channels	mm	0.4 .. 15.0	20	4
CRS-H8	Earth-Sun distance at hour start	AU	0.98 .. 1.02	1	4
CRS-H9	Beta Angle	deg	-90 .. 90	1	4
CRS-H10	Colatitude of subsatellite point at surface at hour start	deg	0 .. 180	1	4
CRS-H11	Longitude of subsatellite point at surface at hour start	deg	0 .. 360	1	4
CRS-H12	Colatitude of subsatellite point at surface at hour end	deg	0 .. 180	1	4
CRS-H13	Longitude of subsatellite point at surface at hour end	deg	0 .. 360	1	4
CRS-H14	Along-track angle of satellite at hour end	deg	0 .. 330	1	4
CRS-H15	Number of Footprints in SSF product	N/A	0 .. 360000	1	4
CRS-H16	Subsystem 4.1 identification string	N/A	ASCII string	1	128
CRS-H17	Subsystem 4.2 identification string	N/A	ASCII string	1	128
CRS-H18	Subsystem 4.3 identification string	N/A	ASCII string	1	128
CRS-H19	Subsystem 4.4 identification string	N/A	ASCII string	1	128
CRS-H20	Subsystem 4.5 identification string	N/A	ASCII string	1	128
CRS-H21	Subsystem 4.6 identification string	N/A	ASCII string	1	128
CRS-H22	IES production date and time	N/A	ASCII string	1	24
CRS-H23	MOA production date and time	N/A	ASCII string	1	24
CRS-H24	SSF production date and time	N/A	ASCII string	1	24
CRS-H25	Instantaneous SARB Version number	N/A	1 .. 26	1	2
CRS-H26	CRS production date and time	N/A	ASCII string	1	19

CRS Scientific Data Sets

For the TRMM satellite, the CRS contains 206 Scientific Data Sets (SDS). For the Terra and Aqua satellites, the CRS contains 250 SDSs. The first 131 SDSs (160 SDSs for Terra and Aqua) are also contained on the SSF. (For a list of these SDSs, see [Table 2.5-3](#) through [Table 2.5-15](#).) The remaining SDSs are generated by the CERES Surface and Atmospheric Radiation Budget (SARB) production software and are unique to the CRS product.

These SDSs are parameter collections of along-track ordered FOVs where the first dimension corresponds to the number of FOVs, and the last dimension corresponds to the number of parameters. 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 FOVs becomes the last dimension and the first dimension is the number of parameters in the SDS.

The SDSs are divided into tables which map to Vgroups of the same name. [Table 2.6-3](#) through [Table 2.6-16](#) summarize the contents of each Vgroup and SDS contained within the CRS file. Product sizing information for the maximum number of possible FOVs is given in [Table 2.6-17](#). (Note: the dimension n in the following tables is the number of FOVs processed: Assuming n = 245475 for sizing). Maximum SDS hourly sizes for the different dimensions are given in [Table 2.6-18](#).

Table 2.6-3. Surface Radiative Properties

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
1	TRMM-132	Terra-161	Photosynthetically active radiation over surface	W m ⁻²	0 .. 780	n	32 bit real
2	TRMM-133	Terra-162	Direct/diffuse surface ratio	N/A	0 .. 30	n	32 bit real
3	TRMM-134	Terra-163	Corrected initial broadband surface albedo	N/A	0 .. 1	n	32 bit real

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-4. Vertical Profile Description

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
4	TRMM-135	Terra-164	Number of atmospheric levels	N/A	0 .. 5	n	32 bit integer
5	TRMM-136	Terra-165	Pressure levels	hPa	0 .. 1100	n x 5	32 bit real

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-5. Pristine Vertical Flux Profiles

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
6	TRMM-137	Terra-166	SW flux - upward - pristine	W m ⁻²	0 .. 1400	n x 2	32 bit real
7	TRMM-138	Terra-167	SW flux - downward - pristine	W m ⁻²	0 .. 1400	n x 2	32 bit real
8	TRMM-139	Terra-168	LW flux - upward - pristine	W m ⁻²	0 .. 850	n x 2	32 bit real
9	TRMM-140	Terra-169	LW flux - downward - pristine	W m ⁻²	0 .. 700	n x 2	32 bit real
10	TRMM-141	Terra-170	WN flux - upward - pristine	W m ⁻²	0 .. 370	n x 2	32 bit real
11	TRMM-142	Terra-171	WN flux - downward - pristine	W m ⁻²	0 .. 370	n x 2	32 bit real

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-6. Constrained Clear Sky Profiles

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
12	TRMM-143	Terra-172	SW flux - upward for clear-sky	W m ⁻²	0 .. 1400	n x 5	32 bit real
13	TRMM-144	Terra-173	SW flux - downward for clear-sky	W m ⁻²	0 .. 1400	n x 5	32 bit real
14	TRMM-145	Terra-174	LW flux - upward for clear-sky	W m ⁻²	0 .. 850	n x 5	32 bit real
15	TRMM-146	Terra-175	LW flux - downward for clear-sky	W m ⁻²	0 .. 700	n x 5	32 bit real
16	TRMM-147	Terra-176	WN flux - upward for clear-sky	W m ⁻²	0 .. 370	n x 5	32 bit real
17	TRMM-148	Terra-177	WN flux - downward for clear-sky	W m ⁻²	0 .. 370	n x 5	32 bit real

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-7. Constrained Total Sky Profiles

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
18	TRMM-149	Terra-178	SW flux - upward for total-sky	W m ⁻²	0 .. 1400	n x 5	32 bit real
19	TRMM-150	Terra-179	SW flux - downward for total-sky	W m ⁻²	0 .. 1400	n x 5	32 bit real
20	TRMM-151	Terra-180	LW flux - upward for total-sky	W m ⁻²	0 .. 850	n x 5	32 bit real
21	TRMM-152	Terra-181	LW flux - downward for total-sky	W m ⁻²	0 .. 700	n x 5	32 bit real
22	TRMM-153	Terra-182	WN flux - upward for total-sky	W m ⁻²	0 .. 370	n x 5	32 bit real
23	TRMM-154	Terra-183	WN flux - downward for total-sky	W m ⁻²	0 .. 370	n x 5	32 bit real

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-8. Pristine Constraint-Initial Flux Deltas

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
24	TRMM-155	Terra-184	SW flux adjustment at surface - upward - pristine	W m ⁻²	-1400 .. 1400	n	32 bit real
25	TRMM-156	Terra-185	SW flux adjustment at TOA - upward - pristine	W m ⁻²	-1400 .. 1400	n	32 bit real
26	TRMM-157	Terra-186	SW flux adjustment at surface - downward - pristine	W m ⁻²	-1400 .. 1400	n	32 bit real
27	TRMM-158	Terra-187	LW flux adjustment at surface - upward - pristine	W m ⁻²	-600 .. 600	n	32 bit real
28	TRMM-159	Terra-188	LW flux adjustment at surface - downward - pristine	W m ⁻²	-700 .. 700	n	32 bit real
29	TRMM-160	Terra-189	LW flux adjustment at TOA - upward - pristine	W m ⁻²	-700 .. 700	n	32 bit real
30	TRMM-161	Terra-190	WN flux adjustment at surface - upward - pristine	W m ⁻²	-50 .. 50	n	32 bit real
31	TRMM-162	Terra-191	WN flux adjustment at surface - downward - pristine	W m ⁻²	-50 .. 50	n	32 bit real
32	TRMM-163	Terra-192	WN flux adjustment at TOA - upward - pristine	W m ⁻²	-50 .. 50	n	32 bit real

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-9. Clear Sky Constraint-Initial Flux Deltas

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
33	TRMM-164	Terra-193	SW flux adjustment at surface - upward for clear-sky	W m ⁻²	-1400 .. 1400	n	32 bit real
34	TRMM-165	Terra-194	SW flux adjustment at TOA - upward for clear-sky	W m ⁻²	-1400 .. 1400	n	32 bit real
35	TRMM-166	Terra-195	SW flux adjustment at surface - downward for clear-sky	W m ⁻²	-1400 .. 1400	n	32 bit real
36	TRMM-167	Terra-196	LW flux adjustment at surface - upward for clear-sky	W m ⁻²	-600 .. 600	n	32 bit real
37	TRMM-168	Terra-197	LW flux adjustment at surface - downward for clear-sky	W m ⁻²	-700 .. 700	n	32 bit real
38	TRMM-169	Terra-198	LW flux adjustment at TOA - upward for clear-sky	W m ⁻²	-700 .. 700	n	32 bit real
39	TRMM-170	Terra-199	WN flux adjustment at surface - upward for clear-sky	W m ⁻²	-50 .. 50	n	32 bit real
40	TRMM-171	Terra-200	WN flux adjustment at surface - downward for clear-sky	W m ⁻²	-50 .. 50	n	32 bit real
41	TRMM-172	Terra-201	WN flux adjustment at TOA - upward for clear-sky	W m ⁻²	-50 .. 50	n	32 bit real

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-10. Total Sky Constraint-Initial Flux Deltas

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
42	TRMM-173	Terra-202	SW flux adjustment at surface - upward for total-sky	W m ⁻²	-1400 .. 1400	n	32 bit real
43	TRMM-174	Terra-203	SW flux adjustment at TOA - upward for total-sky	W m ⁻²	-1400 .. 1400	n	32 bit real
44	TRMM-175	Terra-204	SW flux adjustment at surface - downward for total-sky	W m ⁻²	-1400 .. 1400	n	32 bit real
45	TRMM-176	Terra-205	LW flux adjustment at surface - upward for total-sky	W m ⁻²	-600 .. 600	n	32 bit real
46	TRMM-177	Terra-206	LW flux adjustment at surface - downward for total-sky	W m ⁻²	-700 .. 700	n	32 bit real
47	TRMM-178	Terra-207	LW flux adjustment at TOA - upward for total-sky	W m ⁻²	-700 .. 700	n	32 bit real
48	TRMM-179	Terra-208	WN flux adjustment at surface - upward for total-sky	W m ⁻²	-50 .. 50	n	32 bit real
49	TRMM-180	Terra-209	WN flux adjustment at surface - downward for total-sky	W m ⁻²	-50 .. 50	n	32 bit real
50	TRMM-181	Terra-210	WN flux adjustment at TOA - upward for total-sky	W m ⁻²	-50 .. 50	n	32 bit real

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-11. Satellite Emulated Window Channel

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
51	TRMM-182	Terra-211	WN filtered radiance -satellite emulated	W m ⁻² sr ⁻¹	0 .. 50	n	32 bit real
52	TRMM-183	Terra-212	WN filtered radiance adjustment-satellite emulated	W m ⁻² sr ⁻¹	0 .. 50	n	32 bit real
53	TRMM-184	Terra-213	WN flux - satellite emulated - TOA	W m ⁻²	2 .. 50	n	32 bit real
54	TRMM-185	Terra-214	WN flux adjustment - satellite emulated - TOA	W m ⁻²	2 .. 50	n	32 bit real

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-12. Unfiltered Total Longwave

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
55	TRMM-186	Terra-215	Total LW unfiltered radiance - satellite emulated	W m ⁻² sr ⁻¹	0 .. 200	n	32 bit real
56	TRMM-187	Terra-216	Total LW unfiltered radiance adjustment - satellite emulated	W m ⁻² sr ⁻¹	0 .. 200	n	32 bit real

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-13. Constraint Adjustments

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
57	TRMM-188	Terra-217	Total column precipitable water - initial	cm	0 .. 10	n	32 bit real
58	TRMM-189	Terra-218	Total column precipitable water - adjustment	cm	-10 .. 10	n	32 bit real
59	TRMM-190	Terra-219	Upper tropospheric precipitable water - initial	cm	0 .. 10	n	32 bit real
60	TRMM-191	Terra-220	Upper tropospheric precipitable water - adjustment	cm	-10 .. 10	n	32 bit real
61	TRMM-192	Terra-221	Upper tropospheric humidity - initial	N/A	0.0 .. 100.0	n	32 bit real
62	TRMM-193	Terra-222	Upper tropospheric humidity - adjustment	N/A	0.0 .. 100.0	n	32 bit real
63	TRMM-194	Terra-223	Surface albedo - adjustment	N/A	-1 .. 1	n	32 bit real
64	TRMM-195	Terra-224	Aerosol optical depth - initial	N/A	0 .. 2	n	32 bit real
65	TRMM-196	Terra-225	Aerosol optical depth - adjustment	N/A	-2 .. 2	n	32 bit real
66	TRMM-197	Terra-226	Skin temperature - initial	K	TBD	n	32 bit real
67	TRMM-198	Terra-227	Skin temperature - adjustment	K	TBD	n	32 bit real
68	TRMM-199	Terra-228	Mean visible optical depth- adjustment	N/A	-400 .. 400	n x 2	32 bit real
69	TRMM-200	Terra-229	Mean cloud fractional area - adjustment	N/A	-1 .. 1	n x 2	32 bit real
70	TRMM-201	Terra-230	Mean cloud effective temperature - adjustment	K	TBD	n x 2	32 bit real

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-14. Aerosol Constituency Information

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
71	TRMM-202	Terra-231	Aerosol constituency flags	N/A	01000000 .. 18999999	n x 7	32 bit integer
72	TRMM-203	Terra-232	Aerosol and surface albedo sources flag	N/A	100 - 303	n	32 bit integer

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-15. Constraint Status

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
73	TRMM-204	Terra-233	Number of tuning iterations	N/A	0 .. 1	n	32 bit integer
74	TRMM-205	Terra-234	Constraint status flag	N/A	0 .. 600	n	32 bit integer
75	TRMM-206	Terra-235	FuLiou model error code	N/A	1 .. 3000	n	32 bit integer

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-16. Cloudy Skies with No Aerosol Information

SARB SDS	TRMM CRS SDS Number ^a	Terra and Aqua CRS SDS Number ^b	SDS Name	Units	Range	Dim	Data Type
76	N/A	Terra-236	SW flux - upward - cloudy skies with no aerosol	W m ⁻²	0 .. 1400	n	32 bit real
77	N/A	Terra-237	SW flux - downward - cloudy skies with no aerosol	W m ⁻²	0 .. 1400	n	32 bit real
78	N/A	Terra-238	LW flux - upward - cloudy skies with no aerosol	W m ⁻²	0 .. 850	n	32 bit real
79	N/A	Terra-239	LW flux - downward - cloudy skies with no aerosol	W m ⁻²	0 .. 700	n	32 bit real
80	N/A	Terra-240	WN flux - upward - cloudy skies with no aerosol	W m ⁻²	0 .. 370	n	32 bit real
81	N/A	Terra-241	WN flux - downward - cloudy skies with no aerosol	W m ⁻²	0 .. 370	n	32 bit real
82	N/A	Terra-242	SW flux adjustment at surface - upward - cloudy skies with no aerosol	W m ⁻²	-1400 .. 1400	n	32 bit real
83	N/A	Terra-243	SW flux adjustment at TOA - upward - cloudy skies with no aerosol	W m ⁻²	-1400 .. 1400	n	32 bit real
84	N/A	Terra-244	SW flux adjustment at surface - downward - cloudy skies with no aerosol	W m ⁻²	-1400 .. 1400	n	32 bit real
85	N/A	Terra-245	LW flux adjustment at surface - upward - cloudy skies with no aerosol	W m ⁻²	-600 .. 600	n	32 bit real
86	N/A	Terra-246	LW flux adjustment at surface - downward - cloudy skies with no aerosol	W m ⁻²	-700 .. 700	n	32 bit real
87	N/A	Terra-247	LW flux adjustment at TOA - upward - cloudy skies with no aerosol	W m ⁻²	-700 .. 700	n	32 bit real
88	N/A	Terra-248	WN flux adjustment at surface - upward - cloudy skies with no aerosol	W m ⁻²	-50 .. 50	n	32 bit real
89	N/A	Terra-249	WN flux adjustment at surface - downward - cloudy skies with no aerosol	W m ⁻²	-50 .. 50	n	32 bit real
90	N/A	Terra-250	WN flux adjustment at TOA - upward - cloudy skies with no aerosol	W m ⁻²	-50 .. 50	n	32 bit real

- a. The first 131 TRMM CRS SDSs are listed in the corresponding TRMM SSF DPC pages. TRMM SSF and CRS granules contain fewer SDSs than Terra and Aqua SSF and CRS granules.
- b. The first 160 Terra and Aqua CRS SDSs are listed in the corresponding SSF DPC pages.

Table 2.6-17. Sizing Information^a

SATELLITE	HOURLY SSF SDS TOTAL SIZE (MAXIMUM)	HOURLY CRS-ONLY SDS SIZE (MAXIMUM)	HOURLY CRS TOTAL SDS SIZE (MAXIMUM)	DAILY CRS TOTAL SIZE (MAXIMUM)
TRMM SATELLITE	260.27 MB	132.97 MB	391.42	9.15 GB
TERRA AND AQUA SATELLITES	283.73MB	147.02 MB	430.75	10.10 GB

- a. Sizing data in this table are based solely on binary versions of the products, and do not account for HDF compression.

Table 2.6-18. Maximum Hourly SDS Sizes

Dimension	Maximum Hourly Size (MB)
n	0.94
n x 2	1.87
n x 5	4.68
n x 7	6.55

CRS Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

CRS Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> Updated format to comply with standards. 	All
12/20/02	R3V2	408	<ul style="list-style-type: none"> Added text to indicate a different number of SDSs for the different satellites. Updated table to include sizing information for the different satellites. Updated summary information to include the Product Version section and eliminated the references to the CERES Configuration Codes. Corrected references to the height used as the TOA by SARB to 0.1 hPa. Updated format to comply with standards. 	2.6 Table 2.6-16 2.6 2.6 All
12/20/02	R3V3	408	<ul style="list-style-type: none"> Replaced references to the 0.1 hPa height with the term TOA and defined pristine skies as containing no clouds or aerosols. Removed column containing individual SDS hourly size information from VGroup tables and added Table 2.6-17. Replaced single Item Number column in VGroup Tables with three columns to distinguish the Item Number between satellites. Updated format to comply with standards. 	2.6 Tables 2.6-3 through 2.6-17 Tables 2.6-3 through 2.6-16 All
7/30/03	R3V4	458	<ul style="list-style-type: none"> Updated introduction to discuss the aerosol-free total sky additions to the CRS. Added new table to contain the aerosol-free total sky information. Updated sizing table to reflect the additional data. Updated format to comply with standards. 	2.6 Table 2.6-16 Table 2.6-17 All
1/16/04	R3V5	498	<ul style="list-style-type: none"> The revisions to the document are the updating of Table 2.6-15 to reflect the renaming of the SDS Sigma table version number SDS to FuLiou model error code, and the updating of that SDS's range. 	Table 2.6-15

CRS Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
	Cont'd.		<ul style="list-style-type: none"> • Corrected name shown for SARB SDS 1. • Updated format to comply with standards. 	Table 2.6-3 All
6/28/04	R4V1	541	<ul style="list-style-type: none"> • Included references to the Aqua satellite. • Updated format to comply with standards. 	Sec. 2.6 Tables 2.6-6 through 2.6-17 All
12/20/05	R4V2	597	<ul style="list-style-type: none"> • Added Edition2A to the Product Version category Aqua. 	Sec. 2.6
4/05/07		651	<ul style="list-style-type: none"> • Added Edition2B to the Product Version category Aqua. 	Sec. 2.6
2/01/08	R4V3	668	<ul style="list-style-type: none"> • Added Edition2F to the Product Version category Terra. 	Product Version Section
4/05/07		651	<ul style="list-style-type: none"> • Added Edition2C to the Product Version category Aqua. • The EOSDIS Product Code line was removed from the document. (6/17/2008) 	Product Version Section Sec. 2.6

2.7 Monthly Gridded Radiative Fluxes and Clouds (FSW)

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 HDF product for TRMM consists of eight files, each containing data for ten 1.0-degree equal-angle zones. The HDF product for Terra and Aqua consists of 60 files, each containing data for three 1.0-degree equal-angle zones. Each record contains spatially averaged data for an individual region.

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

- Region data
- Imager Radiances Statistics
- Angular model scene classes
- Radiative fluxes for both Clear-sky and Total-sky at TOA
- Atmospheric flux profiles for Pristine-sky, Clear-sky and Total-sky
- Flux Adjustments for Pristine-sky, Clear-sky and Total-sky
- Surface Emissivity
- Overlap data for eleven cloud conditions
- Cloud category properties for four cloud layers
- Adjustment parameters for four cloud layers
- Adjustment parameters for clear-skies

A complete listing of parameters for this data product can be found in [Tables 2.7-4](#) through [Table 2.7-27](#).

Level: 3

Frequency: 1/Month

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

Time Interval Covered:

File: Month

Record: Hour

Portion of Globe Covered:

File: Gridded Satellite Swath

Record: 1.0-Deg Equal-angle Regions

Product Version:

TRMM:

Terra: Edition2C

Aqua: Beta1, Edition2A, Edition2B

FSW Metadata

The types of FSW metadata are summarized in [Table 2.7-1](#) and contain information which need only be recorded once per product. The CERES metadata are listed in [Appendix B](#). The FSW product-specific metadata parameters are listed in [Table 2.7-2](#).

Table 2.7-1. 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 2.7-2	1	2

Table 2.7-2. FSW Product-specific Metadata

Item	Parameter Name	Description	Data Type	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 the Vdata structures summarized in [Table 2.7-3](#). The TRMM FSW product parameter lists are summarized in [Table 2.7-4](#) through [Table 2.7-13](#) and [Table 2.7-18](#) through [Table 2.7-24](#) including the SDS number, the SDS name, the data type, the units, the range, and the number of elements within each field. The Terra and Aqua FSW product parameter lists are summarized in [Table 2.7-4](#) through [Table 2.7-9](#) and [Table 2.7-14](#) through [Table 2.7-27](#) including the SDS number, the DS name, the data type, the units, the range, and the number of elements within each field. Terra and Aqua FSW products contain additional MODIS aerosol SDSs which are summarized in [Table 2.7-25](#) through [Table 2.7-27](#). The profile flux SDS names are defined differently between TRMM and Terra FSW products, therefore the profile flux SDSs are summarized in separate tables for TRMM and Terra products. The number of records per Vdata is defined as n where n varies for each file. Sizing estimates are based on anticipated Terra sampling.

Table 2.7-3. FSW Vdata Summary

Vdata Name	Description Table	Records	Number of Fields	VData Size (MB)
Time and Position Data	Table 2.7-4	n	6	124.42
Regional Identification Data	Table 2.7-5	n	5	88.87
Surface Map And Clear Area Data	Table 2.7-6	n	11	533.23
Imager Radiances Statistics	Table 2.7-7	n	5	302.17
Angular Model Scene Type Data	Table 2.7-8	n	7	2150.73
TOA Fluxes	Table 2.7-9	n	12	639.88
Pristine Vertical Flux Profiles - TRMM	Table 2.7-10	n	12	1866.24

Table 2.7-3. FSW Vdata Summary

Vdata Name	Description Table	Records	Number of Fields	VData Size (MB)
Constrained Clear Sky Profiles - TRMM	Table 2.7-11	n	30	1555.20
Constrained Total Sky Profiles - TRMM	Table 2.7-12	n	30	1555.20
Constraintment - Initial Flux Deltas - TRMM	Table 2.7-13	n	27	1399.68
Pristine Vertical Flux Profiles - Terra/Aqua	Table 2.7-14	n	12	639.88
Constrained Clear Sky Profiles - Terra/Aqua	Table 2.7-15	n	30	1599.72
Constrained Total Sky Profiles - Terra/Aqua	Table 2.7-16	n	30	1599.72
Constraintment - Initial Flux Deltas - Terra/Aqua	Table 2.7-17	n	27	1261.99
Surface Emissivity	Table 2.7-18	n	7	124.42
Cloud Overlap Conditions	Table 2.7-19	n	11	195.52
Cloud Layer - High	Table 2.7-20	n	18	817.63
Cloud Layer - UpperMid	Table 2.7-21	n	18	817.63
Cloud Layer - LowerMid	Table 2.7-22	n	18	817.63
Cloud Layer - Low	Table 2.7-23	n	18	817.63
Constraintment - Adjustments	Table 2.7-24	n	7	124.42
Aerosol LAND	Table 2.7-25	n	3	53.32
Aerosol OCEAN	Table 2.7-26	n	7	124.42
Cloudy Skies With No Aerosols	Table 2.7-27	n	21	1261.99
Satellite Emulated Window Channel	Table 2.7-28	n	4	213.29
Aerosol Constituency Information	Table 2.7-29	n	1	124.42
TOTAL SIZE				14433.0

Table 2.7-4. Time and Position Data

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-0	Julian Time	day	2 440 000.0 .. 2 480 000.0	3	64-Bit Float ^a	1
FSW-1	Sun Colatitude	deg	0.0 .. 180.0	3	32-Bit Float	1
FSW-2	Sun Longitude	deg	0.0 .. 360.0	3	32-Bit Float	1
FSW-3	Relative Azimuth Angle	deg	0.0 .. 360.0	3	32-Bit Float	1
FSW-4	Cos. Solar Zenith Angle	N/A	0.0 .. 1.0	3	32-Bit Float	1
FSW-5	Spacecraft Zenith Angle	deg	0.0 .. 90.0	3	32-Bit Float	1

a. Julian Time SDS Data Type is set to 32-Bit Float on TRMM products.

Table 2.7-5. Regional Identification Data

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-6	Region Number	N/A	1 .. 64800	3	32-Bit Float	1
FSW-7	Hour Box Number	N/A	1 .. 744	3	32-Bit Float	1
FSW-8	Num. Footprints in Region	N/A	1 .. 500	3	32-Bit Float	1
FSW-9	Colatitude	N/A	1 - 180	3	32-Bit Float	1
FSW-10	Longitude	N/A	1 - 360	3	32-Bit Float	1

Table 2.7-6. Surface Map And Clear Area Data

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-11	Alt. of Srf. above Sea	m	-1000 .. 10000	3	32-Bit Float	1
FSW-12	Surface Type Percentage	percent	0.0 .. 100.0	4	32-Bit Float	20
FSW-13	Snow/Ice Percentage	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-14	Smoke Percentage	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-15	Aerosol Percentage	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-16	Flag - Aerosol Type	N/A	0.0 .. 9999.0	3	32-Bit Float	1
FSW-17	Aerosol Opt. Depth at 0.63 μ m in clr	μ m	-1.0 .. 5.0	3	32-Bit Float	1
FSW-18	Aerosol Opt. Depth at 1.6 μ m in clr	μ m	-1.0 .. 5.0	3	32-Bit Float	1
FSW-19	Precipitable Water	cm	0.001 .. 10.0	3	32-Bit Float	1
FSW-20	Flag - Source Precip. H2O	N/A	0 .. 120	3	32-Bit Float	1
FSW-21	MOA - Relative Column Avg. Humidity	N/A	0.0 .. 100.0	3	32-Bit Float	1

Table 2.7-7. Imager Radiances Statistics

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-22	Imager Viewing Zenith Angle	deg	0.0 .. 90.0	3	32-Bit Float	1
FSW-23	Imager Relative Azimuth Angle	deg	0.0 .. 360.0	3	32-Bit Float	1
FSW-24	Imager Channel Central Wavelength	μm	0.4 .. 15.0	4	32-Bit Float	5
FSW-25	Imager Radiance	$\text{W m}^{-2}\text{sr}^{-1}\mu\text{m}^{-1}$	-1000.0 .. 1000.0	4	32-Bit Float	5
FSW-26	Imager Radiance Clr-sky	$\text{W m}^{-2}\text{sr}^{-1}\mu\text{m}^{-1}$	-1000.0 .. 1000.0	4	32-Bit Float	5

Table 2.7-8. Angular Model Scene Type Data

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-27	Incident Solar Flux	N/A	0.0 .. 1400.0	3	32-Bit Float	1
FSW-28	Area Coverage	percent	0.0 .. 100.0	4	32-Bit Float	20
FSW-29	SW Scene ID	N/A	0 .. 5000	4	32-Bit Float	20
FSW-30	Albedo (mean)	N/A	0.0 .. 1.0	4	32-Bit Float	20
FSW-31	Albedo (std)	N/A	0.0 .. 1.0	4	32-Bit Float	20
FSW-32	LW (mean)	W m^{-2}	0.0 .. 400.0	4	32-Bit Float	20
FSW-33	LW (std)	W m^{-2}	0.0 .. 400.0	4	32-Bit Float	20

Table 2.7-9. TOA Fluxes

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-34	SW TOA Clear-Sky	W m^{-2}	0.0 .. 1400.0	4	32-Bit Float	3
FSW-35	LW TOA Clear-Sky	W m^{-2}	0.0 .. 500.0	4	32-Bit Float	3
FSW-36	WN TOA Clear-Sky	W m^{-2}	0.0 .. 200.0	4	32-Bit Float	3
FSW-37	ALB TOA Clear-Sky	N/A	0.0 .. 1.0	4	32-Bit Float	3

Table 2.7-9. TOA Fluxes

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-38	SW TOA DOWNWARD Clear-Sky ^a	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-39	SW TOA UPWARD Clear-Sky ^a	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-40	LW TOA UPWARD Clear-Sky ^a	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-41	WN TOA UPWARD Clear-Sky ^a	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-42	SW TOA Total-Sky	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-43	LW TOA Total-Sky	W m ⁻²	0.0 .. 500.0	4	32-Bit Float	3
FSW-44	WN TOA Total-Sky	W m ⁻²	0.0 .. 200.0	4	32-Bit Float	3
FSW-45	ALB TOA Total-Sky	N/A	0.0 .. 1.0	4	32-Bit Float	3

a. TOA Clear Sky SW, LW, WN upward & SW downward data is sorted according to the CERES Clear Sky definitions and the mean values are written in an additional set of SDSs.

Table 2.7-10. Pristine Vertical Flux Profiles (TRMM)

TRMM SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-46	SW Upward Pristine Sky (TOA)	W m ⁻²	0.0 - 1400.0	4	32-Bit Float	3
FSW-47	SW Downward Pristine Sky (TOA)	W m ⁻²	0.0 - 1400.0	4	32-Bit Float	3
FSW-48	LW Upward Pristine Sky (TOA)	W m ⁻²	0.0 - 850.0	4	32-Bit Float	3
FSW-49	LW Downward Pristine Sky (TOA)	W m ⁻²	0.0 - 700.0	4	32-Bit Float	3
FSW-50	WN Upward Pristine Sky (TOA)	W m ⁻²	0.0 - 370.0	4	32-Bit Float	3
FSW-51	WN Downward Pristine Sky (TOA)	W m ⁻²	0.0 - 370.0	4	32-Bit Float	3
FSW-52	SW Upward Pristine Sky (SRF)	W m ⁻²	0.0 - 1400.0	4	32-Bit Float	3
FSW-53	SW Downward Pristine Sky (SRF)	W m ⁻²	0.0 - 1400.0	4	32-Bit Float	3
FSW-54	LW Upward Pristine Sky (SRF)	W m ⁻²	0.0 - 850.0	4	32-Bit Float	3
FSW-55	LW Downward Pristine Sky (SRF)	W m ⁻²	0.0 - 700.0	4	32-Bit Float	3

Table 2.7-10. Pristine Vertical Flux Profiles (TRMM)

TRMM SDS Index	SDS Name / Parameter	Units	Range	SDS rank/dim	Data Type	No. of Elements
FSW-56	WN Upward Prestine Sky (SRF)	W m ⁻²	0.0 - 370.0	4	32-Bit Float	3
FSW-57	WN Downward Prestine Sky (SRF)	W m ⁻²	0.0 - 370.0	4	32-Bit Float	3

Table 2.7-11. Constrained Clear Sky Profiles (TRMM)

TRMM SDS Index	SDS Name / Parameter	Units	Range	SDS rank/dim	Data Type	No. of Elements
FSW-58	SW Upward Clear Sky (TOA)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-59	SW Downward Clear Sky (TOA)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-60	LW Upward Clear Sky (TOA)	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-61	LW Downward Clear Sky (TOA)	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-62	WN Upward Clear Sky (TOA)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-63	WN Downward Clear Sky (TOA)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-64	SW Upward Clear Sky (70hPa)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-65	SW Downward Clear Sky (70hPa)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-66	LW Upward Clear Sky (70hPa)	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-67	LW Downward Clear Sky (70hPa)	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-68	WN Upward Clear Sky (70hPa)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-69	WN Downward Clear Sky (70hPa)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-70	SW Upward Clear Sky (200hPa)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-71	SW Downward Clear Sky (200hPa)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-72	LW Upward Clear Sky (200hPa)	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3

Table 2.7-11. Constrained Clear Sky Profiles (TRMM)

TRMM SDS Index	SDS Name / Parameter	Units	Range	SDS rank/dim	Data Type	No. of Elements
FSW-73	LW Downward Clear Sky (200hPa)	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-74	WN Upward Clear Sky (200hPa)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-75	WN Downward Clear Sky (200hPa)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-76	SW Upward Clear Sky (500hPa)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-77	SW Downward Clear Sky (500hPa)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-78	LW Upward Clear Sky (500hPa)	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-79	LW Downward Clear Sky (500hPa)	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-80	WN Upward Clear Sky (500hPa)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-81	WN Downward Clear Sky (500hPa)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-82	SW Upward Clear Sky (SFC)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-83	SW Downward Clear Sky (SFC)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-84	LW Upward Clear Sky (SFC)	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-85	LW Downward Clear Sky (SFC)	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-86	WN Upward Clear Sky (SFC)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-87	WN Downward Clear Sky (SFC)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3

Table 2.7-12. Constrained Total Sky Profiles (TRMM)

TRMM SDS Index	SDS Name / Parameter	Units	Range	SDS rank/dim	Data Type	No. of Elements
FSW-88	SW Upward Total Sky (TOA)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-89	SW Downward Total Sky (TOA)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3

Table 2.7-12. Constrained Total Sky Profiles (TRMM)

TRMM SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-90	LW Upward Total Sky (TOA)	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-91	LW Downward Total Sky (TOA)	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-92	WN Upward Total Sky (TOA)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-93	WN Downward Total Sky (TOA)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-94	SW Upward Total Sky (70hPa)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-95	SW Downward Total Sky (70hPa)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-96	LW Upward Total Sky (70hPa)	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-97	LW Downward Total Sky (70hPa)	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-98	WN Upward Total Sky (70hPa)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-99	WN Downward Total Sky (70hPa)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-100	SW Upward Total Sky (200hPa)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-101	SW Downward Total Sky (200hPa)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-102	LW Upward Total Sky (200hPa)	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-103	LW Downward Total Sky (200hPa)	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-104	WN Upward Total Sky (200hPa)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-105	WN Downward Total Sky (200hPa)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-106	SW Upward Total Sky (500hPa)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-107	SW Downward Total Sky (500hPa)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-108	LW Upward Total Sky (500hPa)	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-109	LW Downward Total Sky (500hPa)	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3

Table 2.7-12. Constrained Total Sky Profiles (TRMM)

TRMM SDS Index	SDS Name / Parameter	Units	Range	SDS rank/dim	Data Type	No. of Elements
FSW-110	WN Upward Total Sky (500hPa)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-111	WN Downward Total Sky (500hPa)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-112	SW Upward Total Sky (SFC)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-113	SW Downward Total Sky (SFC)	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-114	LW Upward Total Sky (SFC)	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-115	LW Downward Total Sky (SFC)	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-116	WN Upward Total Sky (SFC)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-117	WN Downward Total Sky (SFC)	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3

Table 2.7-13. Constraint - Initial Flux Deltas (TRMM)

TRMM SDS Index	SDS Name / Parameter	Units	Range	SDS rank/dim	Data Type	No. of Elements
FSW-118	SW Upward Prestine Sky (TOA)	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-119	LW Upward Prestine Sky (TOA)	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-120	WN Upward Prestine Sky (TOA)	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-121	SW Upward Prestine Sky (SFC)	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-122	SW Downward Prestine Sky (SFC)	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-123	LW Upward Prestine Sky (SFC)	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-124	LW Downward Prestine Sky (SFC)	W m ⁻²	-600.0 .. 600.0	4	32-Bit Float	3
FSW-125	WN Upward Prestine Sky (SFC)	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-126	WN Downward Prestine Sky (SFC)	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3

Table 2.7-13. Constraint - Initial Flux Deltas (TRMM)

TRMM SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-127	SW Upward Clear Sky (TOA)	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-128	LW Upward Clear Sky (TOA)	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-129	WN Upward Clear Sky (TOA)	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-130	SW Upward Clear Sky (SFC)	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-131	SW Downward Clear Sky (SFC)	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-132	LW Upward Clear Sky (SFC)	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-133	LW Downward Clear Sky (SFC)	W m ⁻²	-600.0 .. 600.0	4	32-Bit Float	3
FSW-134	WN Upward Clear Sky (SFC)	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-135	WN Downward Clear Sky (SFC)	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-136	SW Upward Total Sky (TOA)	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-137	LW Upward Total Sky (TOA)	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-138	WN Upward Total Sky (TOA)	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-139	SW Upward Total Sky (SFC)	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-140	SW Downward Total Sky (SFC)	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-141	LW Upward Total-Sky (SFC)	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-142	LW Downward Total-Sky (SFC)	W m ⁻²	-600.0 .. 600.0	4	32-Bit Float	3
FSW-143	WN Upward Total-Sky (SFC)	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-144	WN Downward Total-Sky (SFC)	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3

Table 2.7-14. Pristine Vertical Flux Profiles (Terra/Aqua)

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-46	SW flux - upward - pristine - TOA	W m ⁻²	0.0 - 1400.0	4	32-Bit Float	3
FSW-47	SW flux - upward - pristine - surface	W m ⁻²	0.0 - 1400.0	4	32-Bit Float	3
FSW-48	SW flux - downward - pristine - TOA	W m ⁻²	0.0 - 1400.0	4	32-Bit Float	3
FSW-49	SW flux - downward - pristine - surface	W m ⁻²	0.0 - 1400.0	4	32-Bit Float	3
FSW-50	LW flux - upward - pristine - TOA	W m ⁻²	0.0 - 850.0	4	32-Bit Float	3
FSW-51	LW flux - upward - pristine - surface	W m ⁻²	0.0 - 850.0	4	32-Bit Float	3
FSW-52	LW flux - downward - pristine - TOA	W m ⁻²	0.0 - 700.0	4	32-Bit Float	3
FSW-53	LW flux - downward - pristine - surface	W m ⁻²	0.0 - 700.0	4	32-Bit Float	3
FSW-54	WN flux - upward - pristine - TOA	W m ⁻²	0.0 - 370.0	4	32-Bit Float	3
FSW-55	WN flux - upward - pristine - surface	W m ⁻²	0.0 - 370.0	4	32-Bit Float	3
FSW-56	WN flux - downward - pristine - TOA	W m ⁻²	0.0 - 370.0	4	32-Bit Float	3
FSW-57	WN flux - downward - pristine - surface	W m ⁻²	0.0 - 370.0	4	32-Bit Float	3

Table 2.7-15. Constrained Clear Sky Profiles (Terra/Aqua)

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-58	SW flux - upward - clear-sky - TOA	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-59	SW flux - upward - clear-sky - 70hPa	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-60	SW flux - upward - clear-sky - 200hPa	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-61	SW flux - upward - clear-sky - 500hPa	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-62	SW flux - upward - clear-sky - SFC	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3

Table 2.7-15. Constrained Clear Sky Profiles (Terra/Aqua)

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-63	SW flux - downward - clear-sky - TOA	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-64	SW flux - downward - clear-sky - 70hPa	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-65	SW flux - downward - clear-sky - 200hPa	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-66	SW flux - downward - clear-sky - 500hPa	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-67	SW flux - downward - clear-sky - SFC	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-68	LW flux - upward - clear-sky - TOA	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-69	LW flux - upward - clear-sky - 70hPa	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-70	LW flux - upward - clear-sky - 200hPa	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-71	LW flux - upward - clear-sky - 500hPa	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-72	LW flux - upward - clear-sky - SFC	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-73	LW flux - downward - clear-sky - TOA	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-74	LW flux - downward - clear-sky - 70hPa	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-75	LW flux - downward - clear-sky - 200hPa	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-76	LW flux - downward - clear-sky - 500hPa	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-77	LW flux - downward - clear-sky - SFC	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-78	WN flux - upward - clear-sky - TOA	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-79	WN flux - upward - clear-sky - 70hPa	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-80	WN flux - upward - clear-sky - 200hPa	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-81	WN flux - upward - clear-sky - 500hPa	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-82	WN flux - upward - clear-sky - SFC	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3

Table 2.7-15. Constrained Clear Sky Profiles (Terra/Aqua)

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-83	WN flux - downward - clear-sky - TOA	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-84	WN flux - downward - clear-sky - 70hPa	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-85	WN flux - downward - clear-sky - 200hPa	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-86	WN flux - downward - clear-sky - 500hPa	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-87	WN flux - upward - clear-sky - SFC	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3

Table 2.7-16. Constrained Total Sky Profiles (Terra/Aqua)

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-88	SW flux - upward - total-sky - TOA	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-89	SW flux - upward - total-sky - 70hPA	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-90	SW flux - upward - total-sky - 200hPa	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-91	SW flux - upward - total-sky - 500hPa	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-92	SW flux - upward - total-sky - SFC	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-93	SW flux - downward - total-sky - TOA	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-94	SW flux - downward - total-sky - 70hPA	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-95	SW flux - downward - total-sky - 200hPa	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-96	SW flux - downward - total-sky - 500hPa	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-97	SW flux - downward - total-sky - SFC	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-98	LW flux - upward - total-sky - TOA	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3

Table 2.7-16. Constrained Total Sky Profiles (Terra/Aqua)

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-99	LW flux - upward - total-sky - 70hPa	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-100	LW flux - upward - total-sky - 200hPa	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-101	LW flux - upward - total-sky - 500hPa	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-102	LW flux - upward - total-sky - SFC	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-103	LW flux - downward - total-sky - TOA	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-104	LW flux - downward - total-sky - 70hPa	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-105	LW flux - downward - total-sky - 200hPa	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-106	LW flux - downward - total-sky - 500hPa	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-107	LW flux - downward - total-sky - SFC	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-108	WN flux - upward - total-sky - TOA	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-109	WN flux - upward - total-sky - 70hPa	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-110	WN flux - upward - total-sky - 200hPa	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-111	WN flux - upward - total-sky - 500hPa	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-112	WN flux - upward - total-sky - SFC	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-113	WN flux - downward - total-sky - TOA	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-114	WN flux - downward - total-sky - 70hPa	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-115	WN flux - downward - total-sky - 200hPa	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-116	WN flux - downward - total-sky - 500hPa	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-117	WN flux - upward - total-sky - SFC	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3

Table 2.7-17. Constraint - Initial Flux Deltas (Terra/Aqua)

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-118	SW flux adjustment at surface upward - pristine	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-119	SW flux adjustment at TOA - upward - pristine	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-120	SW flux adjustment at surface - downward - pristine	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-121	LW flux adjustment at surface - upward - pristine	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-122	LW flux adjustment at surface - downward - pristine	W m ⁻²	-600.0 .. 600.0	4	32-Bit Float	3
FSW-123	LW flux adjustment at TOA - upward - pristine	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-124	WN flux adjustment at surface - upward - pristine	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-125	WN flux adjustment at surface - downward - pristine	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-126	WN flux adjustment at TOA - upward - pristine	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-127	SW flux adjustment at surface upward - clear-sky	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-128	SW flux adjustment at TOA - upward - clear-sky	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-129	SW flux adjustment at surface - downward - clear-sky	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-130	LW flux adjustment at surface - upward - clear-sky	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-131	LW flux adjustment at surface - downward - clear-sky	W m ⁻²	-600.0 .. 600.0	4	32-Bit Float	3
FSW-132	LW flux adjustment at TOA - upward - clear-sky	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-133	WN flux adjustment at surface - upward - clear-sky	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-134	WN flux adjustment at surface - downward - clear-sky	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-135	WN flux adjustment at TOA - upward - clear-sky	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-136	SW flux adjustment at surface upward - total-sky	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-137	SW flux adjustment at TOA - upward - total-sky	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3

Table 2.7-17. Constraint - Initial Flux Deltas (Terra/Aqua)

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-138	SW flux adjustment at surface - downward - total-sky	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-139	LW flux adjustment at surface - upward - total-sky	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-140	LW flux adjustment at surface - downward - total-sky	W m ⁻²	-600.0 .. 600.0	4	32-Bit Float	3
FSW-141	LW flux adjustment at TOA - upward - total-sky	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-142	WN flux adjustment at surface - upward - total-sky	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-143	WN flux adjustment at surface - downward - total-sky	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-144	WN flux adjustment at TOA - upward - total-sky	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3

Table 2.7-18. Surface Emissivity

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-145	LW Surface Emissivity	N/A	0.0 .. 1.0	3	32-Bit Float	1
FSW-146	WN Surface Emissivity	N/A	0.0 .. 1.0	3	32-Bit Float	1
FSW-147	Photo. Syn. Radiation	W m ⁻²	0.0 .. 780.0	3	32-Bit Float	1
FSW-148	Direct/Diffuse	N/A	0.0 .. 30.0	3	32-Bit Float	1
FSW-149	Initial Broadband Albedo	N/A	0.0 .. 1.0	3	32-Bit Float	1
FSW-150	Surface Albedo	N/A	0.0 .. 1.0	3	32-Bit Float	1
FSW-151	Skin Temperature	K	175.0 .. 375.0	3	32-Bit Float	1

Table 2.7-19. Cloud Overlap Conditions

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-152	Clear	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-153	Low	percent	0.0 .. 100.0	3	32-Bit Float	1

Table 2.7-19. Cloud Overlap Conditions

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-154	Lowermid	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-155	Uppermid	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-156	High	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-157	High Uppermid	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-158	High Lowermid	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-159	High Low	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-160	Uppermid - Lowermid	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-161	Uppermid - Low	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-162	Lowermid - Low	percent	0.0 .. 100.0	3	32-Bit Float	1

Table 2.7-20. Cloud Layer - High (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-163	Area Fraction Percentage - high cloud	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-164	Effective Pressure - high cloud	hPa	0.0 .. 1100.0	4	32-Bit Float	3
FSW-165	Effective Temperature - high cloud	K	100.0 .. 350.0	4	32-Bit Float	3
FSW-166	Effective Height - high cloud	km	0.0 .. 20.0	4	32-Bit Float	3
FSW-167	Top Pressure - high cloud	hPa	0.0 .. 1100.0	4	32-Bit Float	3
FSW-168	Bottom Pressure - high cloud	hPa	0.0 .. 1100.0	4	32-Bit Float	3
FSW-169	Particle Phase - high cloud	N/A	1.0 .. 2.0	4	32-Bit Float	3
FSW-170	Liquid Water Path - high cloud	gm ⁻²	0.0 .. 10000.0	4	32-Bit Float	3
FSW-171	Ice Water Path - high cloud	gm ⁻²	0.0 .. 10000.0	4	32-Bit Float	3
FSW-172	Liquid Particle Radius - high cloud	μm	0.0 .. 40.0	4	32-Bit Float	3
FSW-173	Ice Particle Diameter - high cloud	μm	0.0 .. 300.0	4	32-Bit Float	3
FSW-174	Vis. Opt. Depth (linear) - high cloud	N/A	0.0 .. 400.0	4	32-Bit Float	3
FSW-175	Vis. Opt. Depth (log) - high cloud	N/A	-6.0 .. 6.0	4	32-Bit Float	3
FSW-176	Infrared Emissivity - high cloud	N/A	0.0 .. 2.0	4	32-Bit Float	3
FSW-177	Vertical Aspect Ratio - high cloud	N/A	0.0 .. 20.0	4	32-Bit Float	3
FSW-178	Adj. Vis. Opt. Depth - high cloud	N/A	-400.0 .. 400.0	3	32-Bit Float	1

Table 2.7-20. Cloud Layer - High (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-179	Adj. Fractional Area - high cloud	N/A	-1 ..1	3	32-Bit Float	1
FSW-180	Adj. Effective Temp. - high cloud	K	TBD	3	32-Bit Float	1

Table 2.7-21. Cloud Layer - UpperMid (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-181	Area Fraction Percentage - upper mid cloud	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-182	Effective Pressure - upper mid cloud	hPa	0.0 .. 1100.0	4	32-Bit Float	3
FSW-183	Effective Temperature - upper mid cloud	K	100.0 .. 350.0	4	32-Bit Float	3
FSW-184	Effective Height - upper mid cloud	km	0.0 .. 20.0	4	32-Bit Float	3
FSW-185	Top Pressure - upper mid cloud	hPa	0.0 .. 1100.0	4	32-Bit Float	3
FSW-186	Bottom Pressure - upper mid cloud	hPa	0.0 .. 1100.0	4	32-Bit Float	3
FSW-187	Particle Phase - upper mid cloud	N/A	1.0 .. 2.0	4	32-Bit Float	3
FSW-188	Liquid Water Path - upper mid cloud	gm ⁻²	0.0 .. 10000.0	4	32-Bit Float	3
FSW-189	Ice Water Path - upper mid cloud	gm ⁻²	0.0 .. 10000.0	4	32-Bit Float	3
FSW-190	Liquid Particle Radius - upper mid cloud	μm	0.0 .. 40.0	4	32-Bit Float	3
FSW-191	Ice Particle Diameter - upper mid cloud	μm	0.0 .. 300.0	4	32-Bit Float	3
FSW-192	Vis. Opt. Depth (linear) - upper mid cloud	N/A	0.0 .. 400.0	4	32-Bit Float	3
FSW-193	Vis. Opt. Depth (log) - upper mid cloud	N/A	-6.0 .. 6.0	4	32-Bit Float	3
FSW-194	Infrared Emissivity - upper mid cloud	N/A	0.0 .. 2.0	4	32-Bit Float	3
FSW-195	Vertical Aspect Ratio - upper mid cloud	N/A	0.0 .. 20.0	4	32-Bit Float	3
FSW-196	Adj. Vis. Opt. Depth - upper mid cloud	N/A	-400.0 .. 400.0	3	32-Bit Float	1

Table 2.7-21. Cloud Layer - UpperMid (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-197	Adj. Fractional Area - upper mid cloud	N/A	-1 ..1	3	32-Bit Float	1
FSW-198	Adj. Effective Temp. - upper mid cloud	K	TBD	3	32-Bit Float	1

Table 2.7-22. Cloud Layer - LowerMid (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-199	Area Fraction Percentage - lower mid cloud	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-200	Effective Pressure - lower mid cloud	hPa	0.0 .. 1100.0	4	32-Bit Float	3
FSW-201	Effective Temperature - lower mid cloud	K	100.0 .. 350.0	4	32-Bit Float	3
FSW-202	Effective Height - lower mid cloud	km	0.0 .. 20.0	4	32-Bit Float	3
FSW-203	Top Pressure - lower mid cloud	hPa	0.0 .. 1100.0	4	32-Bit Float	3
FSW-204	Bottom Pressure - lower mid cloud	hPa	0.0 .. 1100.0	4	32-Bit Float	3
FSW-205	Particle Phase - lower mid cloud	N/A	1.0 .. 2.0	4	32-Bit Float	3
FSW-206	Liquid Water Path - lower mid cloud	gm ⁻²	0.0 .. 10000.0	4	32-Bit Float	3
FSW-207	Ice Water Path - lower mid cloud	gm ⁻²	0.0 .. 10000.0	4	32-Bit Float	3
FSW-208	Liquid Particle Radius - lower mid cloud	μm	0.0 .. 40.0	4	32-Bit Float	3
FSW-209	Ice Particle Diameter - lower mid cloud	μm	0.0 .. 300.0	4	32-Bit Float	3
FSW-210	Vis. Opt. Depth (linear) - lower mid cloud	N/A	0.0 .. 400.0	4	32-Bit Float	3
FSW-211	Vis. Opt. Depth (log) - lower mid cloud	N/A	-6.0 .. 6.0	4	32-Bit Float	3
FSW-212	Infrared Emissivity - lower mid cloud	N/A	0.0 .. 2.0	4	32-Bit Float	3
FSW-213	Vertical Aspect Ratio - lower mid cloud	N/A	0.0 .. 20.0	4	32-Bit Float	3
FSW-214	Adj. Vis. Opt. Depth - lower mid cloud	N/A	-400.0 .. 400.0	3	32-Bit Float	1

Table 2.7-22. Cloud Layer - LowerMid (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-215	Adj. Fractional Area - lower mid cloud	N/A	-1 .. 1	3	32-Bit Float	1
FSW-216	Adj. Effective Temp. - lower mid cloud	K	TBD	3	32-Bit Float	1

Table 2.7-23. Cloud Layer - Low (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-217	Area Fraction Percentage - low cloud	percent	0.0 .. 100.0	3	32-Bit Float	1
FSW-218	Effective Pressure - low cloud	hPa	0.0 .. 1100.0	4	32-Bit Float	3
FSW-219	Effective Temperature - low cloud	K	100.0 .. 350.0	4	32-Bit Float	3
FSW-220	Effective Height - low cloud	km	0.0 .. 20.0	4	32-Bit Float	3
FSW-221	Top Pressure - low cloud	hPa	0.0 .. 1100.0	4	32-Bit Float	3
FSW-222	Bottom Pressure - low cloud	hPa	0.0 .. 1100.0	4	32-Bit Float	3
FSW-223	Particle Phase - low cloud	N/A	1.0 .. 2.0	4	32-Bit Float	3
FSW-224	Liquid Water Path - low cloud	gm ⁻²	0.0 .. 10000.0	4	32-Bit Float	3
FSW-225	Ice Water Path - low cloud	gm ⁻²	0.0 .. 10000.0	4	32-Bit Float	3
FSW-226	Liquid Particle Radius - low cloud	μm	0.0 .. 40.0	4	32-Bit Float	3
FSW-227	Ice Particle Diameter - low cloud	μm	0.0 .. 300.0	4	32-Bit Float	3
FSW-228	Vis. Opt. Depth (linear) - low cloud	N/A	0.0 .. 400.0	4	32-Bit Float	3
FSW-229	Vis. Opt. Depth (log) - low cloud	N/A	-6.0 .. 6.0	4	32-Bit Float	3
FSW-230	Infrared Emissivity - low cloud	N/A	0.0 .. 2.0	4	32-Bit Float	3
FSW-231	Vertical Aspect Ratio - low cloud	N/A	0.0 .. 20.0	4	32-Bit Float	3
FSW-232	Adj. Vis. Opt. Depth - low cloud	N/A	-400.0 .. 400.0	3	32-Bit Float	1
FSW-233	Adj. Fractional Area - low cloud	N/A	-1 .. 1	3	32-Bit Float	1
FSW-234	Adj. Effective Temp. - low cloud	K	TBD	3	32-Bit Float	1

Table 2.7-24. Constraintment - Adjustments (mean)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-235	Init. Precipitable H2O	cm	0 .. 10	3	32-Bit Float	1
FSW-236	Adj. Precipitable H2O	cm	-10 .. 10	3	32-Bit Float	1
FSW-237	Adj. Surface Albedo	N/A	-1 .. 1	3	32-Bit Float	1
FSW-238	Init. Aerosol Opt. Dep.	N/A	0 .. 2	3	32-Bit Float	1
FSW-239	Adj. Aerosol Opt. Dep.	N/A	-2 .. 2	3	32-Bit Float	1
FSW-240	Init. Skin Temperature	K	TBD	3	32-Bit Float	1
FSW-241	Adj. Skin Temperature	K	TBD	3	32-Bit Float	1

Table 2.7-25. Aerosol LAND

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-242	cor_optdepth047_land	N/A	0.0..5.0	3	32-Bit Float	1
FSW-243	cor_optdepth055_land	N/A	0.0..5.0	3	32-Bit Float	1
FSW-244	cor_optdepth066_land	N/A	0.0..5.0	3	32-Bit Float	1

Table 2.7-26. Aerosol OCEAN

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-245	eff_optdepth047_ocean	N/A	0.0..5.0	3	32-Bit Float	1
FSW-246	eff_optdepth055_ocean	N/A	0.0..5.0	3	32-Bit Float	1
FSW-247	eff_optdepth066_ocean	N/A	0.0..5.0	3	32-Bit Float	1
FSW-248	eff_optdepth087_ocean	N/A	0.0..5.0	3	32-Bit Float	1
FSW-249	eff_optdepth124_ocean	N/A	0.0..5.0	3	32-Bit Float	1
FSW-250	eff_optdepth164_ocean	N/A	0.0..5.0	3	32-Bit Float	1
FSW-251	eff_optdepth213_ocean	N/A	0.0..5.0	3	32-Bit Float	1

Table 2.7-27. Cloudy Skies with No Aerosols

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-252	SW flux - upward cloudy skies with no aerosol - TOA	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-253	SW flux - upward cloudy skies with no aerosol - surface	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-254	SW flux - downward cloudy skies with no aerosol - TOA	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-255	SW flux - downward cloudy skies with no aerosol - surface	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
FSW-256	LW flux - upward cloudy skies with no aerosol - TOA	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-257	LW flux - upward cloudy skies with no aerosol - surface	W m ⁻²	0.0 .. 850.0	4	32-Bit Float	3
FSW-258	LW flux - downward cloudy skies with no aerosol - TOA	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-259	LW flux - downward cloudy skies with no aerosol - surface	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
FSW-260	WN flux - upward cloudy skies with no aerosol - TOA	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-261	WN flux - upward cloudy skies with no aerosol - surface	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-262	WN flux - downward cloudy skies with no aerosol - TOA	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-263	WN flux - downward cloudy skies with no aerosol - surface	W m ⁻²	0.0 .. 370.0	4	32-Bit Float	3
FSW-264	SW flux adjustments at surface-upward-cloudy skies/no aerosol	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-265	SW flux adjustments at TOA-upward-cloudy skies/no aerosol	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-266	SW flux adjustments at surface-downward-cloudy skies/no aerosol	W m ⁻²	-1400.0 .. 1400.0	4	32-Bit Float	3
FSW-267	LW flux adjustments at surface-upward-cloudy skies/no aerosol	W m ⁻²	-600.0 .. 600.0	4	32-Bit Float	3
FSW-268	LW flux adjustments at surface-downward-cloudy skies/no aerosol	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-269	LW flux adjustments at TOA-upward-cloudy skies/no aerosol	W m ⁻²	-700.0 .. 700.0	4	32-Bit Float	3
FSW-270	WN flux adjustments at surface-upward-cloudy skies/no aerosol	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3

Table 2.7-27. Cloudy Skies with No Aerosols

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-271	WN flux adjustments at surface-downward- cloudy skies/no aerosol	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3
FSW-272	WN flux adjustments at TOA-upward-cloudy skies/ no aerosol	W m ⁻²	-50.0 .. 50.0	4	32-Bit Float	3

Table 2.7-28. Satellite Emulated Window Channel

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-273	WN flux - satellite emulated - TOA Total-Sky	W m ⁻²	2.0 .. 50.0	4	32-Bit Float	3
FSW-274	WN flux adjustment - satellite emulated - TOA Total-Sky	W m ⁻²	2.0 .. 50.0	4	32-Bit Float	3
FSW-275	WN flux - satellite emulated - TOA Clear-Sky	W m ⁻²	2.0 .. 50.0	4	32-Bit Float	3
FSW-276	WN flux adjustment - satellite emulated - TOA Clear-Sky	W m ⁻²	2.0 .. 50.0	4	32-Bit Float	3

Table 2.7-29. Aerosol Constituency Information

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Ele- ments
FSW-277	Aerosol Constituency Ratio	Percent	0.0 .. 100.0	4	32-Bit Float	7

FSW Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

FSW Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. 	All
02/07/03	R3V2	424	<ul style="list-style-type: none"> • Updated parameters in Regional Identification Data, Regional Imager Data. • Updated Angular model scene category. • Updated vdata sizes. • Added MODIS aerosols for land and Ocean. • Updated format to comply with standards. 	Tables 2.11-5, 2.11-7 Table 2.7-8 Table 2.7-3 Tables 2.7-21, 2.7-22 All
10/23/03	R3V3	476	<ul style="list-style-type: none"> • Added cloudy skies with no Aerosols. • Updated flux profile parameters. • Added Snow/Ice Percentage from Imager History parameter to Angular Model Scene type. • Updated format to comply with standards. 	Tables 2.7.3, 2.7-23 Tables 2.7-11 - 2.7-13 Table 2.7.8 All
10/23/03 01/28/04	R3V4	476 499	<ul style="list-style-type: none"> • Added two new columns to include SDS index numbers for TRMM & Terra. • Julian Time SDS data type is set to 64-bit. Added a note. • Added new tables for TRMM profile flux SDSs, since these names are defined differently for TRMM and Terra. • Updated units and range values. • Updated format to comply with standards. 	All Table 2.7.4 Tables 2.7.10 - 2.7.13 Tables 2.7.19 - 2.7.23 & 2.7.25 - 2.7.26 All
06/04/04	R4V1	530	<ul style="list-style-type: none"> • Deleted Snow/Ice Percentage from Imager History parameter to Angular Model Scene type. • Updated SDS Indices. • Deleted Terra SDS Index columns where ever SDS Indices are the same for TRMM, Terra and Aqua. Updated Column Titles. 	Table 2.7.8 Tables 2.7.9, 2.7.14 - 2.7.27 Tables 2.7.9, 2.7.8, 2.7.18 - 2.7.24

FSW Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
06/04/04 Cont'd.	R4V1	530	<ul style="list-style-type: none"> • Updated Terra SDS Indices. • Added product name in front of SDS index in the first column of the table. • Updated format to comply with standards. 	Tables 2.7.15 - 2.7.17, 2.7.25 - 2.7.27 Tables 2.7.4 - 2.7.27 All
02/07/05	R4V2	575	<ul style="list-style-type: none"> • Added Total-Sky and Clear-sky Satellite Emulated Window Channel parameters. • Added Aerosol Constituency Ratio Parameter. • Updated parameter names. • Updated sds sizes. • Updated format to comply with standards. 	Table 2.7.28 Table 2.7.29 Tables 2.7.14, 2.7.20 - 2.7.23 Table 2.7-3 All
02/07/06	R4V3	575	<ul style="list-style-type: none"> • Added Edition2A and Edition2B to the Product Version category Aqua. • The EOSDIS Product Code line was removed from the document. (6/17/2008) 	Sec. 2.7 Sec. 2.7

2.8 Monthly Gridded TOA/Surface Fluxes and Clouds (SFC)

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) archival data product contains hourly single satellite flux and cloud parameters averaged over regions in a 1.0-degree nested grid. The data are processed and written in local time. Input to the SFC Subsystem is the Single Scanner Footprint TOA/Surface Fluxes and 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. For TRMM, data will be organized onto eight SFC HDF files, each containing data for ten 1.0-degree equal-angle zones. For Terra and Aqua, data will be organized onto 36 SFC HDF files, each containing data for five 1.0-degree equal-angle zones. Each record contains spatially averaged data for an individual region. 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
- Imager Radiances Statistics
- Angular model scene classes
- Total-sky radiative fluxes at TOA and Surface
- Clear-sky radiative fluxes at TOA and Surface
- Surface Emissivity
- Cloud category properties for four cloud layers

A complete listing of metadata and science parameters for this data product can be found in [Tables 2.8-1](#) through [Table 2.8-17](#).

Level: 3

Frequency: 1/Month

Portion of Atmosphere Covered: TOA and Surface

Time Interval Covered:

File: Month

Record: Hour

Portion of Globe Covered:

File: Gridded Satellite Swath

Record: 1.0-Deg Equal-angle Region

Product Version:

TRMM:

Terra: Edition2B

Aqua: Edition1A

SFC Metadata

The CERES Baseline Header Metadata and the CERES_metadata Vdata are listed in [Appendix B](#). The SFC product-specific metadata parameters are listed in [Table 2.8-2](#).

Table 2.8-1. 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 2.8-2	1	2

Table 2.8-2. SFC Product-specific Metadata

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

SFC Science Data

All of the SFC science data are organized into various Vdata Structures, summarized in [Table 2.8-3](#). The TRMM SFC product parameter lists are summarized in [Table 2.8-4](#) through [Table 2.8-15](#) including the SDS number, the SDS name, the data type, the units, the range, and the number of Elements within each field. Terra and Aqua SFC science data contain an additional 10 MODIS aerosol SDS parameters, summarized in [Table 2.8-16](#) through [Table 2.8-17](#). The number of records per Vdata is defined as n where n varies for each file. Sizing estimates are based on TERRA sampling.

Table 2.8-3. SFC Vdata Summary

Vdata Name	Description Table	Records	Number of Fields	Vdata Size (MB)
Time and Position Data	Table 2.8-4	n	6	106.48
Regional Identification Data	Table 2.8-5	n	5	88.74
Surface Map and Full-Clear area Data	Table 2.8-6	n	6	443.69
Imager Radiances Statistics	Table 2.8-7	n	5	301.71
Angular Model Scene Type	Table 2.8-8	n	7	2147.47
TOA Fluxes (mean std num_obs)	Table 2.8-9	n	8	425.94
Surface Fluxes (mean std num_obs)	Table 2.8-10	n	18	958.37
Surface Emissivity	Table 2.8-11	n	2	35.49
Layer Cloud - HIGH (mean std num_obs)	Table 2.8-12	n	15	763.15
Layer Cloud - UPPERMID (mean std num_obs)	Table 2.8-13	n	15	763.15
Layer Cloud - LOWERMID (mean std num_obs)	Table 2.8-14	n	15	763.15

Table 2.8-3. SFC Vdata Summary

Vdata Name	Description Table	Records	Number of Fields	Vdata Size (MB)
Layer Cloud - LOW (mean std num_obs)	Table 2.8-15	n	15	763.15
Aerosol LAND	Table 2.8-16	n	3	53.24
Aerosol OCEAN	Table 2.8-17	n	7	124.23
Vdata TOTAL SIZE				7737.99

Table 2.8-4. Time and Position Data

TRMM Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-0	Julian Time	date	2 440 000.0 .. 2 480 000.0	3	32-Bit Float	1
SFC-1	Sun Colatitude	deg	0.0 .. 180.0	3	32-Bit Float	1
SFC-2	Sun Longitude	deg	0.0 .. 360.0	3	32-Bit Float	1
SFC-3	Relative Azimuth Angle	deg	0.0 .. 360.0	3	32-Bit Float	1
SFC-4	Cos. Solar Zenith Angle	N/A	0.0 .. 1.0	3	32-Bit Float	1
SFC-5	Spacecraft Zenith Angle	deg	0.0 .. 90.0	3	32-Bit Float	1

Table 2.8-5. Regional Identification Data

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-6	Region Number	N/A	1 .. 64800	3	32-Bit Float	1
SFC-7	Hour Box Number	N/A	1 .. 744	3	32-Bit Float	1
SFC-8	Num. Footprints in Region	N/A	1 .. 450	3	32-Bit Float	1
SFC-9	Colatitude	deg	1 .. 180	3	32-Bit Float	1
SFC-10	Longitude	deg	1 .. 360	3	32-Bit Float	1

Table 2.8-6. Surface Map and Full-Clear area Data

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-11	Alt. of Srf. above Sea	m	-1000.0 .. 10000.0	3	32-Bit Float	1
SFC-12	Surface Type Percentage	N/A	0.0 .. 100.0	4	32-Bit Float	20
SFC-13	Precipitable Water	cm	0.001 .. 10.0	3	32-Bit Float	1
SFC-14	Snow/Ice Percentage	N/A	0.0 .. 100.0	3	32-Bit Float	1
SFC-15	Aerosol Opt. Depth at 0.63um in clr	μm	-1.0 .. 5.0	3	32-Bit Float	1
SFC-16	Aerosol Opt. Depth at 1.6um in clr	μm	-1.0 .. 5.0	3	32-Bit Float	1

Table 2.8-7. Imager Radiances Statistics

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-17	Imager Viewing Zenith Angle	deg	0 .. 360	3	32-Bit Float	1
SFC-18	Imager Relative Azimuth. Angle	deg	0 .. 360	3	32-Bit Float	1
SFC-19	Imager Channel Central Wavelength	μm	0.4 .. 15.0	4	32-Bit Float	5
SFC-20	Imager Mean Radiances	W m ⁻² sr ⁻¹ μm ⁻¹	-1000 .. 1000	4	32-Bit Float	5
SFC-21	Imager Radiances over clear area	W m ⁻² sr ⁻¹ μm ⁻¹	-1000 .. 1000	4	32-Bit Float	5

Table 2.8-8. Angular Model Scene Type

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-22	Incident Solar Flux	N/A	0.0 .. 1400.0	3	32-Bit Float	1
SFC-23	Area Coverage	N/A	0.0 .. 100.0	4	32-Bit Float	20
SFC-24	SW Scene ID	N/A	0 .. 5000	4	32-Bit Float	20
SFC-25	Albedo (mean)	N/A	0.0 .. 1.0	4	32-Bit Float	20
SFC-26	Albedo (std)	N/A	0.0 .. 1.0	4	32-Bit Float	20
SFC-27	LW (mean)	W m ⁻²	0.0 .. 400.0	4	32-Bit Float	20

Table 2.8-8. Angular Model Scene Type

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-28	LW (std)	W m ⁻²	0.0 .. 400.0	4	32-Bit Float	20

Table 2.8-9. TOA Fluxes (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-29	SW TOA Clear-sky	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
SFC-30	LW TOA Clear-sky	W m ⁻²	0.0 .. 500.0	4	32-Bit Float	3
SFC-31	WN TOA Clear-sky	W m ⁻²	0.0 .. 200.0	4	32-Bit Float	3
SFC-32	ALB TOA Clear-sky	N/A	0.0 .. 1.0	4	32-Bit Float	3
SFC-33	SW TOA Total-Sky	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
SFC-34	LW TOA Total-Sky	W m ⁻²	0.0 .. 500.0	4	32-Bit Float	3
SFC-35	WN TOA Total-Sky	W m ⁻²	0.0 .. 200.0	4	32-Bit Float	3
SFC-36	ALB TOA Total-Sky	N/A	0.0 .. 1.0	4	32-Bit Float	3

Table 2.8-10. Surface Fluxes (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-37	SW SRF Model A Clear-Sky	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
SFC-38	LW SRF Model A Clear-Sky	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
SFC-39	WN SRF Model A Clear-Sky	W m ⁻²	0.0 .. 250.0	4	32-Bit Float	3
SFC-40	Net. SW SRF Model A Clear-Sky	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
SFC-41	Net. LW SRF Model A Clear-Sky	W m ⁻²	-250.0 .. 50.0	4	32-Bit Float	3
SFC-42	SW SRF Model B Clear-Sky	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
SFC-43	LW SRF Model B Clear-Sky	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
SFC-44	Net. SW SRF Model B Clear-Sky	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
SFC-45	Net. LW SRF Model B Clear-Sky	W m ⁻²	-250.0 .. 50.0	4	32-Bit Float	3
SFC-46	SW SRF Model A Total-Sky	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
SFC-47	LW SRF Model A Total-Sky	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
SFC-48	WN SRF Model A Total-Sky	W m ⁻²	0.0 .. 250.0	4	32-Bit Float	3

Table 2.8-10. Surface Fluxes (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-49	Net. SW SRF Model A Total-Sky	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
SFC-50	Net. LW SRF Model A Total-Sky	W m ⁻²	-250.0 .. 50.0	4	32-Bit Float	3
SFC-51	SW SRF Model B Total-Sky	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
SFC-52	LW SRF Model B Total-Sky	W m ⁻²	0.0 .. 700.0	4	32-Bit Float	3
SFC-53	Net. SW SRF Model B Total-Sky	W m ⁻²	0.0 .. 1400.0	4	32-Bit Float	3
SFC-54	Net. LW SRF Model B Total-Sky	W m ⁻²	-250.0 .. 50.0	4	32-Bit Float	3

Table 2.8-11. Surface Emissivity

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-55	LW Surface	N/A	0.0 .. 1.0	3	32-Bit Float	1
SFC-56	WN Surface	N/A	0.0 .. 1.0	3	32-Bit Float	1

Table 2.8-12. Layer Cloud - HIGH (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-57	Area Fraction Percentage	percent	0.0 .. 100.0	3	32-Bit Float	1
SFC-58	Effective Pressure	hPa	0.0 .. 1100.0	4	32-Bit Float	3
SFC-59	Effective Temperature	K	100.0 .. 350.0	4	32-Bit Float	3
SFC-60	Effective Height	km	0.0 .. 20.0	4	32-Bit Float	3
SFC-61	Top Pressure	hPa	0.0 .. 1100.0	4	32-Bit Float	3
SFC-62	Bottom Pressure	hPa	0.0 .. 1100.0	4	32-Bit Float	3
SFC-63	Particle Phase	N/A	1.0 .. 2.0	4	32-Bit Float	3
SFC-64	Liquid Water Path	g m ⁻²	0.0 .. 10000.0	4	32-Bit Float	3
SFC-65	Ice Water Path	g m ⁻²	0.0 .. 10000.0	4	32-Bit Float	3
SFC-66	Liquid Particle Radius	μm	0.0 .. 40.0	4	32-Bit Float	3
SFC-67	Ice Particle Diameter	μm	0.0 .. 300.0	4	32-Bit Float	3
SFC-68	Vis. Opt. Depth (linear)	N/A	0.0 .. 400.0	4	32-Bit Float	3
SFC-69	Vis. Opt. Depth (log)	N/A	-6.0 .. 6.0	4	32-Bit Float	3

Table 2.8-12. Layer Cloud - HIGH (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-70	Infrared Emissivity	N/A	0.0 .. 2.0	4	32-Bit Float	3
SFC-71	Vertical Aspect Ratio	N/A	0.0 .. 20.0	4	32-Bit Float	3

Table 2.8-13. Layer Cloud - UPPERMID (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-72	Area Fraction Percentage	N/A	0.0 .. 100.0	3	32-Bit Float	1
SFC-73	Effective Pressure	hPa	0.0 .. 1100.0	4	32-Bit Float	3
SFC-74	Effective Temperature	K	100.0 .. 350.0	4	32-Bit Float	3
SFC-75	Effective Height	km	0.0 .. 20.0	4	32-Bit Float	3
SFC-76	Top Pressure	hPa	0.0 .. 1100.0	4	32-Bit Float	3
SFC-77	Bottom Pressure	hPa	0.0 .. 1100.0	4	32-Bit Float	3
SFC-78	Particle Phase	N/A	1.0 .. 2.0	4	32-Bit Float	3
SFC-79	Liquid Water Path	g m ⁻²	0.0 .. 10000.0	4	32-Bit Float	3
SFC-80	Ice Water Path	g m ⁻²	0.0 .. 10000.0	4	32-Bit Float	3
SFC-81	Liquid Particle Radius	μm	0.0 .. 40.0	4	32-Bit Float	3
SFC-82	Ice Particle Effective Diameter	μm	0.0 .. 300.0	4	32-Bit Float	3
SFC-83	Vis. Opt. Depth (linear)	N/A	0.0 .. 400.0	4	32-Bit Float	3
SFC-84	Vis. Opt. Depth (log)	N/A	-6.0 .. 6.0	4	32-Bit Float	3
SFC-85	Infrared Emissivity	N/A	0.0 .. 2.0	4	32-Bit Float	3
SFC-86	Vertical Aspect Ratio	N/A	0.0 .. 20.0	4	32-Bit Float	3

Table 2.8-14. Layer Cloud - LOWERMID (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-87	Area Fraction Percentage	N/A	0.0 .. 100.0	3	32-Bit Float	1
SFC-88	Effective Pressure	hPa	0.0 .. 1100.0	4	32-Bit Float	3
SFC-89	Effective Temperature	K	100.0 .. 350.0	4	32-Bit Float	3
SFC-90	Effective Height	km	0.0 .. 20.0	4	32-Bit Float	3

Table 2.8-14. Layer Cloud - LOWERMID (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-91	Top Pressure	hPa	0.0 .. 1100.0	4	32-Bit Float	3
SFC-92	Cloud Base Pressure	hPa	0.0 .. 1100.0	4	32-Bit Float	3
SFC-93	Particle Phase	N/A	1.0 .. 2.0	4	32-Bit Float	3
SFC-94	Liquid Water Path	g m ²	0.0 .. 10000.0	4	32-Bit Float	3
SFC-95	Ice Water Path	g m ²	0.0 .. 10000.0	4	32-Bit Float	3
SFC-96	Liquid Particle Radius	μm	0.0 .. 40.0	4	32-Bit Float	3
SFC-97	Ice Particle Effective Diameter	μm	0.0 .. 300.0	4	32-Bit Float	3
SFC-98	Vis. Opt. Depth (linear)	N/A	0.0 .. 400.0	4	32-Bit Float	3
SFC-99	Vis. Opt. Depth (log)	N/A	-6.0 .. 6.0	4	32-Bit Float	3
SFC100	Infrared Emissivity	N/A	0.0 .. 2.0	4	32-Bit Float	3
SFC-101	Vertical Aspect Ratio	N/A	0.0 .. 20.0	4	32-Bit Float	3

Table 2.8-15. Layer Cloud - LOW (mean std num_obs)

TRMM/ Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-102	Area Fraction Percentage	N/A	0.0 .. 100.0	3	32-Bit Float	1
SFC-103	Effective Pressure	hPa	0.0 .. 1100.0	4	32-Bit Float	3
SFC-104	Effective Temperature	K	100.0 .. 350.0	4	32-Bit Float	3
SFC-105	Effective Height	km	0.0 .. 20.0	4	32-Bit Float	3
SFC-106	Top Pressure	hPa	0.0 .. 1100.0	4	32-Bit Float	3
SFC-107	Bottom Pressure	hPa	0.0 .. 1100.0	4	32-Bit Float	3
SFC-108	Particle Phase	N/A	1.0 .. 2.0	4	32-Bit Float	3
SFC-109	Liquid Water Path	g m ²	0.0 .. 10000.0	4	32-Bit Float	3
SFC-110	Ice Water Path	g m ²	0.0 .. 10000.0	4	32-Bit Float	3
SFC-111	Liquid Particle Radius	μm	0.0 .. 40.0	4	32-Bit Float	3
SFC-112	Ice Particle Effective Diameter	μm	0.0 .. 300.0	4	32-Bit Float	3
SFC-113	Vis. Opt. Depth (linear)	N/A	0.0 .. 400.0	4	32-Bit Float	3
SFC-114	Vis. Opt. Depth (log)	N/A	-6.0 .. 6.0	4	32-Bit Float	3
SFC-115	Infrared Emissivity	N/A	0.0 .. 2.0	4	32-Bit Float	3
SFC-116	Vertical Aspect Ratio	N/A	0.0 .. 20.0	4	32-Bit Float	3

Table 2.8-16. Aerosol LAND

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-117	cor_optdepth047_land	N/A	0.0 .. 5.0	3	32-Bit Float	1
SFC-118	cor_optdepth055_land	N/A	0.0 .. 5.0	3	32-Bit Float	1
SFC-119	cor_optdepth066_land	N/A	0.0 .. 5.0	3	32-Bit Float	1

Table 2.8-17. Aerosol OCEAN

Terra/ Aqua SDS Index	SDS Name / Parameter	Units	Range	SDS rank/ dim	Data Type	No. of Elements
SFC-120	eff_optdepth047_ocean	N/A	0.0 .. 5.0	3	32-Bit Float	1
SFC-121	eff_optdepth055_ocean	N/A	0.0 .. 5.0	3	32-Bit Float	1
SFC-122	eff_optdepth066_ocean	N/A	0.0 .. 5.0	3	32-Bit Float	1
SFC-123	eff_optdepth087_ocean	N/A	0.0 .. 5.0	3	32-Bit Float	1
SFC-124	eff_optdepth124_ocean	N/A	0.0 .. 5.0	3	32-Bit Float	1
SFC-125	eff_optdepth164_ocean	N/A	0.0 .. 5.0	3	32-Bit Float	1
SFC-126	eff_optdepth213_ocean	N/A	0.0 .. 5.0	3	32-Bit Float	1

SFC Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

SFC Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
5/29/02	R3V2	365	<ul style="list-style-type: none"> • Updated parameters in Regional Identification Data, Regional Imager Data. • Updated format to comply with standards. 	Tables 2.11-5 & 2.11-7 All
02/03/03	R3V3	388	<ul style="list-style-type: none"> • Updated vdata sizes. • Added MODIS aerosols for land and Ocean. • Updated format to comply with standards. 	Table 2.11-3 Tables 2.11-16 & 2.11-17 All
02/03/03	R3V4 R4V1	388	<ul style="list-style-type: none"> • Changed range of MOD04 effective optical depths from 0.0 .. 3.0 to 0.0 .. 5.0 based on changes to v003 MOD04 inputs starting with data date 01.Apr.2002. • Changed units of 10 ,11 in Layer Cloud category from mm to mm. • The revision and version numbers were changed at this time. • Updated format to comply with standards. 	Tables 2.11-16 & 2.11-17 Tables 2.11-12, 2.11-13, 2.11-14, 2.11-15 All All
10/29/03	R4V2	476	<ul style="list-style-type: none"> • Added Snow/Ice Percentage from Imager History parameter to Angular Model Scene type. • Updated format to comply with standards. 	Table 2.8.8 All
06/04/04	R4V3	530	<ul style="list-style-type: none"> • Deleted Snow/Ice Percentage from Imager History parameter to Angular Model Scene type. • Added product name in front of SDS index in the first column of the table. • Updated sds sizes. • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) 	Table 2.8.8 Tables 2.8.4 - 2.8.17 Table 2.8-3 All Sec. 2.8

2.9 Monthly Gridded Cloud Averages (ISCCP-D2like-Day/Nit)

The Monthly Gridded Cloud Averages (ISCCP-D2like-Day/Nit) archival data product contains 3-hourly (GMT based) monthly and monthly 1° gridded regional mean cloud properties as a function of 18 cloud types, similar to the [ISCCP D2](#) product, where the cloud properties are stratified by pressure, optical depth, and phase. There is a dataset for Terra-MODIS and Aqua-MODIS as well as a day and nighttime dataset. The retrievals and therefore the quality are different for each dataset. For the MODIS-based ISCCP-D2like products the cloud amounts for 42 cloud types, similar to the [ISCCP D1](#) product, are also available. Input to the Subsystem is the Single Scanner Footprint TOA/Surface Fluxes and Clouds (SSF) archival data product. Each ISCCP-D2like covers a single month swath from a single CERES instrument mounted on one satellite. The science data are Science Data Sets (SDSs) with multiple records. Each record contains spatially averaged data for an individual region. All Edition ISCCP-D2like HDF files from Terra/Aqua, GEO composite and merged products, will have the same structure and read program and will be different from this current Beta1 version.

The major categories of data output on the ISCCP-D2like-Day and ISCCP-D2like-Nit HDF files are as follows:

- D2like-Day/Nit 18 Cloud Types for monthly-3 hourly/monthly
- D1like-Day/Nit 42 Cloud Type Fractions

A complete listing of metadata and gridded science parameters for this data product can be found in [Table 2.9-1](#) through [Table 2.9-26](#).

Level: 3

Frequency: 1/Month

Portion of Atmosphere Covered: Surface and TOA

Time Interval Covered:

File: 1 Month

Record: 1 Month

Portion of Globe Covered:

File: Entire Global

Record: 1-Deg Regions

Product Version:

TRMM: N/A

Terra: Beta1

Aqua: Beta1

ISCCP-D2like-Day/Nit Metadata

The ISCCP-D2like-Day/Nit metadata are summarized in [Table 2.9-1](#). These metadata contain information that 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 2.9-1. ISCCP-D2like-Day/Nit 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 ISCCP-D2like science data are organized into the HDF Grid data type and are contained in one ISCCP-D2like HDF file, which are shown in [Table 2.9-2](#) to [Table 2.9-5](#). Each table contains a list of the parameters, including SDS index, SDS Name, data type, units, range, and number of elements within each field.

[Table 2.9-2](#) through [Table 2.9-5](#) contain the Vgroup listings following the HDF file structure.

[Table 2.9-6](#) through [Table 2.9-7](#) contain the SDS index numbers as a function of cloud property and are organized by the 18 D2 cloud types.

[Table 2.9-8](#) through [Table 2.9-9](#) contain the SDS index numbers as a function of cloud property and are organized by the 42 D1 cloud types.

Table 2.9-2. Temporal Vgroups

Vgroup Number	Vgroup Name	Monthly 3-Hourly Averages/ Monthly Averages
1	Monthly 3-Hourly Averages	See Table 2.9-3
2	Monthly Averages	See Table 2.9-3

Table 2.9-3. Vgroup Types

Vgroup Number	Vgroup Name	Monthly 3-Hourly Averages/ Monthly Averages
1	D2-like 18 Cloud Types	See Table 2.9-4
2	D1-like 42 Cloud Type Fractions	See Table 2.9-5

Table 2.9-4. ISCCP-D2like 18 Cloud Types

Vgroup Number	Vgroup Name	Monthly 3-Hourly Averages/ Monthly Averages
1	Cumulus (Low, Thin)	See Table 2.9-11
2	Stratocumulus (Low, Mid-thick)	See Table 2.9-12
3	Stratus (Low, Thick)	See Table 2.9-13
4	Alto cumulus (Mid, Thin)	See Table 2.9-14
5	Altostratus (Mid, Mid-thick)	See Table 2.9-15
6	Nimbostratus (Mid, Thick)	See Table 2.9-16
7	Cirrus (High, Thin)	See Table 2.9-17
8	Cirrostratus (High, Mid-thick)	See Table 2.9-18
9	Deep Convection (High, Thick)	See Table 2.9-19

Table 2.9-5. ISCCP-D1like 42 Cloud Type Fractions

Vgroup Number	Vgroup Name	Monthly 3-Hourly Averages/ Monthly Averages
1	10-180mb	See Table 2.9-20
2	180-310mb	See Table 2.9-21
3	310-440mb	See Table 2.9-22
4	440-560mb	See Table 2.9-23
5	560-680mb	See Table 2.9-24
6	680-800mb	See Table 2.9-25
7	800-1000mb	See Table 2.9-26

Table 2.9-6. Table of ISCCP-D2like 18 cloud types of the Monthly 3-Hourly Averages

SDS Index of each V Group number									Monthly 3-Hourly			
1	2	3	4	5	6	7	8	9	SDS Name	Data Type	Units	Range
00	18	36	54	72	90	108	126	144	Total Number Of Observations	32-Bit Float	N/A	N/A
01	19	37	55	73	91	109	127	145	Total Cloud Fraction	32-Bit Float	Percent	0.0 .. 100.0
02	20	38	56	74	92	110	128	146	Liquid Cloud Fraction	32-Bit Float	Percent	0.0 .. 100.0
03	21	39	57	75	93	111	129	147	Liquid Effective Pressure	32-Bit Float	hPa	0 .. 1100
04	22	40	58	76	94	112	130	148	Liquid Effective Temperature	32-Bit Float	K	100 .. 350
05	23	41	59	77	95	113	131	149	Liquid Optical Depth -	32-Bit Float	N/A	0 .. 400
06	24	42	60	78	96	114	132	150	Liquid Log Optical Depth	32-Bit Float	N/A	-6 .. 6
07	25	43	61	79	97	115	133	151	Liquid Water Path	32-bit Float	g m ⁻²	0 .. 10000
08	26	44	62	80	98	116	134	152	Liquid Water Particle Radius	32-bit Float	μm	0 .. 40
09	27	45	63	81	99	117	135	153	Liquid Infrared Emissivity	32-bit Float	N/A	0 .. 1
10	28	46	64	82	100	118	136	154	Ice Cloud Fraction	32-Bit Float	Percent	0.0 .. 100.0
11	29	47	65	83	101	119	137	155	Ice Effective Pressure	32-Bit Float	hPa	0 .. 1100
12	30	48	66	84	102	120	138	156	Ice Effective Temperature	32-Bit Float	K	100 .. 350
13	31	49	67	85	103	121	139	157	Ice Linear Optical Depth	32-Bit Float	N/A	0 .. 400
14	32	50	68	86	104	122	140	158	Ice Log Optical Depth	32-Bit Float	N/A	-6 .. 6
15	33	51	69	87	105	123	141	159	Ice Water Path	32-Bit Float	g m ⁻²	0 .. 10000
16	34	52	70	88	106	124	142	160	Ice Water Particle Diameter	32-Bit Float	μm	0 .. 300
17	35	53	71	89	107	125	143	161	Ice Infrared Emissivity	32-Bit Float	N/A	0 .. 1

Each monthly 3-hourly SDS index has 8*180*360 elements. See [Table 2.9-4](#) for the list of D2 Vgroup numbers. The 18 cloud types are the combination of the 9 Vgroups x cloud phase. See [Table 2.14-7](#) for a complete list of the 8 GMT-based monthly 3-hourly time indices (from ISCCP-D2like-GEO). See [Table 2.14-8](#) for the definition of the 180*360 regions (from ISCCP-D2like-GEO).

Red = Liquid Cloud Phase
 Blue = Ice Cloud Phase

Table 2.9-7. Table of D2 like 18 cloud types of the Monthly Averages

SDS Index of each V Group number									Monthly			
1	2	3	4	5	6	7	8	9	SDS Name	Data Type	Units	Range
183	201	219	237	255	273	291	309	327	Total Number Of Observations	32-Bit Float	N/A	N/A
184	202	220	238	256	274	292	310	328	Total Cloud Fraction	32-Bit Float	Percent	0.0 .. 100.0
185	203	221	239	257	275	293	311	329	Liquid Cloud Fraction	32-Bit Float	Percent	0.0 .. 100.0
186	204	222	240	258	276	294	312	330	Liquid Effective Pressure	32-Bit Float	hPa	0 .. 1100
187	205	223	241	259	277	295	313	331	Liquid Effective Temperature	32-Bit Float	K	100 .. 350
188	206	224	242	260	278	296	314	332	Liquid Optical Depth -	32-Bit Float	N/A	0 .. 400
189	207	225	243	261	279	297	315	333	Liquid Log Optical Depth	32-Bit Float	N/A	-6 .. 6
190	208	226	244	262	280	298	316	334	Liquid Water Path	32-bit Float	g m ⁻²	0 .. 10000
191	209	227	245	263	281	299	317	335	Liquid Water Particle Radius	32-bit Float	μm	0 .. 40
192	210	228	246	264	282	300	318	336	Liquid Infrared Emissivity	32-bit Float	N/A	0 .. 1
193	211	229	247	265	283	301	319	337	Ice Cloud Fraction	32-Bit Float	Percent	0.0 .. 100.0
194	212	230	248	266	284	302	320	338	Ice Effective Pressure	32-Bit Float	hPa	0 .. 1100
195	213	231	249	267	285	303	321	339	Ice Effective Temperature	32-Bit Float	K	100 .. 350
196	214	232	250	268	286	304	322	340	Ice Linear Optical Depth	32-Bit Float	N/A	0 .. 400
197	215	233	251	269	287	305	323	341	Ice Log Optical Depth	32-Bit Float	N/A	-6 .. 6
198	216	234	252	270	288	306	324	342	Ice Water Path	32-Bit Float	g m ⁻²	0 .. 10000
199	217	235	253	271	289	307	325	343	Ice Water Particle Diameter	32-Bit Float	μm	0 .. 300
200	218	236	254	272	290	308	326	344	Ice Infrared Emissivity	32-Bit Float	N/A	0 .. 1

Each monthly SDS index has 1*180*360 elements. See [Table 2.9-4](#) for the list of D2 Vgroup numbers. The 18 cloud types are the combination of the 9 Vgroups x cloud phase. See [Table 2.14-7](#) for a complete list of the 8 GMT-based monthly time indices (from ISCCP-D2like-GEO). See [Table 2.14-8](#) for a complete list of the 180*360 regions (from ISCCP-D2like-GEO).

Red = Liquid Cloud Phase
 Blue = Ice Cloud Phase

Table 2.9-8. Table of ISCCP-D1like 42 cloud types of the Monthly 3-Hourly Averages

SDS Index of each V Group number							Monthly 3-Hourly			
1	2	3	4	5	6	7	SDS Name	Data Type	Units	Range
162	165	168	171	174	177	180	Total Cloud Fraction	32-Bit Float	Percent	0.0 .. 100.0
163	166	169	172	175	178	181	Liquid Cloud Fraction	32-Bit Float	Percent	0.0 .. 100.0
164	167	170	162	176	179	182	Ice Cloud Fraction	32-Bit Float	Percent	0.0 .. 100.0

Each monthly 3-hourly SDS index has 8*6*180*360 elements. See [Table 2.9-5](#) for the list of D1 Vgroup numbers. The 42 cloud types are the combination of the 7 Vgroups x 6 optical depth indices. See [Table 2.9-10](#) for a complete list of optical depth indices. See [Table 2.14-7](#) for a complete list of the 8 GMT-based monthly 3-hourly time indices (from ISCCP-D2like-GEO). See [Table 2.14-8](#) for a complete list of the 180*360 regions (from ISCCP-D2like-GEO).

Table 2.9-9. Table of ISCCP-D1like 42 cloud types of the Monthly Averages

SDS Index of each V Group number							Monthly 3-Hourly			
1	2	3	4	5	6	7	SDS Name	Data Type	Units	Range
345	348	351	354	357	360	363	Total Cloud Fraction	32-Bit Float	Percent	0.0 .. 100.0
346	349	352	355	358	361	364	Liquid Cloud Fraction	32-Bit Float	Percent	0.0 .. 100.0
347	350	353	356	359	362	365	Ice Cloud Fraction	32-Bit Float	Percent	0.0 .. 100.0

Each monthly 3-hourly SDS index has 8*6*180*360 elements. See [Table 2.9-5](#) for the list of D1 Vgroup numbers. The 42 cloud types are the combination of the 7 Vgroups x 6 optical depth indices. See [Table 2.9-10](#) for a complete list of optical depth indices. See [Table 2.14-7](#) for a complete list of the 8-GMT based monthly time indices (from ISCCP-D2like-GEO). See [Table 2.14-8](#) for a complete list of the 180*360 regions (from ISCCP-D2like-GEO).

Table 2.9-10. List of the 6 optical depth indices used in Table 2.9-8 and Table 2.9-9

Optical depth index	Optical depth increment
1	0.02 – 1.27
2	1.27 - 3.55
3	3.55 – 9.38
4	9.38 – 22.63
5	22.63 – 60.36
6	60.36 – 378.65

Table 2.9-11. ISCCP-D2like Cloud Types - Cumulus (Low, Thin) Category

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
0	183	Number Of Observations - Cumulus - MH	Monthly Total Number Of Observations - Cumulus – M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
1	184	Total Cloud Fraction - Cumulus - MH	Total Cloud Fraction - Cumulus – M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
2	185	Liquid Cloud Fraction - Cumulus - MH	Liquid Cloud Fraction - Cumulus – M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
3	186	Liquid Effective Pressure - Cumulus - MH	Liquid Effective Pressure - Cumulus – M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
4	187	Liquid Effective Temperature - Cumulus - MH	Liquid Effective Temperature - Cumulus – M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
5	188	Liquid Linear Optical Depth - Cumulus - MH	Liquid Linear Optical Depth - Cumulus – M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
6	189	Liquid Log Optical Depth - Cumulus - MH	Liquid Log Optical Depth - Cumulus – M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
7	190	Liquid Water Path - Cumulus - MH	Liquid Water Path - Cumulus – M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
8	191	Liquid Water Particle Radius - Cumulus - MH	Liquid Water Particle Radius - Cumulus – M	32-bit Float	μm	0 .. 40	8*180 *360	1*180 *360
9	192	Liquid Infrared Emissivity - Cumulus - MH	Liquid Infrared Emissivity - Cumulus – M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360
10	193	Ice Cloud Fraction - Cumulus - MH	Ice Cloud Fraction - Cumulus – M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
11	194	Ice Effective Pressure - Cumulus - MH	Ice Effective Pressure - Cumulus – M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
12	195	Ice Effective Temperature - Cumulus - MH	Ice Effective Temperature - Cumulus – M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360

Table 2.9-11. ISCCP-D2like Cloud Types - Cumulus (Low, Thin) Category

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
13	196	Ice Linear Optical Depth - Cumulus - MH	Ice Linear Optical Depth - Cumulus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
14	197	Ice Log Optical Depth - Cumulus - MH	Ice Log Optical Depth - Cumulus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
15	198	Ice Water Path - Cumulus - MH	Ice Water Path - Cumulus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
16	199	Ice Water Particle Diameter - Cumulus - MH	Ice Water Particle Diameter - Cumulus - M	32-bit Float	μm	0 .. 300	8*180 *360	1*180 *360
17	200	Ice Infrared Emissivity - Cumulus - MH	Ice Infrared Emissivity - Cumulus - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360

Table 2.9-12. ISCCP-D2like Cloud Types - Stratocumulus (Low, Mid-thick) Category

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
18	201	Number Of Observations - Stratocumulus - MH	Monthly Total Number Of Observations - Stratocumulus - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
19	202	Total Cloud Fraction - Stratocumulus - MH	Total Cloud Fraction - Stratocumulus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
20	203	Liquid Cloud Fraction - Stratocumulus - MH	Liquid Cloud Fraction - Stratocumulus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
21	204	Liquid Effective Pressure - Stratocumulus - MH	Liquid Effective Pressure - Stratocumulus - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
22	205	Liquid Effective Temperature - Stratocumulus - MH	Liquid Effective Temperature - Stratocumulus - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
23	206	Liquid Linear Optical Depth - Stratocumulus - MH	Liquid Linear Optical Depth - Stratocumulus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
24	207	Liquid Log Optical Depth - Stratocumulus - MH	Liquid Log Optical Depth - Stratocumulus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
25	208	Liquid Water Path - Stratocumulus - MH	Liquid Water Path - Stratocumulus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
26	209	Liquid Water Particle Radius - Stratocumulus - MH	Liquid Water Particle Radius - Stratocumulus - M	32-bit Float	μm	0 .. 40	8*180 *360	1*180 *360
27	210	Liquid Infrared Emissivity - Stratocumulus - MH	Liquid Infrared Emissivity - Stratocumulus - M	32-bit Float		0 .. 1	8*180 *360	1*180 *360

Table 2.9-12. ISCCP-D2like Cloud Types - Stratocumulus (Low, Mid-thick) Category

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
28	211	Ice Cloud Fraction - Stratocumulus - MH	Ice Cloud Fraction - Stratocumulus - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
29	212	Ice Effective Pressure - Stratocumulus - MH	Ice Effective Pressure - Stratocumulus - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
30	213	Ice Effective Temperature - Stratocumulus - MH	Ice Effective Temperature - Stratocumulus - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
31	214	Ice Linear Optical Depth - Stratocumulus - MH	Ice Linear Optical Depth - Stratocumulus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
32	215	Ice Log Optical Depth - Stratocumulus - MH	Ice Log Optical Depth - Stratocumulus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
33	216	Ice Water Path - Stratocumulus - MH	Ice Water Path - Stratocumulus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
34	217	Ice Water Particle Diameter - Stratocumulus - MH	Ice Water Particle Diameter - Stratocumulus - M	32-bit Float	μm	0 .. 300	8*180 *360	1*180 *360
35	218	Ice Infrared Emissivity - Stratocumulus - MH	Ice Infrared Emissivity - Stratocumulus - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360

Table 2.9-13. ISCCP-D2like Cloud Types - Stratus (Low, Thick) Category

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
36	219	Number Of Observations - Stratus - MH	Monthly Total Number Of Observations - Stratus - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
37	220	Total Cloud Fraction - Stratus - MH	Total Cloud Fraction - Stratus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
38	221	Liquid Cloud Fraction - Stratus - MH	Liquid Cloud Fraction - Stratus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
39	222	Liquid Effective Pressure - Stratus - MH	Liquid Effective Pressure - Stratus - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
40	223	Liquid Effective Temperature - Stratus - MH	Liquid Effective Temperature - Stratus - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
41	224	Liquid Linear Optical Depth - Stratus - MH	Liquid Linear Optical Depth - Stratus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
42	225	Liquid Log Optical Depth - Stratus - MH	Liquid Log Optical Depth - Stratus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360

Table 2.9-13. ISCCP-D2like Cloud Types - Stratus (Low, Thick) Category

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
43	226	Liquid Water Path - Stratus - MH	Liquid Water Path - Stratus - M	32-bit Float	g m^{-2}	0 .. 10000	8*180 *360	1*180 *360
44	227	Liquid Water Particle Radius - Stratus - MH	Liquid Water Particle Radius - Stratus - M	32-bit Float	μm	0 .. 40	8*180 *360	1*180 *360
45	228	Liquid Infrared Emissivity - Stratus - MH	Liquid Infrared Emissivity - Stratus - M	32-bit Float		0 .. 1	8*180 *360	1*180 *360
46	229	Ice Cloud Fraction - Stratus - MH	Ice Cloud Fraction - Stratus - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
47	230	Ice Effective Pressure - Stratus - MH	Ice Effective Pressure - Stratus - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
48	231	Ice Effective Temperature - Stratus - MH	Ice Effective Temperature - Stratus - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
49	232	Ice Linear Optical Depth - Stratus - MH	Ice Linear Optical Depth - Stratus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
50	233	Ice Log Optical Depth - Stratus - MH	Ice Log Optical Depth - Stratus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
51	234	Ice Water Path - Stratus - MH	Ice Water Path - Stratus - M	32-bit Float	g m^{-2}	0 .. 10000	8*180 *360	1*180 *360
52	235	Ice Water Particle Diameter - Stratus - MH	Ice Water Particle Diameter - Stratus - M	32-bit Float	μm	0 .. 300	8*180 *360	1*180 *360
53	236	Ice Infrared Emissivity - Stratus - MH	Ice Infrared Emissivity - Stratus - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360

Table 2.9-14. ISCCP-D2like Cloud Types - Altocumulus (Mid, Thin) Category

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
54	237	Number Of Observations - Altocumulus - MH	Monthly Total Number Of Observations - Altocumulus - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
55	238	Total Cloud Fraction - Altocumulus - MH	Total Cloud Fraction - Altocumulus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
56	239	Liquid Cloud Fraction - Altocumulus - MH	Liquid Cloud Fraction - Altocumulus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
57	240	Liquid Effective Pressure - Altocumulus - MH	Liquid Effective Pressure - Altocumulus - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
58	241	Liquid Effective Temperature - Altocumulus - MH	Liquid Effective Temperature - Altocumulus - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
59	242	Liquid Linear Optical Depth - Altocumulus - MH	Liquid Linear Optical Depth - Altocumulus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
60	243	Liquid Log Optical Depth - Altocumulus - MH	Liquid Log Optical Depth - Altocumulus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
61	244	Liquid Water Path - Altocumulus - MH	Liquid Water Path - Altocumulus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
62	245	Liquid Water Particle Radius - Altocumulus - MH	Liquid Water Particle Radius - Altocumulus - M	32-bit Float	μm	0 .. 40	8*180 *360	1*180 *360
63	246	Liquid Infrared Emissivity - Altocumulus - MH	Liquid Infrared Emissivity - Altocumulus - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360
64	247	Ice Cloud Fraction - Altocumulus - MH	Ice Cloud Fraction - Altocumulus - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
65	248	Ice Effective Pressure - Altocumulus - MH	Ice Effective Pressure - Altocumulus - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
66	249	Ice Effective Temperature - Altocumulus - MH	Ice Effective Temperature - Altocumulus - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
67	250	Ice Linear Optical Depth - Altocumulus - MH	Ice Linear Optical Depth - Altocumulus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
68	251	Ice Log Optical Depth - Altocumulus - MH	Ice Log Optical Depth - Altocumulus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
69	252	Ice Water Path - Altocumulus - MH	Ice Water Path - Altocumulus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
70	253	Ice Water Particle Diameter - Altocumulus - MH	Ice Water Particle Diameter - Altocumulus - M	32-bit Float	μm	0 .. 300	8*180 *360	1*180 *360
71	254	Ice Infrared Emissivity - Altocumulus - MH	Ice Infrared Emissivity - Altocumulus - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360

Table 2.9-15. ISCCP-D2like Cloud Types - Altostratus (Mid, Mid-thick) Category

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
72	255	Number Of Observations - Altostratus - MH	Monthly Total Number Of Observations - Altostratus - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
73	256	Total Cloud Fraction - Altostratus - MH	Total Cloud Fraction - Altostratus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
74	257	Liquid Cloud Fraction - Altostratus - MH	Liquid Cloud Fraction - Altostratus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
75	258	Liquid Effective Pressure - Altostratus - MH	Liquid Effective Pressure - Altostratus - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
76	259	Liquid Effective Temperature - Altostratus - MH	Liquid Effective Temperature - Altostratus - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
77	260	Liquid Linear Optical Depth - Altostratus - MH	Liquid Linear Optical Depth - Altostratus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
78	261	Liquid Log Optical Depth - Altostratus - MH	Liquid Log Optical Depth - Altostratus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
79	262	Liquid Water Path - Altostratus - MH	Liquid Water Path - Altostratus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
80	263	Liquid Water Particle Radius - Altostratus - MH	Liquid Water Particle Radius - Altostratus - M	32-bit Float	μm	0 .. 40	8*180 *360	1*180 *360
81	264	Liquid Infrared Emissivity - Altostratus - MH	Liquid Infrared Emissivity - Altostratus - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360
82	265	Ice Cloud Fraction - Altostratus - MH	Ice Cloud Fraction - Altostratus - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
83	266	Ice Effective Pressure - Altostratus - MH	Ice Effective Pressure - Altostratus - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
84	267	Ice Effective Temperature - Altostratus - MH	Ice Effective Temperature - Altostratus - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
85	268	Ice Linear Optical Depth - Altostratus - MH	Ice Linear Optical Depth - Altostratus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
86	269	Ice Log Optical Depth - Altostratus - MH	Ice Log Optical Depth - Altostratus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
87	270	Ice Water Path - Altostratus - MH	Ice Water Path - Altostratus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
88	271	Ice Water Particle Diameter - Altostratus - MH	Ice Water Particle Diameter - Altostratus - M	32-bit Float	μm	0 .. 300	8*180 *360	1*180 *360
89	272	Ice Infrared Emissivity - Altostratus - MH	Ice Infrared Emissivity - Altostratus - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360

Table 2.9-16. ISCCP-D2like Cloud Types - Nimbostratus (Mid, Thick) Category

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
90	273	Number Of Observations - Nimbostratus - MH	Monthly Total Number Of Observations - Nimbostratus - M	32-Bit Float	N/A	N/A	8*180*360	1*180*360
91	274	Total Cloud Fraction - Nimbostratus - MH	Total Cloud Fraction - Nimbostratus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180*360	1*180*360
92	275	Liquid Cloud Fraction - Nimbostratus - MH	Liquid Cloud Fraction - Nimbostratus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180*360	1*180*360
93	276	Liquid Effective Pressure - Nimbostratus - MH	Liquid Effective Pressure - Nimbostratus - M	32-Bit Float	hPa	0 .. 1100	8*180*360	1*180*360
94	277	Liquid Effective Temperature - Nimbostratus - MH	Liquid Effective Temperature - Nimbostratus - M	32-Bit Float	K	100 .. 350	8*180*360	1*180*360
95	278	Liquid Linear Optical Depth - Nimbostratus - MH	Liquid Linear Optical Depth - Nimbostratus - M	32-Bit Float	N/A	0 .. 400	8*180*360	1*180*360
96	279	Liquid Log Optical Depth - Nimbostratus - MH	Liquid Log Optical Depth - Nimbostratus - M	32-Bit Float	N/A	-6 .. 6	8*180*360	1*180*360
97	280	Liquid Water Path - Nimbostratus - MH	Liquid Water Path - Nimbostratus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180*360	1*180*360
98	281	Liquid Water Particle Radius - Nimbostratus - MH	Liquid Water Particle Radius - Nimbostratus - M	32-bit Float	μm	0 .. 40	8*180*360	1*180*360
99	282	Liquid Infrared Emissivity - Nimbostratus - MH	Liquid Infrared Emissivity - Nimbostratus - M	32-bit Float	N/A	0 .. 1	8*180*360	1*180*360
100	283	Ice Cloud Fraction - Nimbostratus - MH	Ice Cloud Fraction - Nimbostratus - M	32-Bit Float	N/A	N/A	8*180*360	1*180*360
101	284	Ice Effective Pressure - Nimbostratus - MH	Ice Effective Pressure - Nimbostratus - M	32-Bit Float	hPa	0 .. 1100	8*180*360	1*180*360
102	285	Ice Effective Temperature - Nimbostratus - MH	Ice Effective Temperature - Nimbostratus - M	32-Bit Float	K	100 .. 350	8*180*360	1*180*360
103	286	Ice Linear Optical Depth - Nimbostratus - MH	Ice Linear Optical Depth - Nimbostratus - M	32-Bit Float	N/A	0 .. 400	8*180*360	1*180*360
104	287	Ice Log Optical Depth - Nimbostratus - MH	Ice Log Optical Depth - Nimbostratus - M	32-Bit Float	N/A	-6 .. 6	8*180*360	1*180*360
105	288	Ice Water Path - Nimbostratus - MH	Ice Water Path - Nimbostratus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180*360	1*180*360
106	289	Ice Water Particle Diameter - Nimbostratus - MH	Ice Water Particle Diameter - Nimbostratus - M	32-bit Float	μm	0 .. 300	8*180*360	1*180*360
107	290	Ice Infrared Emissivity - Nimbostratus - MH	Ice Infrared Emissivity - Nimbostratus - M	32-bit Float	N/A	0 .. 1	8*180*360	1*180*360

Table 2.9-17. ISCCP-D2like Cloud Types - Cirrus (High, Thin) Category

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
108	291	Number Of Observations - Cirrus - MH	Monthly Total Number Of Observations - Cirrus - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
109	292	Total Cloud Fraction - Cirrus - MH	Total Cloud Fraction - Cirrus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
110	293	Liquid Cloud Fraction - Cirrus - MH	Liquid Cloud Fraction - Cirrus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
111	294	Liquid Effective Pressure - Cirrus - MH	Liquid Effective Pressure - Cirrus - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
112	295	Liquid Effective Temperature - Cirrus - MH	Liquid Effective Temperature - Cirrus - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
113	296	Liquid Linear Optical Depth - Cirrus - MH	Liquid Linear Optical Depth - Cirrus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
114	297	Liquid Log Optical Depth - Cirrus - MH	Liquid Log Optical Depth - Cirrus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
115	298	Liquid Water Path - Cirrus - MH	Liquid Water Path - Cirrus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
116	299	Liquid Water Particle Radius - Cirrus - MH	Liquid Water Particle Radius - Cirrus - M	32-bit Float	µm	0 .. 40	8*180 *360	1*180 *360
117	300	Liquid Infrared Emissivity - Cirrus - MH	Liquid Infrared Emissivity - Cirrus - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360
118	301	Ice Cloud Fraction - Cirrus - MH	Ice Cloud Fraction - Cirrus - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
119	302	Ice Effective Pressure - Cirrus - MH	Ice Effective Pressure - Cirrus - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
120	303	Ice Effective Temperature - Cirrus - MH	Ice Effective Temperature - Cirrus - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
121	304	Ice Linear Optical Depth - Cirrus - MH	Ice Linear Optical Depth - Cirrus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
122	305	Ice Log Optical Depth - Cirrus - MH	Ice Log Optical Depth - Cirrus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
123	306	Ice Water Path - Cirrus - MH	Ice Water Path - Cirrus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
124	307	Ice Water Particle Diameter - Cirrus - MH	Ice Water Particle Diameter - Cirrus - M	32-bit Float	µm	0 .. 300	8*180 *360	1*180 *360
125	308	Ice Infrared Emissivity - Cirrus - MH	Ice Infrared Emissivity - Cirrus - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360

Table 2.9-18. ISCCP-D2like Cloud Types - Cirrostratus (High, Mid-thick) Category

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
126	309	Number Of Observations - Cirrostratus - MH	Monthly Total Number Of Observations - Cirrostratus - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
127	310	Total Cloud Fraction - Cirrostratus - MH	Total Cloud Fraction - Cirrostratus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
128	311	Liquid Cloud Fraction - Cirrostratus - MH	Liquid Cloud Fraction - Cirrostratus - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
129	312	Liquid Effective Pressure - Cirrostratus - MH	Liquid Effective Pressure - Cirrostratus - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
130	313	Liquid Effective Temperature - Cirrostratus - MH	Liquid Effective Temperature - Cirrostratus - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
131	314	Liquid Linear Optical Depth - Cirrostratus - MH	Liquid Linear Optical Depth - Cirrostratus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
132	315	Liquid Log Optical Depth - Cirrostratus - MH	Liquid Log Optical Depth - Cirrostratus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
133	316	Liquid Water Path - Cirrostratus - MH	Liquid Water Path - Cirrostratus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
134	317	Liquid Water Particle Radius - Cirrostratus - MH	Liquid Water Particle Radius - Cirrostratus - M	32-bit Float	μm	0 .. 40	8*180 *360	1*180 *360
135	318	Liquid Infrared Emissivity - Cirrostratus - MH	Liquid Infrared Emissivity - Cirrostratus - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360
136	319	Ice Cloud Fraction - Cirrostratus - MH	Ice Cloud Fraction - Cirrostratus - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
137	320	Ice Effective Pressure - Cirrostratus - MH	Ice Effective Pressure - Cirrostratus - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
138	321	Ice Effective Temperature - Cirrostratus - MH	Ice Effective Temperature - Cirrostratus - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
139	322	Ice Linear Optical Depth - Cirrostratus - MH	Ice Linear Optical Depth - Cirrostratus - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
140	323	Ice Log Optical Depth - Cirrostratus - MH	Ice Log Optical Depth - Cirrostratus - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
141	324	Ice Water Path - Cirrostratus - MH	Ice Water Path - Cirrostratus - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
142	325	Ice Water Particle Diameter - Cirrostratus - MH	Ice Water Particle Diameter - Cirrostratus - M	32-bit Float	μm	0 .. 300	8*180 *360	1*180 *360
143	326	Ice Infrared Emissivity - Cirrostratus - MH	Ice Infrared Emissivity - Cirrostratus - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360

Table 2.9-19. ISCCP-D2like Cloud Types - Deep Convection (High, Thick) Category

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
144	327	Number Of Observations - Deep Convection - MH	Monthly Total Number Of Observations - Deep Convection - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
145	328	Total Cloud Fraction - Deep Convection - MH	Total Cloud Fraction - Deep Convection - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
146	329	Liquid Cloud Fraction - Deep Convection - MH	Liquid Cloud Fraction - Deep Convection - M	32-Bit Float	Percent	0.0 .. 100.0	8*180 *360	1*180 *360
147	330	Liquid Effective Pressure - Deep Convection - MH	Liquid Effective Pressure - Deep Convection - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
148	331	Liquid Effective Temperature - Deep Convection - MH	Liquid Effective Temperature - Deep Convection - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
149	332	Liquid Linear Optical Depth - Deep Convection - MH	Liquid Linear Optical Depth - Deep Convection - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
150	333	Liquid Log Optical Depth - Deep Convection - MH	Liquid Log Optical Depth - Deep Convection - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
151	334	Liquid Water Path - Deep Convection - MH	Liquid Water Path - Deep Convection - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
152	335	Liquid Water Particle Radius - Deep Convection - MH	Liquid Water Particle Radius - Deep Convection - M	32-bit Float	μm	0 .. 40	8*180 *360	1*180 *360
153	336	Liquid Infrared Emissivity - Deep Convection - MH	Liquid Infrared Emissivity - Deep Convection - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360
154	337	Ice Cloud Fraction - Deep Convection - MH	Ice Cloud Fraction - Deep Convection - M	32-Bit Float	N/A	N/A	8*180 *360	1*180 *360
155	338	Ice Effective Pressure - Deep Convection - MH	Ice Effective Pressure - Deep Convection - M	32-Bit Float	hPa	0 .. 1100	8*180 *360	1*180 *360
156	339	Ice Effective Temperature - Deep Convection - MH	Ice Effective Temperature - Deep Convection - M	32-Bit Float	K	100 .. 350	8*180 *360	1*180 *360
157	340	Ice Linear Optical Depth - Deep Convection - MH	Ice Linear Optical Depth - Deep Convection - M	32-Bit Float	N/A	0 .. 400	8*180 *360	1*180 *360
158	341	Ice Log Optical Depth - Deep Convection - MH	Ice Log Optical Depth - Deep Convection - M	32-Bit Float	N/A	-6 .. 6	8*180 *360	1*180 *360
159	342	Ice Water Path - Deep Convection - MH	Ice Water Path - Deep Convection - M	32-bit Float	g m ⁻²	0 .. 10000	8*180 *360	1*180 *360
160	343	Ice Water Particle Diameter - Deep Convection - MH	Ice Water Particle Diameter - Deep Convection - M	32-bit Float	μm	0 .. 300	8*180 *360	1*180 *360
161	344	Ice Infrared Emissivity - Deep Convection - MH	Ice Infrared Emissivity - Deep Convection - M	32-bit Float	N/A	0 .. 1	8*180 *360	1*180 *360

Table 2.9-20. ISCCP-D1like 42 Cloud Type Fractions (10-180mb)

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
162	345	Total Cloud Area Fraction - (10-180mb) - MH	Total Cloud Area Fraction - (10-180mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180 *360	1*6*180 *360
163	346	Liquid Cloud Area Fraction - (10-180mb) - MH	Liquid Cloud Area Fraction - (10-180mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180 *360	1*6*180 *360
164	347	Ice Cloud Area Fraction - (10-180mb) - MH	Ice Cloud Area Fraction - (10-180mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180 *360	1*6*180 *360

Table 2.9-21. ISCCP-D1like 42 Cloud Type Fractions (180-310mb)

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
165	348	Total Cloud Area Fraction - (180-310mb) - MH	Total Cloud Area Fraction - (180-310mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180 *360	1*6*180 *360
166	349	Liquid Cloud Area Fraction - (180-310mb) - MH	Liquid Cloud Area Fraction - (180-310mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180 *360	1*6*180 *360
167	350	Ice Cloud Area Fraction - (180-310mb) - MH	Ice Cloud Area Fraction - (180-310mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180 *360	1*6*180 *360

Table 2.9-22. ISCCP-D1like 42 Cloud Type Fractions (310-440mb)

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
168	351	Total Cloud Area Fraction - (310-440mb) - MH	Total Cloud Area Fraction - (310-440mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180 *360	1*6*180 *360
169	352	Liquid Cloud Area Fraction - (310-440mb) - MH	Liquid Cloud Area Fraction - (310-440mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180 *360	1*6*180 *360
170	353	Ice Cloud Area Fraction - (310-440mb) - MH	Ice Cloud Area Fraction - (310-440mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180 *360	1*6*180 *360

Table 2.9-23. ISCCP-D1like 42 Cloud Type Fractions (440-560mb)

SDS index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
171	354	Total Cloud Area Fraction - (440-560mb) - MH	Total Cloud Area Fraction - (440-560mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180*360	1*6*180*360
172	355	Liquid Cloud Area Fraction - (440-560mb) - MH	Liquid Cloud Area Fraction - (440-560mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180*360	1*6*180*360
173	356	Ice Cloud Area Fraction - (440-560mb) - MH	Ice Cloud Area Fraction - (440-560mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180*360	1*6*180*360

Table 2.9-24. ISCCP-D1like 42 Cloud Type Fractions (560-680mb)

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
174	357	Total Cloud Area Fraction - (560-680mb) - MH	Total Cloud Area Fraction - (560-680mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180*360	1*6*180*360
175	358	Liquid Cloud Area Fraction - (560-680mb) - MH	Liquid Cloud Area Fraction - (560-680mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180*360	1*6*180*360
176	359	Ice Cloud Area Fraction - (560-680mb) - MH	Ice Cloud Area Fraction - (560-680mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180*360	1*6*180*360

Table 2.9-25. ISCCP-D1like 42 Cloud Type Fractions (680-800mb)

SDS Index		SDS Name					No. of Elements	
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M
177	360	Total Cloud Area Fraction - (680-800mb) - MH	Total Cloud Area Fraction - (680-800mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180*360	1*6*180*360
178	361	Liquid Cloud Area Fraction - (680-800mb) - MH	Liquid Cloud Area Fraction - (680-800mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180*360	1*6*180*360
179	362	Ice Cloud Area Fraction - (680-800mb) - MH	Ice Cloud Area Fraction - (680-800mb) - M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180*360	1*6*180*360

Table 2.9-26. ISCCP-D1like 42 Cloud Type Fractions (800-1000mb)

SDS Index		SDS Name				No. of Elements			
MH	M	Monthly 3-Hourly (MH)	Monthly (M)	Data Type	Units	Range	MH	M	
180	363	Total Cloud Area Fraction – (800-1000mb) – MH	Total Cloud Area Fraction – (800-1000mb) – M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180*360	1*6*180*360	
181	364	Liquid Cloud Area Fraction – (800-1000mb) – MH	Liquid Cloud Area Fraction – (800-1000mb) – M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180*360	1*6*180*360	
182	365	Ice Cloud Area Fraction – (800-1000mb) – MH	Ice Cloud Area Fraction – (800-1000mb) – M	32-Bit Float	Percent	0.0 .. 100.0	8*6*180*360	1*6*180*360	

Total Bits/Region Record: 82,944
Total Bytes/Region Record: 10,368
Total Records/File: 64,800
Total Bits/File: 5,374,771,200
Total Bytes/File: 671,846,400

ISCCP-D2like-Day/Nit Revision Record

The product Revision Record contains information pertaining to approved document changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The document authors are listed on the cover.

ISCCP-D2like-Day/Nit Revision Record

SCCR Approval Date	Release/ Version Number	SCCR Number	Description of Revision	Section(s) Affected
04-03-2008	R5V1	672	• Initial version.	All

2.10 Synoptic Radiative Fluxes and Clouds (SYN)

The Synoptic Radiative Fluxes and Clouds (SYN) product contains a day of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. The 1-degree regional flux at the hour of observation from the CERES FSW product and concurrent diurnal data from geostationary satellites are used to estimate the regional flux at 3-hour GMT based intervals. Also at 3-hour intervals are estimates of the adjusted (tuned) fluxes at the five atmospheric levels as defined by the CERES CRS product for both clear-sky and total-sky scenes, estimates of the average cloud parameters in four cloud height categories, and averaged cloud parameters.

The SYN contains the following apriori and observed input:

- Regional data
- Cloud category properties for four (low, lower middle, upper middle and high) cloud layers
- Observed CERES TOA clear-sky and all-sky fluxes
- MODIS based spectral aerosol optical depths

The SYN contains the following constrained (tuned) vertical flux profiles for both clear-sky and total-sky conditions evaluated at the TOA, 70mb, 200mb, 500mb, and surface:

- Longwave, Shortwave, and Window channels upward and downward.

The constrained (tuned) and initial (untuned) profiles for the following are included for pristine (clear-sky no-aerosol), clear-sky, total-sky-no-aerosol, and total-sky conditions:

- Longwave upward at the surface and TOA.
- Longwave downward at the surface.
- Shortwave upward at the surface and TOA.
- Shortwave downward at the surface.
- Window channel upward at the surface and TOA.
- Window channel downward at the surface.

The adjustments to the radiative transfer model input parameters between the initial and the constrained (adjusted) passes are also contained on the SYN. These parameters include:

- Surface albedo and skin temperature
- Total column precipitable water, upper tropospheric relative humidity, and column ozone
- Aerosol optical depth
- Cloud optical depth, fractional area, and effective temperature

The SYN contains the direct and diffuse shortwave surface fluxes for total-sky, clear-sky, pristine and actinic conditions. The SYN also contains surface UVA and UVB downwelling and direct diffuse ratios for total-sky, clear-sky, pristine, and total-sky-no-aerosol conditions.

Level: 3

Frequency: Every 3 Hours

Portion of Atmosphere Covered: Surface, Internal and TOA

Time Interval Covered:

File: 3 Hours

Record: 3 Hours

Portion of Globe Covered:

File: Entire Global

Record: 1 CERES region

Product Version:

TRMM: N/A

Terra: Beta5, Beta6, Edition2C, Edition2F

Aqua: Beta6, Edition2B, Edition2C

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](#). The SYN product-specific metadata parameters are listed in [Table 2.10-1](#) and the CRS_Header_Vdata parameters are listed in [Table 2.10-2](#).

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_Header Vdata	Table 2.10-2	1	25

Table 2.10-2. SYN_Header_Vdata

Item	Description	Units	Range	Elements	Bytes/Elem
SYN-H1	SYN ID	N/A	112 .. 200	1	4
SYN-H2	Julian Day	N/A	ASCII string	1	28
SYN-H3	MOA production date and time	N/A	ASCII string	1	24
SYN-H4	Synoptic SARB Version number	N/A	1 .. 26	1	2
SYN-H5	SYN production date and time	N/A	ASCII string	1	19

[Table 2.10-3](#) List of the Vgroups contained in the Monthly Hourly Averages and Monthly Averages Vgroups in AVG.

Table 2.10-3. Temporal Vgroups of SYN

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
1	Time and Position	See Table 2.10-4
2	Observed TOA Fluxes	See Table 2.10-5
3	Cloud Layer - High	See Table 2.10-6
4	Cloud Layer - UpperMid	See Table 2.10-6
5	Cloud Layer - LowerMid	See Table 2.10-6
6	Cloud Layer - Low	See Table 2.10-6
7	Stowe-Ignatov Aerosol Optical Depth	See Table 2.10-7
8	MODIS Aerosol Optical Depth	See Table 2.10-8
9	Tuned Pristine Fluxes	See Table 2.10-9
10	Tuned ClearSky Flux Profiles	See Table 2.10-10

Table 2.10-3. Temporal Vgroups of SYN

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
11	Tuned TotalSky-NoAerosol Fluxes	See Table 2.10-11
12	Tuned TotalSky Flux Profiles	See Table 2.10-12
13	Untuned Pristine Fluxes	See Table 2.10-13
14	Untuned ClearSky Fluxes	See Table 2.10-14
15	Untuned TotalSky-NoAerosol Fluxes	See Table 2.10-15
16	Untuned TotalSky Fluxes	See Table 2.10-16
17	Satellite Emulated WN TOA Fluxes	See Table 2.10-16
18	TOA Flux Error	See Table 2.10-17
19	Number of Hourboxes	See Table 2.10-17
20	Constrainment Adjustments	See Table 2.10-18
21	Surface SW Direct/Diffuse Fluxes	See Table 2.10-19
22	UVA - UVB Fluxes	See Table 2.10-20
23	PAR Fluxes	See Table 2.10-21
24	Pristine-Sky SW MultiStream Correction	See Table 2.10-22

SYN Scientific Data Sets

The SYN contains 223 Scientific Data Sets (SDS) which are parameter collections of one-degree regional data where the first dimension corresponds to the number of global regions, 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 regions becomes the last dimension and the first dimension is the number of parameters in the SDS. The SDSs are divided into tables which map to Vgroups of the same name. [Tables 2.10-4](#) to [Table 2.10-24](#) summarize the contents of each Vgroup and SDS contained within the SYN file. Product sizing information for the number of CERES regions, 64800, is given in [Table 2.10-25](#). Under the Dimensions column in the following tables the 8 refers to the 8 3-hourly GMT time increment in the daily file. Although the 3-hourly mean is an average of hourly computations only the mean is given (no standard deviation).

Table 2.10-4. Time and Position

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-0	Region number	N/A	1 .. 64800	8	32-bit integer
SYN-1	Colatitude	Degree	0 .. 180	8	32-bit real
SYN-2	Longitude	Degree	0 .. 360	8	32-bit real
SYN-3	Surface altitude above sea level	m	-1000 .. 10000	8	32-bit real
SYN-4	Surface type percent coverage	Percent	0 .. 100	8 x 20	32-bit real

Table 2.10-5. Observed TOA Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-5	SW TOA Total-Sky	W m ⁻²	0 .. 1400	8	32-bit real
SYN-6	LW TOA Total-Sky	W m ⁻²	0 .. 500	8	32-bit real
SYN-7	WN TOA Total-Sky	W m ⁻² μm ⁻¹	2 .. 50	8	32-bit real
SYN-8	SW TOA Clear-Sky	W m ⁻²	0 .. 1400	8	32-bit real
SYN-9	LW TOA Clear-Sky	W m ⁻²	0 .. 500	8	32-bit real
SYN-10	WN TOA Clear-Sky	W m ⁻² μm ⁻¹	2 .. 50	8	32-bit real

Table 2.10-6. Cloud Properties for Four Cloud Layers

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-11	Area Fraction Percentage	Percent	0 .. 100	8 x 4	32-bit real
SYN-12	Vis. Opt. Depth (linear)	N/A	0 .. 400	8 x 4	32-bit real
SYN-13	Vis. Opt. Depth (log)	N/A	-6 .. 6	8 x 4	32-bit real
SYN-14	Infrared Emissivity	N/A	0 .. 1	8 x 4	32-bit real
SYN-15	Liquid Water Path	g m ⁻²	0 .. 10000	8 x 4	32-bit real
SYN-16	Ice Water Path	g m ⁻²	0 .. 10000	8 x 4	32-bit real
SYN-17	Top Pressure	hPa	0 .. 1100	8 x 4	32-bit real
SYN-18	Effective Pressure	hPa	0 .. 1100	8 x 4	32-bit real
SYN-19	Effective Temperature	K	100 .. 350	8 x 4	32-bit real
SYN-20	Effective Height	km	0 .. 20	8 x 4	32-bit real
SYN-21	Bottom Pressure	hPa	0 .. 1100	8 x 4	32-bit real
SYN-22	Liquid Particle Radius	μm	0 .. 40	8 x 4	32-bit real
SYN-23	Ice Particle Diameter	μm	0 .. 300	8 x 4	32-bit real
SYN-24	Particle Phase	N/A	1 .. 2	8 x 4	32-bit real
SYN-25	Vertical Aspect Ratio	N/A	0 .. 20	8 x 4	32-bit real

Table 2.10-7. Stowe-Ignatov Aerosol Optical Depth

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-71	Aerosol visible optical depth - 0.63 μm	N/A	0 .. 5	8	32-bit real
SYN-72	Aerosol visible optical depth - 1.6 μm	N/A	0 .. 5	8	32-bit real

Table 2.10-8. MODIS Aerosol Optical Depth

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-73	Initial Aerosol Optical Depth	N/A	0 .. 5	8	32-bit real
SYN-74	Aerosol Opt. Depth at 0.47 μm in Land	N/A	0 .. 5	8	32-bit real
SYN-75	Aerosol Opt. Depth at 0.55 μm in Land	N/A	0 .. 5	8	32-bit real
SYN-76	Aerosol Opt. Depth at 0.66 μm in Land	N/A	0 .. 5	8	32-bit real
SYN-77	Aerosol Opt. Depth at 0.47 μm in Ocean	N/A	0 .. 5	8	32-bit real
SYN-78	Aerosol Opt. Depth at 0.55 μm in Ocean	N/A	0 .. 5	8	32-bit real
SYN-79	Aerosol Opt. Depth at 0.66 μm in Ocean	N/A	0 .. 5	8	32-bit real
SYN-80	Aerosol Opt. Depth at 0.87 μm in Ocean	N/A	0 .. 5	8	32-bit real
SYN-81	Aerosol Opt. Depth at 1.24 μm in Ocean	N/A	0 .. 5	8	32-bit real
SYN-82	Aerosol Opt. Depth at 1.64 μm in Ocean	N/A	0 .. 5	8	32-bit real
SYN-83	Aerosol Opt. Depth at 2.13 μm in Ocean	N/A	0 .. 5	8	32-bit real

Table 2.10-9. Tuned Pristine Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-84	Tuned Pristine SW Surface Up	W m^{-2}	0 .. 1400	8	32-bit real
SYN-85	Tuned Pristine SW Surface Down	W m^{-2}	0 .. 1400	8	32-bit real
SYN-86	Tuned Pristine SW TOA Up	W m^{-2}	0 .. 1400	8	32-bit real
SYN-87	Tuned Pristine LW Surface Up	W m^{-2}	0 .. 850	8	32-bit real
SYN-88	Tuned Pristine LW Surface Down	W m^{-2}	0 .. 700	8	32-bit real
SYN-89	Tuned Pristine LW TOA Up	W m^{-2}	0 .. 850	8	32-bit real
SYN-90	Tuned Pristine WN Surface Up	W m^{-2}	0 .. 370	8	32-bit real
SYN-91	Tuned Pristine WN Surface Down	W m^{-2}	0 .. 370	8	32-bit real
SYN-92	Tuned Pristine WN TOA Up	W m^{-2}	0 .. 370	8	32-bit real

Table 2.10-10. Tuned ClearSky Flux Profiles

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-93	Tuned Clear-Sky SW Up	W m^{-2}	0 .. 1400	8 x 5	32-bit real
SYN-94	Tuned Clear-Sky SW Down	W m^{-2}	0 .. 1400	8 x 5	32-bit real
SYN-95	Tuned Clear-Sky LW Up	W m^{-2}	0 .. 850	8 x 5	32-bit real
SYN-96	Tuned Clear-Sky LW Down	W m^{-2}	0 .. 700	8 x 5	32-bit real
SYN-97	Tuned Clear-Sky WN Up	W m^{-2}	0 .. 370	8 x 5	32-bit real
SYN-98	Tuned Clear-Sky WN Down	W m^{-2}	0 .. 370	8 x 5	32-bit real

Table 2.10-11. Tuned TotalSky-NoAerosol Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-99	Tuned Total-Sky-NoAerosol SW Surface Up	W m ⁻²	0 .. 1400	8	32-bit real
SYN-100	Tuned Total-Sky-NoAerosol SW Surface Down	W m ⁻²	0 .. 1400	8	32-bit real
SYN-101	Tuned Total-Sky-NoAerosol SW TOA Up	W m ⁻²	0 .. 1400	8	32-bit real
SYN-102	Tuned Total-Sky-NoAerosol LW Surface Up	W m ⁻²	0 .. 850	8	32-bit real
SYN-103	Tuned Total-Sky-NoAerosol LW Surface Down	W m ⁻²	0 .. 700	8	32-bit real
SYN-104	Tuned Total-Sky-NoAerosol LW TOA Up	W m ⁻²	0 .. 850	8	32-bit real
SYN-105	Tuned Total-Sky-NoAerosol WN Surface Up	W m ⁻²	0 .. 370	8	32-bit real
SYN-106	Tuned Total-Sky-NoAerosol WN Surface Down	W m ⁻²	0 .. 370	8	32-bit real
SYN-107	Tuned Total-Sky-NoAerosol WN TOA Up	W m ⁻²	0 .. 370	8	32-bit real

Table 2.10-12. Tuned TotalSky Flux Profiles

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-108	Tuned Total-Sky SW Up	W m ⁻²	0 .. 1400	8 x 5	32-bit real
SYN-109	Tuned Total-Sky SW Down	W m ⁻²	0 .. 1400	8 x 5	32-bit real
SYN-110	Tuned Total-Sky LW Up	W m ⁻²	0 .. 850	8 x 5	32-bit real
SYN-111	Tuned Total-Sky LW Down	W m ⁻²	0 .. 700	8 x 5	32-bit real
SYN-112	Tuned Total-Sky WN Up	W m ⁻²	0 .. 370	8 x 5	32-bit real
SYN-113	Tuned Total-Sky WN Down	W m ⁻²	0 .. 370	8 x 5	32-bit real

Table 2.10-13. Untuned Pristine Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-114	Untuned Pristine SW Surface Up	W m ⁻²	0 .. 1500	8	32-bit real
SYN-115	Untuned Pristine SW Surface Down	W m ⁻²	0 .. 1500	8	32-bit real
SYN-116	Untuned Pristine SW TOA Up	W m ⁻²	0 .. 1400	8	32-bit real
SYN-117	Untuned Pristine LW Surface Up	W m ⁻²	0 .. 850	8	32-bit real

Table 2.10-13. Untuned Pristine Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-118	Untuned Pristine LW Surface Down	W m ⁻²	0 .. 700	8	32-bit real
SYN-119	Untuned Pristine LW TOA Up	W m ⁻²	0 .. 850	8	32-bit real
SYN-120	Untuned Pristine WN Surface Up	W m ⁻²	0 .. 370	8	32-bit real
SYN-121	Untuned Pristine WN Surface Down	W m ⁻²	0 .. 370	8	32-bit real
SYN-122	Untuned Pristine WN TOA Up	W m ⁻²	0 .. 370	8	32-bit real

Table 2.10-14. Untuned ClearSky Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-123	Untuned Clear-Sky SW Surface Up	W m ⁻²	0 .. 1400	8	32-bit real
SYN-124	Untuned Clear-Sky SW Surface Down	W m ⁻²	0 .. 1400	8	32-bit real
SYN-125	Untuned Clear-Sky SW TOA Up	W m ⁻²	0 .. 1400	8	32-bit real
SYN-126	Untuned Clear-Sky LW Surface Up	W m ⁻²	0 .. 850	8	32-bit real
SYN-127	Untuned Clear-Sky LW Surface Down	W m ⁻²	0 .. 700	8	32-bit real
SYN-128	Untuned Clear-Sky LW TOA Up	W m ⁻²	0 .. 850	8	32-bit real
SYN-129	Untuned Clear-Sky WN Surface Up	W m ⁻²	0 .. 370	8	32-bit real
SYN-130	Untuned Clear-Sky WN Surface Down	W m ⁻²	0 .. 370	8	32-bit real
SYN-131	Untuned Clear-Sky WN TOA Up	W m ⁻²	0 .. 370	8	32-bit real

Table 2.10-15. Untuned TotalSky-NoAerosol Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-132	Untuned Total-Sky SW Surface Up	W m ⁻²	0 .. 1400	8	32-bit real
SYN-133	Untuned Total-Sky SW Surface Down	W m ⁻²	0 .. 1400	8	32-bit real
SYN-134	Untuned Total-Sky SW TOA Up	W m ⁻²	0 .. 1400	8	32-bit real
SYN-135	Untuned Total-Sky LW Surface Up	W m ⁻²	0 .. 850	8	32-bit real
SYN-136	Untuned Total-Sky LW Surface Down	W m ⁻²	0 .. 700	8	32-bit real
SYN-137	Untuned Total-Sky LW TOA Up	W m ⁻²	0 .. 850	8	32-bit real
SYN-138	Untuned Total-Sky WN Surface Up	W m ⁻²	0 .. 370	8	32-bit real
SYN-139	Untuned Total-Sky WN Surface Down	W m ⁻²	0 .. 370	8	32-bit real
SYN-140	Untuned Total-Sky WN TOA Up	W m ⁻²	0 .. 370	8	32-bit real

Table 2.10-16. Untuned TotalSky Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-141	Untuned Total-Sky SW Surface Up	W m ⁻²	0 .. 1400	8	32-bit real
SYN-142	Untuned Total-Sky SW Surface Down	W m ⁻²	0 .. 1400	8	32-bit real
SYN-143	Untuned Total-Sky SW TOA Up	W m ⁻²	0 .. 1400	8	32-bit real
SYN-144	Untuned Total-Sky LW Surface Up	W m ⁻²	0 .. 850	8	32-bit real
SYN-145	Untuned Total-Sky LW Surface Down	W m ⁻²	0 .. 700	8	32-bit real
SYN-146	Untuned Total-Sky LW TOA Up	W m ⁻²	0 .. 850	8	32-bit real
SYN-147	Untuned Total-Sky WN Surface Up	W m ⁻²	0 .. 370	8	32-bit real
SYN-148	Untuned Total-Sky WN Surface Down	W m ⁻²	0 .. 370	8	32-bit real
SYN-149	Untuned Total-Sky WN TOA Up	W m ⁻²	0 .. 370	8	32-bit real

Table 2.10-17. Satellite Emulated WN TOA Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-150	Untuned Satellite Emulated WN TOA	W m ⁻²	50 .. 400	8	32-bit real
SYN-151	Tuned Satellite Emulated WN TOA	W m ⁻²	50 .. 400	8	32-bit real

Table 2.10-18. TOA Flux Error

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-152	Tuned Minus Observed SW TOA	W m ⁻²	-1400 .. 1400	8	32-bit real
SYN-153	Untuned Minus Observed SW TOA	W m ⁻²	-1400 .. 1400	8	32-bit real
SYN-154	Tuned Minus Observed LW TOA	W m ⁻²	-600 .. 600	8	32-bit real
SYN-155	Untuned Minus Observed LW TOA	W m ⁻²	-600 .. 600	8	32-bit real

Table 2.10-19. Number of Hourboxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-156	Number of Observed SW	N/A	1 .. 744	8	32-bit real
SYN-157	Number of Untuned SW	N/A	1 .. 744	8	32-bit real
SYN-158	Number of Tuned SW	N/A	1 .. 744	8	32-bit real
SYN-159	Number of Observed LW	N/A	1 .. 744	8	32-bit real

Table 2.10-19. Number of Hourboxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-160	Number of Untuned LW	N/A	1 .. 744	8	32-bit real
SYN-161	Number of Tuned LW	N/A	1 .. 744	8	32-bit real

Table 2.10-20. Constraint Adjustments

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-162	Total column precipitable water - initial	cm	0 .. 10	8	32-bit real
SYN-163	Total column precipitable water - adjusted	cm	-10 .. 10	8	32-bit real
SYN-164	Upper tropospheric precipitable water - initial	cm	0 .. 10	8	32-bit real
SYN-165	Upper tropospheric precipitable water - adjusted	cm	0 .. 10	8	32-bit real
SYN-166	Upper tropospheric humidity - initial	N/A	0.0 .. 100.0	8	32-bit real
SYN-167	Upper tropospheric humidity - adjusted	N/A	0.0 .. 100.0	8	32-bit real
SYN-168	Corrected initial broadband surface albedo	N/A	0.0 .. 1.0	8	32-bit real
SYN-169	Surface albedo - adjusted	N/A	0 .. 1	8	32-bit real
SYN-170	Aerosol optical depth - initial	N/A	0 .. 5	8	32-bit real
SYN-171	Aerosol optical depth - adjusted	N/A	0 .. 5	8	32-bit real
SYN-172	Skin temperature - initial	K	175 .. 375	8	32-bit real
SYN-173	Skin temperature - adjusted	K	175 .. 375	8	32-bit real
SYN-174	Surface pressure	hPa	0 .. 800	8	32-bit real
SYN-175	Column ozone - initial	du	0 .. 800	8	32-bit real
SYN-176	Column ozone - Flag source	N/A	0 .. 3	8	32-bit integer
SYN-177	Mean visible optical depth - adjusted	N/A	0 .. 400	8	32-bit real
SYN-178	Mean cloud fractional area - adjusted	%	0 .. 1	8	32-bit real
SYN-179	Mean cloud effective temperature - adjusted	K	175 .. 375	8	32-bit real

Table 2.10-21. Surface SW Direct/Diffuse Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-180	Total-Sky SW flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-181	Clear-Sky SW flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-182	Pristine-Sky SW flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-183	Actinic-Sky SW flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-184	Total-Sky SW flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-185	Clear-Sky SW flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-186	Pristine-Sky SW flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-187	Actinic-Sky SW flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real

Table 2.10-22. UVA - UVB Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-188	TOA Downwelling UVB Flux	W m ⁻²	0 .. 1400	8	32-bit real
SYN-189	TOA Downwelling UVA Flux	W m ⁻²	0 .. 1400	8	32-bit real
SYN-190	Pristine UVB Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-191	Pristine UVB Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-192	Pristine UVA Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-193	Pristine UVA Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-194	Clear-Sky UVB Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-195	Clear-Sky UVB Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-196	Clear-Sky UVA Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-197	Clear-Sky UVA Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-198	Total-Sky-NoAerosol UVB Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-199	Total-Sky-NoAerosol UVB Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-200	Total-Sky-NoAerosol UVA Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-201	Total-Sky-NoAerosol UVA Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-202	Total-Sky UVB Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-203	Total-Sky UVB Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real

Table 2.10-22. UVA - UVB Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-204	Total-Sky UVA Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-205	Total-Sky UVA Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-206	Total-Sky Surface UV Index	N/A	0 .. 30	8	32-bit real
SYN-207	Clear-Sky Surface UV Index	N/A	0 .. 30	8	32-bit real
SYN-208	Pristine Surface UV Index	N/A	0 .. 30	8	32-bit real
SYN-209	Total-Sky-NoAerosol Surface UV Index	N/A	0 .. 30	8	32-bit real
SYN-210	Total-Sky UVB Surface Up	W m ⁻²	0 .. 5	8	32-bit real
SYN-211	Snow Grain Size	μm	50 .. 2000	8	32-bit real
SYN-212	Match Total Aerosol Optical Depth at 0.55 μm	N/A	0 .. 10	8	32-bit real

Table 2.10-23. PAR Fluxes

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-213	TOA Downwelling PAR Flux	W m ⁻²	0 .. 1400	8	32-bit real
SYN-214	Total-Sky PAR Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-215	Total-Sky PAR Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-216	Total-Sky PAR PURV Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-217	Total-Sky PAR PURV Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-218	Total-Sky PAR ChlorA Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-219	Total-Sky PAR ChlorA Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-220	Clear-Sky PAR Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-221	Clear-Sky PAR Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real
SYN-222	Pristine PAR Surface flux - Direct	W m ⁻²	0 .. 1400	8	32-bit real
SYN-223	Pristine PAR Surface flux - Diffuse	W m ⁻²	0 .. 1400	8	32-bit real

Table 2.10-24. Pristine-Sky SW MultiStream Correction

SDS Index	SDS Name	Units	Range	Dimensions	Data Type
SYN-224	SW TOA Flux - Up - Pristine-Sky - Corrected	W m ⁻²	0 .. 1000	8	32-bit real
SYN-225	SW Surface Flux - Down - Pristine-Sky - Corrected	W m ⁻²	0 .. 1000	8	32-bit real

Table 2.10-25. Sizing Information

Data Quantity	Size (MB)
Daily TOTAL SYN Size	596
Monthly TOTAL SYN Size	18476

SYN Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

SYN Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> Updated format to comply with standards. 	All
N/A	R3V2	639	<ul style="list-style-type: none"> Updated to change all tables and added the SDS Index tables. The EOSDIS Product Code line was removed from the document. (6/17/2008) 	All Sec. 2.9
			<ul style="list-style-type: none"> Updated to add three parameters and changed the SDS Index tables. Section numbering was changed due to insertion of the ISCCP D2-like DPC. (09/23/2008) 	Tables 2.9-22, 2.9-23, 2.9-24 All
11/12/08	R5V1	689	<ul style="list-style-type: none"> Updated "Product Version" category. Removed Beta3 from "Product Version" category. (11/17/2008) Corrected the Terra and Aqua product versions. (12/08/2008) Corrected the Terra and Aqua product versions. (12/16/2008) 	Sec. 2.10 Sec. 2.10 Sec. 2.10 Sec. 2.10

2.11 Monthly Regional Radiative Fluxes and Clouds (AVG)

The monthly Regional Radiative and Clouds (AVG) product contains monthly and monthly hourly (3-hour) averages of the Synoptic Radiative Fluxes and Clouds (SYN) product. This product is the CERES equivalent of the monthly regional averages in the ERBE ES-4 product of the CERES untuned and tuned radiative transfer modeled fluxes. This product is written in HDF_EOS and contains meta data as well as gridded science data.

The AVG contains the following apriori and observed input:

- Regional data
- Cloud category properties for four (low, lower middle, upper middle and high) cloud layers
- Observed CERES TOA clear-sky and all-sky fluxes
- MODIS based spectral aerosol optical depths

The AVG contains the following constrained (tuned) vertical flux profiles for both clear-sky and total-sky conditions evaluated at the TOA, 70mb, 200mb, 500mb, and surface:

- Longwave, Shortwave, and Window channels upward and downward.

The constrained (tuned) and initial (untuned) profiles for the following are included for pristine (clear-sky no-aerosol), clear-sky, total-sky-no-aerosol, and total-sky conditions:

- Longwave upward at the surface and TOA.
- Longwave downward at the surface.
- Shortwave upward at the surface and TOA.
- Shortwave downward at the surface.
- Window channel upward at the surface and TOA.
- Window channel downward at the surface.

The adjustments to the radiative transfer model input parameters between the initial and the constrained (adjusted) passes are also contained on the AVG. These parameters include:

- Surface albedo and skin temperature
- Total column precipitable water, upper tropospheric relative humidity, and column ozone
- Aerosol optical depth
- Cloud optical depth, fractional area, and effective temperature

The AVG contains the direct and diffuse shortwave surface fluxes for total-sky, clear-sky, pristine and actinic conditions. The AVG also contains surface UVA and UVB downwelling and direct diffuse ratios for total-sky, clear-sky, pristine, and total-sky-no-aerosol conditions.

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

Frequency: 1/Month

Portion of Atmosphere Covered: Surface to TOA

Time Interval Covered:

File: 1 Month

Record: 1 Month

Portion of Globe Covered:

File: Entire Global

Record: 1.0-Deg Regions

Product Version:

TRMM: N/A

Terra: Beta5, Beta6, Edition2C, Edition2F

Aqua: Beta6, Edition2B, Edition2C

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 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

[Table 2.11-2](#) List of the Vgroups contained in 1.0 Degree Regional Vgroups.

Table 2.11-2. Temporal Vgroups of AVG

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
1	Monthly Hourly Averages	See Table 2.11-3
2	Monthly Averages	See Table 2.11-3

[Table 2.10-3](#) List of the Vgroups contained in the Monthly Hourly Averages and Monthly Averages Vgroups in AVG.

Table 2.11-3. Temporal Vgroups of AVG

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
1	Time and Position	See Table 2.11-4(a) & (b)
2	Observed TOA Fluxes	See Table 2.11-5(a) & (b)
3	Cloud Layer - High	See Table 2.11-6(a) & (b)
4	Cloud Layer - UpperMid	See Table 2.11-6(a) & (b)
5	Cloud Layer - LowerMid	See Table 2.11-6(a) & (b)
6	Cloud Layer - Low	See Table 2.11-6(a) & (b)
7	Stowe-Ignatov Aerosol Optical Depth	See Table 2.11-7(a) & (b)
8	MODIS Aerosol Optical Depth	See Table 2.11-8(a) & (b)
9	Tuned Pristine Fluxes	See Table 2.11-9(a) & (b)
10	Tuned ClearSky Flux Profiles	See Table 2.11-10(a) & (b)
11	Tuned TotalSky-NoAerosol Fluxes	See Table 2.11-11(a) & (b)
12	Tuned TotalSky Flux Profiles	See Table 2.11-12(a) & (b)
13	Untuned Pristine Fluxes	See Table 2.11-13(a) & (b)
14	Untuned ClearSky Fluxes	See Table 2.11-14(a) & (b)
15	Untuned TotalSky-NoAerosol Fluxes	See Table 2.11-15(a) & (b)
16	Untuned TotalSky Fluxes	See Table 2.11-16(a) & (b)

Table 2.11-3. Temporal Vgroups of AVG

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
17	Satellite Emulated WN TOA Fluxes	See Table 2.11-17(a) & (b)
18	TOA Flux Error	See Table 2.11-18(a) & (b)
19	Number of Hourboxes	See Table 2.11-19(a) & (b)
20	Constraintment Adjustments	See Table 2.11-20(a) & (b)
21	Surface SW Direct/Diffuse Fluxes	See Table 2.11-21(a) & (b)
22	UVA - UVB Fluxes	See Table 2.11-22(a) & (b)
23	PAR Fluxes	See Table 2.11-23(a) & (b)
24	Pristine-Sky SW MultiStream Correction	See Table 2.11-24(a) & (b)

AVG Science Data

All of the AVG science data are organized into the HDF-EOS Grid data type, which is shown in [Table 2.11-4\(a\)](#) & (b) 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 elements within each field. The 18 under the Dimensions column in the following tables the 18 refers to 9 = 8 monthly hourly (3-hour GMT based) + 1 monthly regional x 2 mean and standard deviation.

Table 2.11-4(a). Time and Position

SDS Name	Units	Range	Dimensions	Data Type
Region number	N/A	1 .. 64800	1	32-bit integer
Colatitude	Degree	0 .. 180	1	32-bit real
Longitude	Degree	0 .. 360	1	32-bit real
Surface altitude above sea level	m	-1000 .. 10000	1	32-bit real
Surface type percent coverage	Percent	0 .. 100	1 x 20	32-bit real

Table 2.11-4(b). SDS Index of Time and Position

SDS Name	Regional Monthly Hourly	Regional Monthly
Region Number	0	223
Colatitude	1	224
Longitude	2	225
Surface altitude above sea level	3	226
Surface type percent coverage	4	227

Table 2.11-5(a). Observed TOA Fluxes

SDS Name	Units	Range	Dimensions	Data Type
SW TOA Total-Sky	W m ⁻²	0 .. 1400	18	32-bit real
LW TOA Total-Sky	W m ⁻²	0 .. 500	18	32-bit real
WN TOA Total-Sky	W m ⁻² μm ⁻¹	2 .. 50	18	32-bit real
SW TOA Clear-Sky	W m ⁻²	0 .. 1400	18	32-bit real
LW TOA Clear-Sky	W m ⁻²	0 .. 500	18	32-bit real
WN TOA Clear-Sky	W m ⁻² μm ⁻¹	2 .. 50	18	32-bit real

Table 2.11-5(b). SDS Index of Observed TOA Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
SW TOA Total-Sky	5	228
LW TOA Total-Sky	6	229
WN TOA Total-Sky	7	230
SW TOA Clear-Sky	8	231
LW TOA Clear-Sky	9	232
WN TOA Clear-Sky	10	233

Table 2.11-6(a). Cloud Properties for Four Cloud Layers

SDS Name	Units	Range	Dimensions	Data Type
Area Fraction Percentage	Percent	0 .. 100	18 x 4	32-bit real
Vis. Opt. Depth (linear)	N/A	0 .. 400	18 x 4	32-bit real
Vis. Opt. Depth (log)	N/A	-6 .. 6	18 x 4	32-bit real
Infrared Emissivity	N/A	0 .. 1	18 x 4	32-bit real
Liquid Water Path	g m ⁻²	0 .. 10000	18 x 4	32-bit real
Ice Water Path	g m ⁻²	0 .. 10000	18 x 4	32-bit real
Top Pressure	hPa	0 .. 1100	18 x 4	32-bit real
Effective Pressure	hPa	0 .. 1100	18 x 4	32-bit real
Effective Temperature	K	100 .. 350	18 x 4	32-bit real
Effective Height	km	0 .. 20	18 x 4	32-bit real
Bottom Pressure	hPa	0 .. 1100	18 x 4	32-bit real
Liquid Particle Radius	μm	0 .. 40	18 x 4	32-bit real

Table 2.11-6(a). Cloud Properties for Four Cloud Layers

SDS Name	Units	Range	Dimensions	Data Type
Ice Particle Diameter	μm	0 .. 300	18 x 4	32-bit real
Particle Phase	N/A	1 .. 2	18 x 4	32-bit real
Vertical Aspect Ratio	N/A	0 .. 20	18 x 4	32-bit real

Table 2.11-6(b). SDS Index of High, Uppermid, Lowermid, Low (mean, stdev, num obs) in Cloud Properties

SDS Name	Regional Monthly Hourly				Regional Monthly			
Area Fraction Percentage	11	26	41	56	234	249	264	279
Vis. Opt. Depth (linear)	12	27	42	57	235	250	265	280
Vis. Opt. Depth (log)	13	28	43	58	236	251	266	281
Infrared Emissivity	14	29	44	59	237	252	267	282
Liquid Water Path	15	30	45	60	238	253	268	283
Ice Water Path	16	31	46	61	239	254	269	284
Top Pressure	17	32	47	62	240	255	270	285
Effective Pressure	18	33	48	63	241	256	271	286
Effective Temperature	19	34	49	64	242	257	272	287
Effective Height	20	35	50	65	243	258	273	288
Bottom Pressure	21	36	51	66	244	259	274	289
Liquid Particle Radius	22	37	52	67	245	260	275	290
Ice Particle Diameter	23	38	53	68	246	261	276	291
Particle Phase	24	39	54	69	247	262	277	292
Vertical Aspect Ratio	25	40	55	70	248	263	278	293

Color Red - High Cloud
 Color Green - Uppermid Cloud
 Color Blue - Lowermid Cloud
 Color Black - Low Cloud

Table 2.11-7(a). Stowe-Ignatov Aerosol Optical Depth

SDS Name	Units	Range	Dimensions	Data Type
Aerosol visible optical depth - 0.63 μm	N/A	0 .. 5	18	32-bit real
Aerosol visible optical depth - 1.6 μm	N/A	0 .. 5	18	32-bit real

Table 2.11-7(b). SDS Index of Stowe-Ignatov Aerosol Optical Depth

SDS Name	Regional Monthly Hourly	Regional Monthly
Aerosol visible optical depth - 0.63 μm	71	294
Aerosol visible optical depth - 1.6 μm	72	295

Table 2.11-8(a). MODIS Aerosol Optical Depth

SDS Name	Units	Range	Dimensions	Data Type
Initial Aerosol Optical Depth	N/A	0 .. 5	18	32-bit real
Aerosol Opt. Depth at 0.47 μm in Land	N/A	0 .. 5	18	32-bit real
Aerosol Opt. Depth at 0.55 μm in Land	N/A	0 .. 5	18	32-bit real
Aerosol Opt. Depth at 0.66 μm in Land	N/A	0 .. 5	18	32-bit real
Aerosol Opt. Depth at 0.47 μm in Ocean	N/A	0 .. 5	18	32-bit real
Aerosol Opt. Depth at 0.55 μm in Ocean	N/A	0 .. 5	18	32-bit real
Aerosol Opt. Depth at 0.66 μm in Ocean	N/A	0 .. 5	18	32-bit real
Aerosol Opt. Depth at 0.87 μm in Ocean	N/A	0 .. 5	18	32-bit real
Aerosol Opt. Depth at 1.24 μm in Ocean	N/A	0 .. 5	18	32-bit real
Aerosol Opt. Depth at 1.64 μm in Ocean	N/A	0 .. 5	18	32-bit real
Aerosol Opt. Depth at 2.13 μm in Ocean	N/A	0 .. 5	18	32-bit real

Table 2.11-8(b). SDS Index of MODIS Aerosol Optical Depth

SDS Name	Regional Monthly Hourly	Regional Monthly
Initial Aerosol Optical Depth	73	296
Aerosol Opt. Depth at 0.47 μm in Land	74	297
Aerosol Opt. Depth at 0.55 μm in Land	75	298
Aerosol Opt. Depth at 0.66 μm in Land	76	299
Aerosol Opt. Depth at 0.47 μm in Ocean	77	300
Aerosol Opt. Depth at 0.55 μm in Ocean	78	301
Aerosol Opt. Depth at 0.66 μm in Ocean	79	302
Aerosol Opt. Depth at 0.87 μm in Ocean	80	303

Table 2.11-8(b). SDS Index of MODIS Aerosol Optical Depth

SDS Name	Regional Monthly Hourly	Regional Monthly
Aerosol Opt. Depth at 1.24 μm in Ocean	81	304
Aerosol Opt. Depth at 1.64 μm in Ocean	82	305
Aerosol Opt. Depth at 2.13 μm in Ocean	83	306

Table 2.11-9(a). Tuned Pristine Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Tuned Pristine SW Surface Up	W m^{-2}	0 .. 1400	18	32-bit real
Tuned Pristine SW Surface Down	W m^{-2}	0 .. 1400	18	32-bit real
Tuned Pristine SW TOA Up	W m^{-2}	0 .. 1400	18	32-bit real
Tuned Pristine LW Surface Up	W m^{-2}	0 .. 850	18	32-bit real
Tuned Pristine LW Surface Down	W m^{-2}	0 .. 700	18	32-bit real
Tuned Pristine LW TOA Up	W m^{-2}	0 .. 850	18	32-bit real
Tuned Pristine WN Surface Up	W m^{-2}	0 .. 370	18	32-bit real
Tuned Pristine WN Surface Down	W m^{-2}	0 .. 370	18	32-bit real
Tuned Pristine WN TOA Up	W m^{-2}	0 .. 370	18	32-bit real

Table 2.11-9(b). SDS Index of Tuned Pristine Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
Tuned Pristine SW Surface Up	84	307
Tuned Pristine SW Surface Down	85	308
Tuned Pristine SW TOA Up	86	309
Tuned Pristine LW Surface Up	87	310
Tuned Pristine LW Surface Down	88	311
Tuned Pristine LW TOA Up	89	312
Tuned Pristine WN Surface Up	90	313
Tuned Pristine WN Surface Down	91	314
Tuned Pristine WN TOA Up	92	315

Table 2.11-10(a). Tuned ClearSky Flux Profiles

SDS Name	Units	Range	Dimensions	Data Type
Tuned Clear-Sky SW Up	W m ⁻²	0 .. 1400	18 x 5	32-bit real
Tuned Clear-Sky SW Down	W m ⁻²	0 .. 1400	18 x 5	32-bit real
Tuned Clear-Sky LW Up	W m ⁻²	0 .. 850	18 x 5	32-bit real
Tuned Clear-Sky LW Down	W m ⁻²	0 .. 700	18 x 5	32-bit real
Tuned Clear-Sky WN Up	W m ⁻²	0 .. 370	18 x 5	32-bit real
Tuned Clear-Sky WN Down	W m ⁻²	0 .. 370	18 x 5	32-bit real

Table 2.11-10(b). SDS Index of Tuned ClearSky Flux Profiles

SDS Name	Regional Monthly Hourly	Regional Monthly
Tuned Clear-Sky SW Up	93	316
Tuned Clear-Sky SW Down	94	317
Tuned Clear-Sky LW Up	95	318
Tuned Clear-Sky LW Down	96	319
Tuned Clear-Sky WN Up	97	320
Tuned Clear-Sky WN Down	98	321

Table 2.11-11(a). Tuned TotalSky-NoAerosol Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Tuned Total-Sky-NoAerosol SW Surface Up	W m ⁻²	0 .. 1400	18	32-bit real
Tuned Total-Sky-NoAerosol SW Surface Down	W m ⁻²	0 .. 1400	18	32-bit real
Tuned Total-Sky-NoAerosol SW TOA Up	W m ⁻²	0 .. 1400	18	32-bit real
Tuned Total-Sky-NoAerosol LW Surface Up	W m ⁻²	0 .. 850	18	32-bit real
Tuned Total-Sky-NoAerosol LW Surface Down	W m ⁻²	0 .. 700	18	32-bit real
Tuned Total-Sky-NoAerosol LW TOA Up	W m ⁻²	0 .. 850	18	32-bit real
Tuned Total-Sky-NoAerosol WN Surface Up	W m ⁻²	0 .. 370	18	32-bit real
Tuned Total-Sky-NoAerosol WN Surface Down	W m ⁻²	0 .. 370	18	32-bit real
Tuned Total-Sky-NoAerosol WN TOA Up	W m ⁻²	0 .. 370	18	32-bit real

Table 2.11-11(b). SDS Index of Tuned TotalSky-NoAerosol Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
Tuned Total-Sky-NoAerosol SW Surface Up	99	322
Tuned Total-Sky-NoAerosol SW Surface Down	100	323
Tuned Total-Sky-NoAerosol SW TOA Up	101	324
Tuned Total-Sky-NoAerosol LW Surface Up	102	325
Tuned Total-Sky-NoAerosol LW Surface Down	103	326
Tuned Total-Sky-NoAerosol LW TOA Up	104	327
Tuned Total-Sky-NoAerosol WN Surface Up	105	328
Tuned Total-Sky-NoAerosol WN Surface Down	106	329
Tuned Total-Sky-NoAerosol WN TOA Up	107	330

Table 2.11-12(a). Tuned TotalSky Flux Profiles

SDS Name	Units	Range	Dimensions	Data Type
Tuned Total-Sky SW Up	W m ⁻²	0 .. 1400	18 x 5	32-bit real
Tuned Total-Sky SW Down	W m ⁻²	0 .. 1400	18 x 5	32-bit real
Tuned Total-Sky LW Up	W m ⁻²	0 .. 850	18 x 5	32-bit real
Tuned Total-Sky LW Down	W m ⁻²	0 .. 700	18 x 5	32-bit real
Tuned Total-Sky WN Up	W m ⁻²	0 .. 370	18 x 5	32-bit real
Tuned Total-Sky WN Down	W m ⁻²	0 .. 370	18 x 5	32-bit real

Table 2.11-12(b). SDS Index of Tuned TotalSky Flux Profiles

SDS Name	Regional Monthly Hourly	Regional Monthly
Tuned Total-Sky SW Up	108	331
Tuned Total-Sky SW Down	109	332
Tuned Total-Sky LW Up	110	333
Tuned Total-Sky LW Down	111	334
Tuned Total-Sky WN Up	112	335
Tuned Total-Sky WN Down	113	336

Table 2.11-13(a). Untuned Pristine Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Untuned Pristine SW Surface Up	W m ⁻²	0 .. 1500	18	32-bit real
Untuned Pristine SW Surface Down	W m ⁻²	0 .. 1500	18	32-bit real
Untuned Pristine SW TOA Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Pristine LW Surface Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Pristine LW Surface Down	W m ⁻²	0 .. 700	18	32-bit real
Untuned Pristine LW TOA Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Pristine WN Surface Up	W m ⁻²	0 .. 370	18	32-bit real
Untuned Pristine WN Surface Down	W m ⁻²	0 .. 370	18	32-bit real
Untuned Pristine WN TOA Up	W m ⁻²	0 .. 370	18	32-bit real

Table 2.11-13(b). SDS Index of Untuned Pristine Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
Untuned Pristine SW Surface Up	114	337
Untuned Pristine SW Surface Down	115	338
Untuned Pristine SW TOA Up	116	339
Untuned Pristine LW Surface Up	117	340
Untuned Pristine LW Surface Down	118	341
Untuned Pristine LW TOA Up	119	342
Untuned Pristine WN Surface Up	120	343
Untuned Pristine WN Surface Down	121	344
Untuned Pristine WN TOA Up	122	345

Table 2.11-14(a). Untuned ClearSky Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Untuned Clear-Sky SW Surface Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Clear-Sky SW Surface Down	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Clear-Sky SW TOA Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Clear-Sky LW Surface Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Clear-Sky LW Surface Down	W m ⁻²	0 .. 700	18	32-bit real
Untuned Clear-Sky LW TOA Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Clear-Sky WN Surface Up	W m ⁻²	0 .. 370	18	32-bit real
Untuned Clear-Sky WN Surface Down	W m ⁻²	0 .. 370	18	32-bit real

Table 2.11-14(a). Untuned ClearSky Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Untuned Clear-Sky WN TOA Up	W m ⁻²	0 .. 370	18	32-bit real

Table 2.11-14(b). SDS Index of Untuned ClearSky Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
Untuned Clear-Sky SW Surface Up	123	346
Untuned Clear-Sky SW Surface Down	124	347
Untuned Clear-Sky SW TOA Up	125	348
Untuned Clear-Sky LW Surface Up	126	349
Untuned Clear-Sky LW Surface Down	127	350
Untuned Clear-Sky LW TOA Up	128	351
Untuned Clear-Sky WN Surface Up	129	352
Untuned Clear-Sky WN Surface Down	130	353
Untuned Clear-Sky WN TOA Up	131	354

Table 2.11-15(a). Untuned TotalSky-NoAerosol Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Untuned Total-Sky-NoAerosol SW Surface Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Total-Sky-NoAerosol SW Surface Down	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Total-Sky-NoAerosol SW TOA Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Total-Sky-NoAerosol LW Surface Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Total-Sky-NoAerosol LW Surface Down	W m ⁻²	0 .. 700	18	32-bit real
Untuned Total-Sky-NoAerosol LW TOA Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Total-Sky-NoAerosol WN Surface Up	W m ⁻²	0 .. 370	18	32-bit real
Untuned Total-Sky-NoAerosol WN Surface Down	W m ⁻²	0 .. 370	18	32-bit real
Untuned Total-Sky-NoAerosol WN TOA Up	W m ⁻²	0 .. 370	18	32-bit real

Table 2.11-15(b). SDS Index of Untuned TotalSky-NoAerosol Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
Untuned Total-Sky-NoAerosol SW Surface Up	132	355
Untuned Total-Sky-NoAerosol SW Surface Down	133	356
Untuned Total-Sky-NoAerosol SW TOA Up	134	357
Untuned Total-Sky-NoAerosol LW Surface Up	135	358
Untuned Total-Sky-NoAerosol LW Surface Down	136	359
Untuned Total-Sky-NoAerosol LW TOA Up	137	360
Untuned Total-Sky-NoAerosol WN Surface Up	138	361
Untuned Total-Sky-NoAerosol WN Surface Down	139	362
Untuned Total-Sky-NoAerosol WN TOA Up	140	363

Table 2.11-16(a). Untuned TotalSky Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Untuned Total-Sky SW Surface Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Total-Sky SW Surface Down	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Total-Sky SW TOA Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Total-Sky LW Surface Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Total-Sky LW Surface Down	W m ⁻²	0 .. 700	18	32-bit real
Untuned Total-Sky LW TOA Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Total-Sky WN Surface Up	W m ⁻²	0 .. 370	18	32-bit real
Untuned Total-Sky WN Surface Down	W m ⁻²	0 .. 370	18	32-bit real
Untuned Total-Sky WN TOA Up	W m ⁻²	0 .. 370	18	32-bit real

Table 2.11-16(b). SDS Index of Untuned TotalSky Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
Untuned Total-Sky SW Surface Up	141	364
Untuned Total-Sky SW Surface Down	142	365
Untuned Total-Sky SW TOA Up	143	366
Untuned Total-Sky LW Surface Up	144	367
Untuned Total-Sky LW Surface Down	145	368
Untuned Total-Sky LW TOA Up	146	369
Untuned Total-Sky WN Surface Up	147	370
Untuned Total-Sky WN Surface Down	148	371

Table 2.11-16(b). SDS Index of Untuned TotalSky Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
Untuned Total-Sky WN TOA Up	149	372

Table 2.11-17(a). Satellite Emulated WN TOA Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Untuned Satellite Emulated WN TOA	W m ⁻²	-1400 .. 1400	18	32-bit real
Tuned Satellite Emulated WN TOA	W m ⁻²	-1400 .. 1400	18	32-bit real

Table 2.11-17(b). SDS Index of Satellite Emulated WN TOA Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
Untuned Satellite Emulated WN TOA	150	373
Tuned Satellite Emulated WN TOA	151	374

Table 2.11-18(a). TOA Fluxes Error

SDS Name	Units	Range	Dimensions	Data Type
Tuned Minus Observed SW TOA	W m ⁻²	-1400 .. 1400	18	32-bit real
Untuned Minus Observed SW TOA	W m ⁻²	-1400 .. 1400	18	32-bit real
Tuned Minus Observed LW TOA	W m ⁻²	-600 .. 600	18	32-bit real
Untuned Minus Observed LW TOA	W m ⁻²	-600 .. 600	18	32-bit real

Table 2.11-18(b). SDS Index of TOA Fluxes Error

SDS Name	Regional Monthly Hourly	Regional Monthly
Tuned Minus Observed SW TOA	152	375
Untuned Minus Observed SW TOA	153	376
Tuned Minus Observed LW TOA	154	377
Untuned Minus Observed LW TOA	155	378

Table 2.11-19(a). Number of Hourboxes

SDS Name	Units	Range	Dimensions	Data Type
Number of Observed SW	N/A	0 .. 744	9	32-bit real
Number of Untuned SW	N/A	0 .. 744	9	32-bit real
Number of Tuned SW	N/A	0 .. 744	9	32-bit real
Number of Observed LW	N/A	0 .. 744	9	32-bit real
Number of Untuned LW	N/A	0 .. 744	9	32-bit real
Number of Tuned LW	N/A	0 .. 744	9	32-bit real

Table 2.11-19(b). SDS Index of Number of Hourboxes

SDS Name	Regional Monthly Hourly	Regional Monthly
Number of Observed SW	156	379
Number of Untuned SW	157	380
Number of Tuned SW	158	381
Number of Observed LW	159	382
Number of Untuned LW	160	383
Number of Tuned LW	161	384

Table 2.11-20(a). Constraint Adjustments

SDS Name	Units	Range	Dimensions	Data Type
Total column precipitable water - initial	cm	0 .. 10	18	32-bit real
Total column precipitable water - adjusted	cm	-10 .. 10	18	32-bit real
Upper tropospheric precipitable water - initial	cm	0 .. 10	18	32-bit real
Upper tropospheric precipitable water - adjusted	cm	0 .. 10	18	32-bit real
Upper tropospheric humidity - initial	N/A	0.0 .. 100.0	18	32-bit real
Upper tropospheric humidity - adjusted	N/A	0.0 .. 100.0	18	32-bit real
Aerosol optical depth - initial	N/A	0 .. 5	18	32-bit real
Aerosol optical depth - adjusted	N/A	0 .. 5	18	32-bit real
Skin temperature - initial	K	175 .. 375	18	32-bit real
Skin temperature - adjusted	K	175 .. 375	18	32-bit real

Table 2.11-20(a). Constraint Adjustments

SDS Name	Units	Range	Dimensions	Data Type
Surface pressure	hPa	0 .. 800	18	32-bit real
Column ozone - initial	du	0 .. 800	18	32-bit real
Mean visible optical depth- adjusted	N/A	0 .. 400	18	32-bit real
Mean cloud fractional area - adjusted	%	0 .. 100	18	32-bit real
Mean cloud effective temperature - adjusted	K	175 .. 375	18	32-bit real

Table 2.11-20(b). SDS Index of Constraint Adjustments

SDS Name	Regional Monthly Hourly	Regional Monthly
Total column precipitable water - initial	162	385
Total column precipitable water - adjusted	163	386
Upper tropospheric precipitable water - initial	164	387
Upper tropospheric precipitable water - adjusted	165	388
Upper tropospheric humidity - initial	166	389
Upper tropospheric humidity - adjusted	167	390
Aerosol optical depth - initial	168	391
Aerosol optical depth - adjusted	169	392
Skin temperature - initial	170	393
Skin temperature - adjusted	171	394
Surface pressure	172	395
Column ozone - initial	173	396
Mean visible optical depth- adjusted	174	397
Mean cloud fractional area - adjusted	175	398
Mean cloud effective temperature - adjusted	176	399

Table 2.11-21(a). Surface SW Direct/Diffuse Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Total-Sky SW flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky SW flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Pristine-Sky SW flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Actinic-Sky SW flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky SW flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky SW flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real

Table 2.11-21(a). Surface SW Direct/Diffuse Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Pristine-Sky SW flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Actinic-Sky SW flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real

Table 2.11-21(b). SDS Index of Surface SW Direct/Diffuse Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
Total-Sky SW flux - Diffuse	177	400
Clear-Sky SW flux - Diffuse	178	401
Pristine-Sky SW flux - Diffuse	179	402
Actinic-Sky SW flux - Diffuse	180	403
Total-Sky SW flux - Direct	181	404
Clear-Sky SW flux - Direct	182	405
Pristine-Sky SW flux - Direct	183	406
Actinic-Sky SW flux - Direct	184	407

Table 2.11-22(a). UVA - UVB Fluxes

SDS Name	Units	Range	Dimensions	Data Type
TOA Downwelling UVB Flux	W m ⁻²	0 .. 1400	18	32-bit real
TOA Downwelling UVA Flux	W m ⁻²	0 .. 1400	18	32-bit real
Pristine UVB Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Pristine UVB Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Pristine UVA Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Pristine UVA Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky UVB Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky UVB Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky UVA Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky UVA Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky-NoAerosol UVB Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky-NoAerosol UVB Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky-NoAerosol UVA Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky-NoAerosol UVA Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real

Table 2.11-22(a). UVA - UVB Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Total-Sky UVB Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky UVB Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky UVA Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky UVA Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky Surface UV Index	N/A	0 .. 30	18	32-bit real
Clear-Sky Surface UV Index	N/A	0 .. 30	18	32-bit real
Pristine Surface UV Index	N/A	0 .. 30	18	32-bit real
Total-Sky-NoAerosol Surface UV- Index	N/A	0 .. 30	18	32-bit real
Total-Sky UVB Surface Up	W m ⁻²	0 .. 5	18	32-bit real
Snow Grain Size	μm	50 .. 2000	18	32-bit real
Match Total Aerosol Optical Depth at 0.55 μm	N/A	0 .. 10	18	32-bit real

Table 2.11-22(b). SDS Index of UVA - UVB Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
TOA Downwelling UVB Flux	185	408
TOA Downwelling UVA Flux	186	409
Pristine UVB Surface flux - Direct	187	410
Pristine UVB Surface flux - Diffuse	188	411
Pristine UVA Surface flux - Direct	189	412
Pristine UVA Surface flux - Diffuse	190	413
Clear-Sky UVB Surface flux - Direct	191	414
Clear-Sky UVB Surface flux - Diffuse	192	415
Clear-Sky UVA Surface flux - Direct	193	416
Clear-Sky UVA Surface flux - Diffuse	194	417
Total-Sky-NoAerosol UVB Surface flux - Direct	195	418
Total-Sky-NoAerosol UVB Surface flux - Diffuse	196	419
Total-Sky-NoAerosol UVA Surface flux - Direct	197	420
Total-Sky-NoAerosol UVA Surface flux - Diffuse	198	421
Total-Sky UVB Surface flux - Direct	199	422
Total-Sky UVB Surface flux - Diffuse	200	423
Total-Sky UVA Surface flux - Direct	201	424
Total-Sky UVA Surface flux - Diffuse	202	425
Total-Sky Surface UV Index	203	426

Table 2.11-22(b). SDS Index of UVA - UVB Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
Clear-Sky Surface UV Index	204	427
Pristine Surface UV Index	205	428
Total-Sky-NoAerosol Surface UV- Index	206	429
Total-Sky UVB Surface Up	207	430
Snow Grain Size	208	431
Match Total Aerosol Optical Depth at 0.55 μm	209	432

Table 2.11-23(a). PAR Fluxes

SDS Name	Units	Range	Dimensions	Data Type
TOA Downwelling PAR Flux	W m^{-2}	0 .. 1400	18	32-bit real
Total-Sky PAR Surface flux - Direct	W m^{-2}	0 .. 1400	18	32-bit real
Total-Sky PAR Surface flux - Diffuse	W m^{-2}	0 .. 1400	18	32-bit real
Total-Sky PAR PURV Surface flux - Direct	W m^{-2}	0 .. 1400	18	32-bit real
Total-Sky PAR PURV Surface flux - Diffuse	W m^{-2}	0 .. 1400	18	32-bit real
Total-Sky PAR ChlorA Surface flux - Direct	W m^{-2}	0 .. 1400	18	32-bit real
Total-Sky PAR ChlorA Surface flux - Diffuse	W m^{-2}	0 .. 1400	18	32-bit real
Clear-Sky PAR Surface flux - Direct	W m^{-2}	0 .. 1400	18	32-bit real
Clear-Sky PAR Surface flux - Diffuse	W m^{-2}	0 .. 1400	18	32-bit real
Pristine PAR Surface flux - Direct	W m^{-2}	0 .. 1400	18	32-bit real
Pristine PAR Surface flux - Diffuse	W m^{-2}	0 .. 1400	18	32-bit real

Table 2.11-23(b). SDS Index of PAR Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
TOA Downwelling PAR Flux	210	433
Total-Sky PAR Surface flux - Direct	211	434
Total-Sky PAR Surface flux - Diffuse	212	435
Total-Sky PAR PURV Surface flux - Direct	213	436
Total-Sky PAR PURV Surface flux - Diffuse	214	437
Total-Sky PAR ChlorA Surface flux - Direct	215	438

Table 2.11-23(b). SDS Index of PAR Fluxes

SDS Name	Regional Monthly Hourly	Regional Monthly
Total-Sky PAR ChlorA Surface flux - Diffuse	216	439
Clear-Sky PAR Surface flux - Direct	217	440
Clear-Sky PAR Surface flux - Diffuse	218	441
Pristine PAR Surface flux - Direct	219	442
Pristine PAR Surface flux - Diffuse	220	443

Table 2.11-24(a). Pristine-Sky SW MultiStream Correction

SDS Name	Units	Range	Dimensions	Data Type
SW TOA Flux - Up - Pristine-Sky - Corrected	W m ⁻²	0 .. 1000	18	32-bit real
SW Surface Flux - Down- Pristine-Sky - Corrected	W m ⁻²	0 .. 1000	18	32-bit real

Table 2.11-24(b). SDS Index of Pristine-Sky SW MultiStream Correction

SDS Name	Regional Monthly Hourly	Regional Monthly
SW TOA Flux - Up - Pristine-Sky - Corrected	221	444
SW Surface Flux - Down- Pristine-Sky - Corrected	222	445

Total Bits / Record: 151296
Total Bytes / Record: 18912
Total Records / File: 64800
Total Bytes / File: 1,225,497,560
Total MBytes/File: 1225 MB

AVG Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

AVG Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. 	All
11/15/06	R3V2	639	<ul style="list-style-type: none"> • Updated to change all tables and added SDS Index tables. • The EOSDIS Product Code line was removed from the document. (6/17/2008) 	All Sec. 2.10
02/08/08	R3V3	667	<ul style="list-style-type: none"> • Updated to add three parameteres. • Changed all of the SDS Index tables. • Section numbering was changed due to insertion of the ISCCP D2-like DPC. (09/23/2008) 	Table 2.10-22(a) Tables 2.10-4(b) to 2.10-24(b) All
11/12/08	R5V1	689	<ul style="list-style-type: none"> • Updated "Product Version" category. • Removed Beta3 from "Product Version" category. (11/17/2008) • Corrected the Terra and Aqua product versions. (12/08/2008) • Corrected the Terra and Aqua product versions. (12/16/2008) 	Sec. 2.11 Sec. 2.11 Sec. 2.11 Sec. 2.11

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

The Monthly Zonal and Global Radiative Fluxes and Clouds (ZAVG) product are the zonal and global averages of the monthly Regional Radiative and Clouds (AVG) product. This product is the CERES equivalent of the zonal and global averages in the ERBE ES-4 product of the CERES untuned and tuned radiative transfer modeled fluxes. This product is written in HDF_EOS and contains meta data as well as gridded science data.

The ZAVG contains the following apriori and observed input:

- Zonal/Global data
- Cloud category properties for four (low, lower middle, upper middle and high) cloud layers
- Observed CERES TOA clear-sky and all-sky fluxes
- MODIS based spectral aerosol optical depths

The ZAVG contains the following constrained (tuned) vertical flux profiles for both clear-sky and total-sky conditions evaluated at the TOA, 70mb, 200mb, 500mb, and surface:

- Longwave, Shortwave, and Window channels upward and downward.

The constrained (tuned) and initial (untuned) profiles for the following are included for pristine (clear-sky no-aerosol), clear-sky, total-sky-no-aerosol, and total-sky conditions:

- Longwave upward at the surface and TOA.
- Longwave downward at the surface.
- Shortwave upward at the surface and TOA.
- Shortwave downward at the surface.
- Window channel upward at the surface and TOA.
- Window channel downward at the surface.

The adjustments to the radiative transfer model input parameters between the initial and the constrained (adjusted) passes are also contained on the ZAVG. These parameters include:

- Surface albedo and skin temperature
- Total column precipitable water, upper tropospheric relative humidity, and column ozone
- Aerosol optical depth
- Cloud optical depth, fractional area, and effective temperature

The ZAVG contains the direct and diffuse shortwave surface fluxes for total-sky, clear-sky, pristine and actinic conditions. The ZAVG also contains surface UVA and UVB downwelling and direct diffuse ratios for total-sky, clear-sky, pristine, and total-sky-no-aerosol conditions.

A complete listing of metadata and science parameters for this data product can be found in [Table 2.12-1](#) and [Table 2.12-3](#).

Level: 3

Frequency: Monthly

Portion of Atmosphere Covered: Surface to TOA

Time Interval Covered:

File: 1 Month

Record: 1 Month

Portion of Globe Covered:

File: Entire Global

Record: Zonal or Global

Product Version:

TRMM: N/A

Terra: Beta5, Beta6, Edition2C, Edition2F

Aqua: Beta6, Edition2B, Edition2C

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 2.12-1. ZAVG 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

ZAVG Science Data

All of the ZAVG science data are organized into the HDF-EOS Grid data type, which is shown in [Table 2.11-3](#) 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 elements within each field.

[Table 2.11-2](#) List of the Vgroups for different Gridded Categories.

Table 2.12-2. Gridded Categories of ZAVG

Vgroup Number	Vgroup Name	Description	Number of Records
2	1.0 Degree Zonal	See Table 2.12-3	180
3	Global	See Table 2.12-3	1

[Table 2.12-3](#) List of the Vgroups contained in 1.0 Degree Zonal and Global Vgroups.

Table 2.12-3. Temporal Vgroups of ZAVG

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
1	Monthly Hourly Averages	See Table 2.12-4
2	Monthly Averages	See Table 2.12-4

[Table 2.12-4](#) List of the Vgroups contained in the Monthly Hourly Averages and Monthly Averages Vgroups in ZAVG.

Table 2.12-4. Temporal Vgroups of ZAVG

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
1	Observed TOA Fluxes	See Table 2.12-5(a) & (b)
2	Cloud Layer - High	See Table 2.12-6(a) & (b)
3	Cloud Layer - UpperMid	See Table 2.12-6(a) & (b)
4	Cloud Layer - LowerMid	See Table 2.12-6(a) & (b)
5	Cloud Layer - Low	See Table 2.12-6(a) & (b)
6	Stowe-Ignatov Aerosol Optical Depth	See Table 2.12-7(a) & (b)
7	MODIS Aerosol Optical Depth	See Table 2.12-8(a) & (b)
8	Tuned Pristine Fluxes	See Table 2.12-9(a) & (b)
9	Tuned ClearSky Flux Profiles	See Table 2.12-10(a) & (b)
10	Tuned TotalSky-NoAerosol Fluxes	See Table 2.12-11(a) & (b)
11	Tuned TotalSky Flux Profiles	See Table 2.12-12(a) & (b)
12	Untuned Pristine Fluxes	See Table 2.12-13(a) & (b)
13	Untuned ClearSky Fluxes	See Table 2.12-14(a) & (b)
14	Untuned TotalSky-NoAerosol Fluxes	See Table 2.12-15(a) & (b)
15	Untuned TotalSky Fluxes	See Table 2.12-16(a) & (b)
16	Satellite Emulated WN TOA Fluxes	See Table 2.12-17(a) & (b)
17	TOA Flux Error	See Table 2.12-18(a) & (b)
18	Constrainment Adjustments	See Table 2.12-19(a) & (b)
19	Surface SW Direct/Diffuse Fluxes	See Table 2.12-20(a) & (b)
20	UVA - UVB Fluxes	See Table 2.12-21(a) & (b)
21	PAR Fluxes	See Table 2.12-22(a) & (b)
22	Pristine-Sky SW MultiStream Correction	See Table 2.12-23(a) & (b)

ZAVG Science Data

All of the ZAVG science data are organized into the HDF-EOS Grid data type, which is shown in [Table 2.12-4](#) 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 elements within each field. The 18 under the Dimensions column in the following tables the 18 refers to 9 = 8 monthly hourly (3-hour GMT based) + 1 monthly regional x 2 mean and standard deviation.

Table 2.12-5(a). Observed TOA Fluxes

SDS Name	Units	Range	Dimensions	Data Type
SW TOA Total-Sky	W m ⁻²	0 .. 1400	18	32-bit real
LW TOA Total-Sky	W m ⁻²	0 .. 500	18	32-bit real

Table 2.12-5(a). Observed TOA Fluxes

SDS Name	Units	Range	Dimensions	Data Type
WN TOA Total-Sky	$W m^{-2} \mu m^{-1}$	2 .. 50	18	32-bit real
SW TOA Clear-Sky	$W m^{-2}$	0 .. 1400	18	32-bit real
LW TOA Clear-Sky	$W m^{-2}$	0 .. 500	18	32-bit real
WN TOA Clear-Sky	$W m^{-2} \mu m^{-1}$	2 .. 50	18	32-bit real

Table 2.12-5(b). SDS Index of Observed TOA Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
SW TOA Total-Sky	0	212	424	636
LW TOA Total-Sky	1	213	425	637
WN TOA Total-Sky	2	214	426	638
SW TOA Clear-Sky	3	215	427	639
LW TOA Clear-Sky	4	216	428	640
WN TOA Clear-Sky	5	217	429	641

Table 2.12-6(a). Cloud Properties for Four Cloud Layers

SDS Name	Units	Range	Dimensions	Data Type
Area Fraction Percentage	Percent	0 .. 100	18 x 4	32-bit real
Vis. Opt. Depth (linear)	N/A	0 .. 400	18 x 4	32-bit real
Vis. Opt. Depth (log)	N/A	-6 .. 6	18 x 4	32-bit real
Infrared Emissivity	N/A	0 .. 1	18 x 4	32-bit real
Liquid Water Path	$g m^{-2}$	0 .. 10000	18 x 4	32-bit real
Ice Water Path	$g m^{-2}$	0 .. 10000	18 x 4	32-bit real
Top Pressure	hPa	0 .. 1100	18 x 4	32-bit real
Effective Pressure	hPa	0 .. 1100	18 x 4	32-bit real
Effective Temperature	K	100 .. 350	18 x 4	32-bit real
Effective Height	km	0 .. 20	18 x 4	32-bit real
Bottom Pressure	hPa	0 .. 1100	18 x 4	32-bit real
Liquid Particle Radius	μm	0 .. 40	18 x 4	32-bit real
Ice Particle Diameter	μm	0 .. 300	18 x 4	32-bit real
Particle Phase	N/A	1 .. 2	18 x 4	32-bit real
Vertical Aspect Ratio	N/A	0 .. 20	18 x 4	32-bit real

Table 2.12-6(b). SDS Index of High, Uppermid, Lowermid, Low (mean, stdev, num obs) in Cloud Properties

SDS Name	Zonal Monthly Hourly				Zonal Monthly				Global Monthly Hourly				Global Monthly			
Area Fraction Percentage	6	21	36	51	218	233	248	263	430	445	460	475	642	657	672	687
Vis. Opt. Depth (linear)	7	22	37	52	219	234	249	264	431	446	461	476	643	658	673	688
Vis. Opt. Depth (log)	8	23	38	53	220	235	250	265	432	447	462	477	644	659	674	689
Infrared Emissivity	9	24	39	54	221	236	251	266	433	448	463	478	645	660	675	690
Liquid Water Path	10	25	40	55	222	237	252	267	434	449	464	479	646	661	676	691
Ice Water Path	11	26	41	56	223	238	253	268	435	450	465	480	647	662	677	692
Top Pressure	12	27	42	57	224	239	254	269	436	451	466	481	648	663	678	693
Effective Pressure	13	28	43	58	225	240	255	270	437	452	467	482	649	664	679	694
Effective Temperature	14	29	44	59	226	241	256	271	438	453	468	483	650	665	680	695
Effective Height	15	30	45	60	227	242	257	272	439	454	469	484	651	666	681	696
Bottom Pressure	16	31	46	61	228	243	258	273	440	455	470	485	652	667	682	697
Liquid Particle Radius	17	32	47	62	229	244	259	274	441	456	471	486	653	668	683	698
Ice Particle Diameter	18	33	48	63	230	245	260	275	442	457	472	487	654	669	684	699
Particle Phase	19	34	49	64	231	246	261	276	443	458	473	488	655	670	685	700
Vertical Aspect Ratio	20	35	50	65	232	247	262	277	444	459	474	489	656	671	686	701

Color Red - High Cloud
 Color Green - Uppermid Cloud
 Color Blue - Lowermid Cloud
 Color Black - Low Cloud

Table 2.12-7(a). Stowe-Ignatov Aerosol Optical Depth

SDS Name	Units	Range	Dimensions	Data Type
Aerosol visible optical depth - 0.63 μm	N/A	0 .. 5	18	32-bit real
Aerosol visible optical depth - 1.6 μm	N/A	0 .. 5	18	32-bit real

Table 2.12-7(b). SDS Index of Stowe-Ignatov Aerosol Optical Depth

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Aerosol visible optical depth - 0.63 μm	66	278	490	702
Aerosol visible optical depth - 1.6 μm	67	279	491	703

Table 2.12-8(a). MODIS Aerosol Optical Depth

Item	SDS Name	Units	Range	Dimensions	Data Type
ZAVG-223	Initial Aerosol Optical Depth	N/A	0 .. 5	18	32-bit real
ZAVG-224	Aerosol Opt. Depth at 0.47 μm in Land	N/A	0 .. 5	18	32-bit real
ZAVG-225	Aerosol Opt. Depth at 0.55 μm in Land	N/A	0 .. 5	18	32-bit real
ZAVG-226	Aerosol Opt. Depth at 0.66 μm in Land	N/A	0 .. 5	18	32-bit real
ZAVG-227	Aerosol Opt. Depth at 0.47 μm in Ocean	N/A	0 .. 5	18	32-bit real
ZAVG-228	Aerosol Opt. Depth at 0.55 μm in Ocean	N/A	0 .. 5	18	32-bit real
ZAVG-229	Aerosol Opt. Depth at 0.66 μm in Ocean	N/A	0 .. 5	18	32-bit real
ZAVG-230	Aerosol Opt. Depth at 0.87 μm in Ocean	N/A	0 .. 5	18	32-bit real
ZAVG-231	Aerosol Opt. Depth at 1.24 μm in Ocean	N/A	0 .. 5	18	32-bit real
ZAVG-232	Aerosol Opt. Depth at 1.64 μm in Ocean	N/A	0 .. 5	18	32-bit real
ZAVG-233	Aerosol Opt. Depth at 2.13 μm in Ocean	N/A	0 .. 5	18	32-bit real

Table 2.12-8(b). SDS Index of MODIS Aerosol Optical Depth

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Initial Aerosol Optical Depth	68	280	492	704
Aerosol Opt. Depth at 0.47 μm in Land	69	281	493	705
Aerosol Opt. Depth at 0.55 μm in Land	70	282	494	706
Aerosol Opt. Depth at 0.66 μm in Land	71	283	495	707
Aerosol Opt. Depth at 0.47 μm in Ocean	72	284	496	708
Aerosol Opt. Depth at 0.55 μm in Ocean	73	285	497	709
Aerosol Opt. Depth at 0.66 μm in Ocean	74	286	498	710
Aerosol Opt. Depth at 0.87 μm in Ocean	75	287	499	711
Aerosol Opt. Depth at 1.24 μm in Ocean	76	288	500	712
Aerosol Opt. Depth at 1.64 μm in Ocean	77	289	501	713
Aerosol Opt. Depth at 2.13 μm in Ocean	78	290	502	714

Table 2.12-9(a). Tuned Pristine Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Tuned Pristine SW Surface Up	W m ⁻²	0 .. 1400	18	32-bit real
Tuned Pristine SW Surface Down	W m ⁻²	0 .. 1400	18	32-bit real
Tuned Pristine SW TOA Up	W m ⁻²	0 .. 1400	18	32-bit real
Tuned Pristine LW Surface Up	W m ⁻²	0 .. 850	18	32-bit real
Tuned Pristine LW Surface Down	W m ⁻²	0 .. 700	18	32-bit real
Tuned Pristine LW TOA Up	W m ⁻²	0 .. 850	18	32-bit real
Tuned Pristine WN Surface Up	W m ⁻²	0 .. 370	18	32-bit real
Tuned Pristine WN Surface Down	W m ⁻²	0 .. 370	18	32-bit real
Tuned Pristine WN TOA Up	W m ⁻²	0 .. 370	18	32-bit real

Table 2.12-9(b). SDS Index of Tuned Pristine Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Tuned Pristine SW Surface Up	79	291	503	715
Tuned Pristine SW Surface Down	80	292	504	716
Tuned Pristine SW TOA Up	81	293	505	717
Tuned Pristine LW Surface Up	82	294	506	718
Tuned Pristine LW Surface Down	83	295	507	719
Tuned Pristine LW TOA Up	84	296	508	720
Tuned Pristine WN Surface Up	85	297	509	721
Tuned Pristine WN Surface Down	86	298	510	722
Tuned Pristine WN TOA Up	87	299	511	723

Table 2.12-10(a). Tuned ClearSky Flux Profiles

SDS Name	Units	Range	Dimensions	Data Type
Tuned Clear-Sky SW Up	W m ⁻²	0 .. 1400	18 x 5	32-bit real
Tuned Clear-Sky SW Down	W m ⁻²	0 .. 1400	18 x 5	32-bit real
Tuned Clear-Sky LW Up	W m ⁻²	0 .. 850	18 x 5	32-bit real
Tuned Clear-Sky LW Down	W m ⁻²	0 .. 700	18 x 5	32-bit real
Tuned Clear-Sky WN Up	W m ⁻²	0 .. 370	18 x 5	32-bit real
Tuned Clear-Sky WN Down	W m ⁻²	0 .. 370	18 x 5	32-bit real

Table 2.12-10(b). SDS Index of Tuned ClearSky Flux Profiles

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Tuned Clear-Sky SW Up	88	300	512	724
Tuned Clear-Sky SW Down	89	301	513	725
Tuned Clear-Sky LW Up	90	302	514	726
Tuned Clear-Sky LW Down	91	303	515	727
Tuned Clear-Sky WN Up	92	304	516	728
Tuned Clear-Sky WN Down	93	305	517	729

Table 2.12-11(a). Tuned TotalSky-NoAerosol Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Tuned Total-Sky-NoAerosol SW Surface Up	W m ⁻²	0 .. 1400	18	32-bit real
Tuned Total-Sky-NoAerosol SW Surface Down	W m ⁻²	0 .. 1400	18	32-bit real
Tuned Total-Sky-NoAerosol SW TOA Up	W m ⁻²	0 .. 1400	18	32-bit real
Tuned Total-Sky-NoAerosol LW Surface Up	W m ⁻²	0 .. 850	18	32-bit real
Tuned Total-Sky-NoAerosol LW Surface Down	W m ⁻²	0 .. 700	18	32-bit real
Tuned Total-Sky-NoAerosol LW TOA Up	W m ⁻²	0 .. 850	18	32-bit real
Tuned Total-Sky-NoAerosol WN Surface Up	W m ⁻²	0 .. 370	18	32-bit real
Tuned Total-Sky-NoAerosol WN Surface Down	W m ⁻²	0 .. 370	18	32-bit real
Tuned Total-Sky-NoAerosol WN TOA Up	W m ⁻²	0 .. 370	18	32-bit real

Table 2.12-11(b). SDS Index of Tuned TotalSky-NoAerosol Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Zonal Monthly Hourly	Zonal Monthly
Tuned Total-Sky-NoAerosol SW Surface Up	94	306	518	730
Tuned Total-Sky-NoAerosol SW Surface Down	95	307	519	731

Table 2.12-11(b). SDS Index of Tuned TotalSky-NoAerosol Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Zonal Monthly Hourly	Zonal Monthly
Tuned Total-Sky-NoAerosol SW TOA Up	96	308	520	732
Tuned Total-Sky-NoAerosol LW Surface Up	97	309	521	733
Tuned Total-Sky-NoAerosol LW Surface Down	98	310	522	734
Tuned Total-Sky-NoAerosol LW TOA Up	99	311	523	735
Tuned Total-Sky-NoAerosol WN Surface Up	100	312	524	736
Tuned Total-Sky-NoAerosol WN Surface Down	101	313	525	737
Tuned Total-Sky-NoAerosol WN TOA Up	102	314	526	738

Table 2.12-12(a). Tuned TotalSky Flux Profiles

SDS Name	Units	Range	Dimensions	Data Type
Tuned Total-Sky SW Up	W m ⁻²	0 .. 1400	18 x 5	32-bit real
Tuned Total-Sky SW Down	W m ⁻²	0 .. 1400	18 x 5	32-bit real
Tuned Total-Sky LW Up	W m ⁻²	0 .. 850	18 x 5	32-bit real
Tuned Total-Sky LW Down	W m ⁻²	0 .. 700	18 x 5	32-bit real
Tuned Total-Sky WN Up	W m ⁻²	0 .. 370	18 x 5	32-bit real
Tuned Total-Sky WN Down	W m ⁻²	0 .. 370	18 x 5	32-bit real

Table 2.12-12(b). SDS Index of Tuned TotalSky Flux Profiles

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Tuned Total-Sky SW Up	103	315	527	739
Tuned Total-Sky SW Down	104	316	528	740
Tuned Total-Sky LW Up	105	317	529	741
Tuned Total-Sky LW Down	106	318	530	742
Tuned Total-Sky WN Up	107	319	531	743
Tuned Total-Sky WN Down	108	320	532	744

Table 2.12-13(a). Untuned Pristine Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Untuned Pristine SW Surface Up	W m ⁻²	0 .. 1500	18	32-bit real
Untuned Pristine SW Surface Down	W m ⁻²	0 .. 1500	18	32-bit real
Untuned Pristine SW TOA Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Pristine LW Surface Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Pristine LW Surface Down	W m ⁻²	0 .. 700	18	32-bit real
Untuned Pristine LW TOA Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Pristine WN Surface Up	W m ⁻²	0 .. 370	18	32-bit real
Untuned Pristine WN Surface Down	W m ⁻²	0 .. 370	18	32-bit real
Untuned Pristine WN TOA Up	W m ⁻²	0 .. 370	18	32-bit real

Table 2.12-13(b). SDS Index of Untuned Pristine Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Untuned Pristine SW Surface Up	109	321	533	745
Untuned Pristine SW Surface Down	110	322	534	746
Untuned Pristine SW TOA Up	111	323	535	747
Untuned Pristine LW Surface Up	112	324	536	748
Untuned Pristine LW Surface Down	113	325	537	749
Untuned Pristine LW TOA Up	114	326	538	750
Untuned Pristine WN Surface Up	115	327	539	751
Untuned Pristine WN Surface Down	116	328	540	752
Untuned Pristine WN TOA Up	117	329	541	753

Table 2.12-14(a). Untuned ClearSky Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Untuned Clear-Sky SW Surface Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Clear-Sky SW Surface Down	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Clear-Sky SW TOA Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Clear-Sky LW Surface Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Clear-Sky LW Surface Down	W m ⁻²	0 .. 700	18	32-bit real
Untuned Clear-Sky LW TOA Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Clear-Sky WN Surface Up	W m ⁻²	0 .. 370	18	32-bit real
Untuned Clear-Sky WN Surface Down	W m ⁻²	0 .. 370	18	32-bit real

Table 2.12-14(a). Untuned ClearSky Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Untuned Clear-Sky WN TOA Up	W m ⁻²	0 .. 370	18	32-bit real

Table 2.12-14(b). SDS Index of Untuned ClearSky Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Untuned Clear-Sky SW Surface Up	118	330	542	754
Untuned Clear-Sky SW Surface Down	119	331	543	755
Untuned Clear-Sky SW TOA Up	120	332	544	756
Untuned Clear-Sky LW Surface Up	121	333	545	757
Untuned Clear-Sky LW Surface Down	122	334	546	758
Untuned Clear-Sky LW TOA Up	123	335	547	759
Untuned Clear-Sky WN Surface Up	124	336	548	760
Untuned Clear-Sky WN Surface Down	125	337	549	761
Untuned Clear-Sky WN TOA Up	126	338	550	762

Table 2.12-15(a). Untuned TotalSky-NoAerosol Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Untuned Total-Sky-NoAerosol SW Surface Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Total-Sky-NoAerosol SW Surface Down	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Total-Sky-NoAerosol SW TOA Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Total-Sky-NoAerosol LW Surface Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Total-Sky-NoAerosol LW Surface Down	W m ⁻²	0 .. 700	18	32-bit real
Untuned Total-Sky-NoAerosol LW TOA Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Total-Sky-NoAerosol WN Surface Up	W m ⁻²	0 .. 370	18	32-bit real
Untuned Total-Sky-NoAerosol WN Surface Down	W m ⁻²	0 .. 370	18	32-bit real
Untuned Total-Sky-NoAerosol WN TOA Up	W m ⁻²	0 .. 370	18	32-bit real

Table 2.12-15(b). SDS Index of Untuned TotalSky-NoAerosol Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Untuned Total-Sky-NoAerosol SW Surface Up	127	339	551	763
Untuned Total-Sky-NoAerosol SW Surface Down	128	340	552	764
Untuned Total-Sky-NoAerosol SW TOA Up	129	341	553	765
Untuned Total-Sky-NoAerosol LW Surface Up	130	342	554	766
Untuned Total-Sky-NoAerosol LW Surface Down	131	343	555	767
Untuned Total-Sky-NoAerosol LW TOA Up	132	344	556	768
Untuned Total-Sky-NoAerosol WN Surface Up	133	345	557	769
Untuned Total-Sky-NoAerosol WN Surface Down	134	346	558	770
Untuned Total-Sky-NoAerosol WN TOA Up	135	347	559	771

Table 2.12-16(a). Untuned TotalSky Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Untuned Total-Sky SW Surface Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Total-Sky SW Surface Down	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Total-Sky SW TOA Up	W m ⁻²	0 .. 1400	18	32-bit real
Untuned Total-Sky LW Surface Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Total-Sky LW Surface Down	W m ⁻²	0 .. 700	18	32-bit real
Untuned Total-Sky LW TOA Up	W m ⁻²	0 .. 850	18	32-bit real
Untuned Total-Sky WN Surface Up	W m ⁻²	0 .. 370	18	32-bit real
Untuned Total-Sky WN Surface Down	W m ⁻²	0 .. 370	18	32-bit real
Untuned Total-Sky WN TOA Up	W m ⁻²	0 .. 370	18	32-bit real

Table 2.12-16(b). SDS Index of Untuned TotalSky Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Untuned Total-Sky SW Surface Up	136	348	560	772
Untuned Total-Sky SW Surface Down	137	349	561	773
Untuned Total-Sky SW TOA Up	138	350	562	774
Untuned Total-Sky LW Surface Up	139	351	563	775
Untuned Total-Sky LW Surface Down	140	352	564	776
Untuned Total-Sky LW TOA Up	141	353	565	777
Untuned Total-Sky WN Surface Up	142	354	566	778

Table 2.12-16(b). SDS Index of Untuned TotalSky Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Untuned Total-Sky WN Surface Down	143	355	567	779
Untuned Total-Sky WN TOA Up	144	356	568	780

Table 2.12-17(a). Satellite Emulated WN TOA Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Untuned Satellite Emulated WN TOA	W m ⁻²	-1400 .. 1400	18	32-bit real
Tuned Satellite Emulated WN TOA	W m ⁻²	-1400 .. 1400	18	32-bit real

Table 2.12-17(b). SDS Index of Satellite Emulated WN TOA Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Untuned Satellite Emulated WN TOA	145	357	569	781
Tuned Satellite Emulated WN TOA	146	358	570	782

Table 2.12-18(a). TOA Fluxes Error

SDS Name	Units	Range	Dimensions	Data Type
Tuned Minus Observed SW TOA	W m ⁻²	-1400 .. 1400	18	32-bit real
Untuned Minus Observed SW TOA	W m ⁻²	-1400 .. 1400	18	32-bit real
Tuned Minus Observed LW TOA	W m ⁻²	-600 .. 600	18	32-bit real
Untuned Minus Observed LW TOA	W m ⁻²	-600 .. 600	18	32-bit real

Table 2.12-18(b). SDS Index of TOA Fluxes Error

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Tuned Minus Observed SW TOA	147	359	571	783
Untuned Minus Observed SW TOA	148	360	572	784
Tuned Minus Observed LW TOA	149	361	573	785
Untuned Minus Observed LW TOA	150	362	574	786

Table 2.12-19(a). Constraint Adjustments

SDS Name	Units	Range	Dimensions	Data Type
Total column precipitable water - initial	cm	0 .. 10	18	32-bit real
Total column precipitable water - adjusted	cm	-10 .. 10	18	32-bit real
Upper tropospheric precipitable water - initial	cm	0 .. 10	18	32-bit real
Upper tropospheric precipitable water - adjusted	cm	0 .. 10	18	32-bit real
Upper tropospheric humidity - initial	N/A	0.0 .. 100.0	18	32-bit real
Upper tropospheric humidity - adjusted	N/A	0.0 .. 100.0	18	32-bit real
Aerosol optical depth - initial	N/A	0 .. 5	18	32-bit real
Aerosol optical depth - adjusted	N/A	0 .. 5	18	32-bit real
Skin temperature - initial	K	175 .. 375	18	32-bit real
Skin temperature - adjusted	K	175 .. 375	18	32-bit real
Surface pressure	hPa	0 .. 800	18	32-bit real
Column ozone - initial	du	0 .. 800	18	32-bit real
Mean visible optical depth- adjusted	N/A	0 .. 400	18	32-bit real
Mean cloud fractional area - adjusted	%	0 .. 1 00	18	32-bit real
Mean cloud effective temperature - adjusted	K	175 .. 375	18	32-bit real

Table 2.12-19(b). SDS Index of Constraint Adjustments

SDS Name	Zonal Monthly	Zonal Hourly	Global Monthly	Global Hourly
Total column precipitable water - initial	151	363	575	787
Total column precipitable water - adjusted	152	364	576	788
Upper tropospheric precipitable water - initial	153	365	577	789
Upper tropospheric precipitable water - adjusted	154	366	578	790
Upper tropospheric humidity - initial	155	367	579	791
Upper tropospheric humidity - adjusted	156	368	580	792
Aerosol optical depth - initial	157	369	581	793
Aerosol optical depth - adjusted	158	370	582	794
Skin temperature - initial	159	371	583	795
Skin temperature - adjusted	160	372	584	796
Surface pressure	161	373	585	797

Table 2.12-19(b). SDS Index of Constraint Adjustments

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Column ozone - initial	162	374	586	798
Mean visible optical depth- adjusted	163	375	587	799
Mean cloud fractional area - adjusted	164	376	588	800
Mean cloud effective temperature - adjusted	165	377	589	801

Table 2.12-20(a). Surface SW Direct/Diffuse Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Total-Sky SW flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky SW flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Pristine-Sky SW flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Actinic-Sky SW flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky SW flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky SW flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Pristine-Sky SW flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Actinic-Sky SW flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real

Table 2.12-20(b). SDS Index of Surface SW Direct/Diffuse Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Total-Sky SW flux - Diffuse	166	378	590	802
Clear-Sky SW flux - Diffuse	167	379	591	803
Pristine-Sky SW flux - Diffuse	168	380	592	804
Actinic-Sky SW flux - Diffuse	169	381	593	805
Total-Sky SW flux - Direct	170	382	594	806
Clear-Sky SW flux - Direct	171	383	595	807
Pristine-Sky SW flux - Direct	172	384	596	808
Actinic-Sky SW flux - Direct	173	385	597	809

Table 2.12-21(a). UVA - UVB Fluxes

SDS Name	Units	Range	Dimensions	Data Type
TOA Downwelling UVB Flux	W m ⁻²	0 .. 1400	18	32-bit real
TOA Downwelling UVA Flux	W m ⁻²	0 .. 1400	18	32-bit real
Pristine UVB Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Pristine UVB Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Pristine UVA Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Pristine UVA Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky UVB Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky UVB Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky UVA Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky UVA Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky-NoAerosol UVB Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky-NoAerosol UVB Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky-NoAerosol UVA Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky-NoAerosol UVA Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky UVB Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky UVB Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky UVA Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky UVA Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky Surface UV Index	N/A	0 .. 30	18	32-bit real
Clear-Sky Surface UV Index	N/A	0 .. 30	18	32-bit real
Pristine Surface UV Index	N/A	0 .. 30	18	32-bit real
Total-Sky-NoAerosol Surface UV-Index	N/A	0 .. 30	18	32-bit real
Total-Sky UVB Surface Up	W m ⁻²	0 .. 5	18	32-bit real
Snow Grain Size	μm	50 .. 2000	18	32-bit real
Match Total Aerosol Optical Depth at 0.55 μm	N/A	0 .. 10	18	32-bit real

Table 2.12-21(b). SDS Index of UVA - UVB Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
TOA Downwelling UVB Flux	174	386	598	810
TOA Downwelling UVA Flux	175	387	599	811
Pristine UVB Surface flux - Direct	176	388	600	812
Pristine UVB Surface flux - Diffuse	177	389	601	813
Pristine UVA Surface flux - Direct	178	390	602	814
Pristine UVA Surface flux - Diffuse	179	391	603	815
Clear-Sky UVB Surface flux - Direct	180	392	604	816
Clear-Sky UVB Surface flux - Diffuse	181	393	605	817
Clear-Sky UVA Surface flux - Direct	182	394	606	818
Clear-Sky UVA Surface flux - Diffuse	183	395	607	819
Total-Sky-NoAerosol UVB Surface flux - Direct	184	396	608	820
Total-Sky-NoAerosol UVB Surface flux - Diffuse	185	397	609	821
Total-Sky-NoAerosol UVA Surface flux - Direct	186	398	610	822
Total-Sky-NoAerosol UVA Surface flux - Diffuse	187	399	611	823
Total-Sky UVB Surface flux - Direct	188	400	612	824
Total-Sky UVB Surface flux - Diffuse	189	401	613	825
Total-Sky UVA Surface flux - Direct	190	402	614	826
Total-Sky UVA Surface flux - Diffuse	191	403	615	827
Total-Sky Surface UV Index	192	404	616	828
Clear-Sky Surface UV Index	193	405	617	829
Pristine Surface UV Index	194	406	618	830
Total-Sky-NoAerosol Surface UV- Index	195	407	619	831
Total-Sky UVB Surface Up	196	408	620	832
Snow Grain Size	197	409	621	833
Match Total Aerosol Optical Depth at 0.55 μm	198	410	622	834

Table 2.12-22(a). PAR Fluxes

SDS Name	Units	Range	Dimensions	Data Type
TOA Downwelling PAR Flux	W m^{-2}	0 .. 1400	18	32-bit real
Total-Sky PAR Surface flux - Direct	W m^{-2}	0 .. 1400	18	32-bit real
Total-Sky PAR Surface flux - Diffuse	W m^{-2}	0 .. 1400	18	32-bit real
Total-Sky PAR PURV Surface flux - Direct	W m^{-2}	0 .. 1400	18	32-bit real

Table 2.12-22(a). PAR Fluxes

SDS Name	Units	Range	Dimensions	Data Type
Total-Sky PAR PURV Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky PAR ChlorA Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Total-Sky PAR ChlorA Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky PAR Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Clear-Sky PAR Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real
Pristine PAR Surface flux - Direct	W m ⁻²	0 .. 1400	18	32-bit real
Pristine PAR Surface flux - Diffuse	W m ⁻²	0 .. 1400	18	32-bit real

Table 2.12-22(b). SDS Index of PAR Fluxes

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
TOA Downwelling PAR Flux	199	411	623	835
Total-Sky PAR Surface flux - Direct	200	412	624	836
Total-Sky PAR Surface flux - Diffuse	201	413	625	837
Total-Sky PAR PURV Surface flux - Direct	202	414	626	838
Total-Sky PAR PURV Surface flux - Diffuse	203	415	627	839
Total-Sky PAR ChlorA Surface flux - Direct	204	416	628	840
Total-Sky PAR ChlorA Surface flux - Diffuse	205	417	629	841
Clear-Sky PAR Surface flux - Direct	206	418	630	842
Clear-Sky PAR Surface flux - Diffuse	207	419	631	843
Pristine PAR Surface flux - Direct	208	420	632	844
Pristine PAR Surface flux - Diffuse	209	421	633	845

Table 2.12-23(a). Pristine-Sky SW MultiStream Correction

SDS Name	Units	Range	Dimensions	Data Type
SW TOA Flux - Up - Pristine-Sky - Corrected	W m ⁻²	0 .. 1000	18	32-bit real
SW Surface Flux - Down - Pristine-Sky - Corrected	W m ⁻²	0 .. 1000	18	32-bit real

Table 2.12-23(b). SDS Index of Pristine-Sky SW MultiStream Correction

SDS Name	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
SW TOA Flux - Up - Pristine-Sky - Corrected	210	422	634	846
SW Surface Flux - Down- Pristine-Sky - Corrected	211	423	635	847

Total Bits / Record: 149760
Total Bytes / Record: 18720
Total Records / File: 181
Total Bytes / File: 3,388,320
Total MBytes / File: 3.39

ZAVG Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

ZAVG Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. 	All
11/15/06	R3V2	639	<ul style="list-style-type: none"> • Updated to change all tables and added SDS Index tables. • The EOSDIS Product Code line was removed from the document. (6/17/2008) 	All Sec. 2.11
02/08/08	R3V3	667	<ul style="list-style-type: none"> • Updated to add three parameters. • Changed SDS Index tables. • Section numbering was changed due to insertion of the ISCCP D2-like DPC. (09/23/2008) 	Table 2.11-21(a) Tables 2.11-5(b) to 2.11-23(b) All
11/12/08	R5V1	689	<ul style="list-style-type: none"> • Updated "Product Version" category. • Removed Beta3 from "Product Version" category. (11/17/2008) • Corrected the Terra and Aqua product versions. (12/08/2008) • Corrected the Terra and Aqua product versions. (12/16/2008) 	Sec. 2.12 Sec. 2.12 Sec. 2.12 Sec. 2.12

2.13 Monthly TOA/Surface Averages (SRBAVG)

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 and contains metadata as well as gridded science data.

SRBAVG is composed of the following structures contained in three separate files (SRBAVG1, SRBAVG2, SRBAVG3):

On a Regional, Zonal, and Global Basis:

- Regional parameters (SRBAVG1)
- Total-sky radiative fluxes at TOA and surface (SRBAVG1)
- Clear-sky radiative fluxes at TOA and surface (SRBAVG1)
- Surface data (SRBAVG1)
- CERES and GEO Layer-averaged cloud properties (SRBAVG2)
- CERES Layer-averaged cloud properties (SRBAVG3)

A complete listing of metadata and gridded science parameters for this data product can be found in [Tables 2.13-1](#) through [Table 2.13-21](#)(a) & (b).

Level: 3

Frequency: 1/Month

Portion of Atmosphere Covered: Surface and TOA

Time Interval Covered:

File: 1 Month

Record: 1 Month

Portion of Globe Covered:

File: Entire Global

Record: 1-Deg Regions

Product Version:

TRMM: Edition2B

Terra: Edition2C, Edition2D

Aqua: Edition2A

SRBAVG Metadata

The types of SRBAVG 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.

Table 2.13-1. 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 Grid data type and are contained in three files: SRBAVG1, SRBAVG2 and SRBAVG3, which are shown in [Tables 2.13-5](#) through [Table 2.13-21\(a\)](#) & (b) 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 elements within each field.

SRBAVG Scientific Data Sets

[Table 2.13-2](#) List of the Vgroups for different Gridded Categories.

Table 2.13-2. Gridded Categories of SRBAVG1, SRBAVG2 and SRBAVG3

Vgroup Number	Vgroup Name	Description	Number of Records
1	1.0 Degree Regional	See Table 2.13-3	64800
2	1.0 Degree Zonal	See Table 2.13-3	180
3	Global	See Table 2.13-3	1

[Table 2.13-3](#) List of the Vgroups contained in 1.0 Degree Regional, 1.0 Degree Zonal and Global Vgroups.

Table 2.13-3. Temporal Vgroups of SRBAVG1, SRBAVG2 and SRBAVG3

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
1	Monthly Hourly Averages	See Table 2.13-4 for SRBAVG1 See Table 2.13-5 for SRBAVG2 and SRBAVG3
2	Monthly Averages	See Table 2.13-4 for SRBAVG1 See Table 2.13-5 for SRBAVG2 and SRBAVG3

Table 2.13-4 List of the Vgroups contained in the Monthly Hourly Averages and Monthly Averages Vgroups in SRBAVG1.

Table 2.13-4. Temporal Vgroups of SRBAVG1

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
1	Region parameters	See Table 2.13-6(a) & (b)
2	TOA Fluxes	See Table 2.13-7
3	Surface Fluxes	See Table 2.13-13(a) & (b)
4	Surface Data	See Table 2.13-19(a) & (b)

Table 2.13-5 List of the Vgroups contained in Monthly Hourly Averages and Monthly Averages Vgroups in SRBAVG2 (CERES and GEO Layer Cloud Properties) and SRBAVG3 (CERES Layer Cloud Properties).

Table 2.13-5. Temporal Vgroup of SRBAVG2 and SRBAVG3

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
1	CERES and GEO Layer Cloud Properties	See Table 2.13-20
2	CERES Layer Cloud Properties	See Table 2.13-20

Table 2.13-6(a) & (b) List of the SDSs contained in the Regional Parameters Vgroup.

Table 2.13-6(a). Region Parameters in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements
Region Number	4-Bit Integer	unitless	0.0 .. 44640	1
Colatitude	32-Bit Float	degree	0.0 .. 180.0	1
Longitude	32-Bit Float	degree	0.0 .. 360.0	1
Surface Type Percent Coverage	32-Bit Float	percent	0.0 .. 100.0	20
Surface Altitude	32-Bit Float	m	-1000.0 .. 10000	1
Snow/Ice Percent Coverage	32-Bit Float	percent	0.0 .. 100.0	1
Precipitable Water	32-Bit Float	cm	0.0001 .. 10.0	1
Total Aerosol Visible Optical Depth @0.63 microns	32-Bit Float	μm	0.0 .. 2.0	1
Total Aerosol Visible Optical Depth @1.6 microns	32-Bit Float	μm	0.0 .. 2.0	1

Table 2.13-6(b). SDS Index of Region Parameters in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Region Number	0	59	118	167	216	265
Colatitude	1	60	119	168	217	266
Longitude	2	61	120	169	218	267
Surface Type Percent Coverage	3	62	121	170	219	268
Surface Altitude	4	63	122	171	220	269
Snow/Ice Percent Coverage	5	64	123	172	221	270
Precipitable Water	6	65	124	173	222	271
Total Aerosol Visible Optical Depth @0.63 microns	7	66	125	174	223	272
Total Aerosol Visible Optical Depth @1.6 microns	8	67	126	175	224	273

Table 2.13-7 List of the Vgroups contained in the TOA Fluxes Vgroup.

Table 2.13-7. TOA Fluxes in SRBAVG1

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
1	Clear-Sky Raw Data Average	See Table 2.13-8(a) & (b)
2	Total-Sky Raw Data Average	See Table 2.13-9(a) & (b)
3	Clear-Sky non-GEO Method	See Table 2.13-10(a) & (b)
4	Total-Sky non-GEO Method	See Table 2.13-11(a) & (b)
5	Clear-Sky GEO Method	See Table 2.13-12(a) & (b)
6	Total-Sky GEO Method	See Table 2.13-13(a) & (b)

Table 2.13-8(a) & (b) List of the SDSs contained in the Clear-Sky Raw Data Average Vgroup.

Table 2.13-8(a). Clear-Sky Raw Data Average in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Clear-sky TOA SW Flux - Raw Data Average	32-Bit Float	Wm ⁻²	0.0 .. 800.0	72	3
Clear-sky TOA LW Flux - Raw Data Average	32-Bit Float	Wm ⁻²	0.0 .. 400.0	72	3

Table 2.13-8(a). Clear-Sky Raw Data Average in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Clear-sky TOA WN Flux - Raw Data Average	32-Bit Float	Wm ⁻²	0.0 .. 800.0	72	3
Clear-sky TOA Albedo - Raw Data Average	32-Bit Float	N/A	0.0 .. 1.0	72	3
Clear-sky TOA Net Flux - Raw Data Average	32-Bit Float	Wm ⁻²	-300.0 .. 400.0	72	3

Table 2.13-8(b). SDS Index of Clear-Sky Raw Data Average in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly
Clear-sky TOA SW Flux - Raw Data Average	9	68
Clear-sky TOA LW Flux - Raw Data Average	10	69
Clear-sky TOA WN Flux - Raw Data Average	11	70
Clear-sky TOA Albedo - Raw Data Average	12	71
Clear-sky TOA Net Flux - Raw Data Average	13	72

Table 2.13-9(a) & (b) List of the SDSs contained in the Total-Sky Raw Data Average Vgroup.

Table 2.13-9(a). Total-Sky Raw Data Average in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Total-sky TOA SW Flux - Raw Data Average	32-Bit Float	Wm ⁻²	0.0 .. 800.0	72	3
Total-sky TOA LW Flux - Raw Data Average	32-Bit Float	Wm ⁻²	0.0 .. 400.0	72	3
Total-sky TOA WN Flux - Raw Data Average	32-Bit Float	Wm ⁻²	0.0 .. 800.0	72	3
Total-sky TOA Albedo - Raw Data Average	32-Bit Float	N/A	0.0 .. 1.0	72	3
Total-sky TOA Net Flux - Raw Data Average	32-Bit Float	Wm ⁻²	-300.0 .. 400.0	72	3

Table 2.13-9(b). SDS Index of Total-Sky Raw Data Average in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly
Total-sky TOA SW Flux - Raw Data Average	14	73
Total-sky TOA LW Flux - Raw Data Average	15	74
Total-sky TOA WN Flux - Raw Data Average	16	75
Total-sky TOA Albedo - Raw Data Average	17	76
Total-sky TOA Net Flux - Raw Data Average	18	77

Table 2.13-10(a) & (b) List of the SDSs contained in the Clear-Sky non-GEO Method Vgroup.

Table 2.13-10(a). Clear-Sky non-GEO Method in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Clear-sky TOA SW Flux - non-GEO Interpolation	32-Bit Float	Wm ⁻²	0.0 .. 800.0	72	3
Clear-sky TOA LW Flux - non-GEO Interpolation	32-Bit Float	Wm ⁻²	0.0 .. 400.0	72	3
Clear-sky TOA WN Flux - non-GEO Interpolation	32-Bit Float	Wm ⁻²	0.0 .. 800.0	72	3
Clear-sky TOA Albedo - non-GEO Interpolation	32-Bit Float	N/A	0.0 .. 1.0	72	3
Clear-sky TOA Net Flux - non-GEO Interpolation	32-Bit Float	Wm ⁻²	-300.0 .. 400.0	72	3

Table 2.13-10(b). SDS Index of Clear-Sky non-GEO Method in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Clear-sky TOA SW Flux - non-GEO Interpolation	19	78	127	176	225	274
Clear-sky TOA LW Flux - non-GEO Interpolation	20	79	128	177	226	275
Clear-sky TOA WN Flux - non-GEO Interpolation	21	80	129	178	227	276

Table 2.13-10(b). SDS Index of Clear-Sky non-GEO Method in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Clear-sky TOA Albedo - non-GEO Interpolation	22	81	130	179	228	277
Clear-sky TOA Net Flux - non-GEO Interpolation	23	82	131	180	229	278

Table 2.13-11(a) & (b) List of the SDSs contained in the Total-Sky non-GEO Method Vgroup.

Table 2.13-11(a). Total-Sky non-GEO Method in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Total-sky TOA SW Flux - non-GEO Interpolation	32-Bit Float	Wm ⁻²	0.0 .. 800.0	72	3
Total-sky TOA LW Flux - non-GEO Interpolation	32-Bit Float	Wm ⁻²	0.0 .. 400.0	72	3
Total-sky TOA WN Flux - non-GEO Interpolation	32-Bit Float	Wm ⁻²	0.0 .. 800.0	72	3
Total-sky TOA Albedo - non-GEO Interpolation	32-Bit Float	N/A	0.0 .. 1.0	72	3
Total-sky TOA Net Flux - non-GEO Interpolation	32-Bit Float	Wm ⁻²	-300.0 .. 400.0	72	3

Table 2.13-11(b). SDS Index of Total-Sky non-GEO Method in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Total-sky TOA SW Flux - non-GEO Interpolation	24	83	132	181	230	279
Total-sky TOA LW Flux - non-GEO Interpolation	25	84	133	182	231	280
Total-sky TOA WN Flux - non-GEO Interpolation	26	85	134	183	232	281
Total-sky TOA Albedo - non-GEO Interpolation	27	86	135	184	233	282
Total-sky TOA Net Flux - non-GEO Interpolation	28	87	136	185	234	283

Table 2.13-12(a) & (b) List of the SDSs contained in the Clear-Sky GEO Method Vgroup.

Table 2.13-12(a). Clear-Sky GEO Method in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Clear-sky TOA SW Flux - GEO Interpolation	32-Bit Float	Wm ⁻²	0.0 .. 800.0	72	3
Clear-sky TOA LW Flux - GEO Interpolation	32-Bit Float	Wm ⁻²	0.0 .. 400.0	72	3
Clear-sky TOA WN Flux - GEO Interpolation	32-Bit Float	Wm ⁻²	0.0 .. 800.0	72	3
Clear-sky TOA Albedo - GEO Interpolation	32-Bit Float	N/A	0.0 .. 1.0	72	3
Clear-sky TOA Net Flux - GEO Interpolation	32-Bit Float	Wm ⁻²	-300.0 .. 400.0	72	3

Table 2.13-12(b). SDS Index of Clear-Sky GEO Method in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Clear-sky TOA SW Flux - GEO Interpolation	29	88	137	186	235	284
Clear-sky TOA LW Flux - GEO Interpolation	30	89	138	187	236	285
Clear-sky TOA WN Flux - GEO Interpolation	31	90	139	188	237	286
Clear-sky TOA Albedo - GEO Interpolation	32	91	140	189	238	287
Clear-sky TOA Net Flux - GEO Interpolation	33	92	141	190	239	288

Table 2.13-13(a) & (b) List of the SDSs contained in the Total-Sky GEO Method Vgroup.

Table 2.13-13(a). Total-Sky GEO Method in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Total-sky TOA SW Flux - GEO Interpolation	32-Bit Float	Wm ⁻²	0.0 .. 800.0	72	3
Total-sky TOA LW Flux - GEO Interpolation	32-Bit Float	Wm ⁻²	0.0 .. 400.0	72	3
Total-sky TOA WN Flux - GEO Interpolation	32-Bit Float	Wm ⁻²	0.0 .. 800.0	72	3
Total-sky TOA Albedo - GEO Interpolation	32-Bit Float	N/A	0.0 .. 1.0	72	3
Total-sky TOA Net Flux - GEO Interpolation	32-Bit Float	Wm ⁻²	-300.0 .. 400.0	72	3

Table 2.13-13(b). SDS Index of Total-Sky GEO Method in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Total-sky TOA SW Flux - GEO Interpolation	34	93	142	191	240	289
Total-sky TOA LW Flux - GEO Interpolation	35	94	143	192	241	290
Total-sky TOA WN Flux - GEO Interpolation	36	95	144	193	242	291
Total-sky TOA Albedo - GEO Interpolation	37	96	145	194	243	292
Total-sky TOA Net Flux - GEO Interpolation	38	97	146	195	244	293

Table 2.13-14 List of the Vgroups contained in the Surface Fluxes Vgroup.

Table 2.13-14. Surface Fluxes in SRBAVG1

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
1	Clear-Sky Net	See Table 2.13-15(a) & (b)
2	Total-Sky Net	See Table 2.13-16(a) & (b)
3	Clear-Sky Down	See Table 2.13-17(a) & (b)
4	Total-Sky Down	See Table 2.13-18(a) & (b)

Table 2.13-15(a) & (b) List of the SDSs contained in the Clear-Sky Net Vgroup.

Table 2.13-15(a). Clear-Sky Net in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Clear-sky Sfc Net SW Flux - Mod A	32-Bit Float	Wm ⁻²	0.0 .. 1400.0	72	3
Clear-sky Sfc Net SW Flux - Mod B	32-Bit Float	Wm ⁻²	0.0 .. 1400.0	72	3
Clear-sky Sfc Net LW Flux - Mod A	32-Bit Float	Wm ⁻²	-250.0 .. 50.0	72	3
Clear-sky Sfc Net LW Flux - Mod B	32-Bit Float	Wm ⁻²	-250.0 .. 50.0	72	3

Table 2.13-15(b). SDS Index of Clear-Sky Net in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Clear-sky Sfc Net SW Flux - Mod A	39	98	147	196	245	294
Clear-sky Sfc Net SW Flux - Mod B	40	99	148	197	246	295
Clear-sky Sfc Net LW Flux - Mod A	41	100	149	198	247	296
Clear-sky Sfc Net LW Flux - Mod B	42	101	150	199	248	297

Table 2.13-16(a) & (b) List of the SDSs contained in the Total-Sky Net Vgroup.

Table 2.13-16(a). Total-Sky Net in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Total-sky Sfc Net SW Flux - Mod A	32-Bit Float	Wm ⁻²	0.0 .. 1400.0	72	3
Total-sky Sfc Net SW Flux - Mod B	32-Bit Float	Wm ⁻²	0.0 .. 1400.0	72	3
Total-sky Sfc Net LW Flux - Mod A	32-Bit Float	Wm ⁻²	-250.0 .. 50.0	72	3
Total-sky Sfc Net LW Flux - Mod B	32-Bit Float	Wm ⁻²	-250.0 .. 50.0	72	3

Table 2.13-16(b). SDS Index of Total-Sky Net in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Total-sky Sfc Net SW Flux - Mod A	43	102	151	200	249	298
Total-sky Sfc Net SW Flux - Mod B	44	103	152	201	250	299
Total-sky Sfc Net LW Flux - Mod A	45	104	153	202	251	300
Total-sky Sfc Net LW Flux - Mod B	46	105	154	203	252	301

Table 2.13-17(a) & (b) List of the SDSs contained in the Clear-Sky Down Vgroup.

Table 2.13-17(a). Clear-Sky Down in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Clear-sky Sfc Down SW Flux - Mod A	32-Bit Float	Wm ⁻²	0.0 .. 1400.0	72	3
Clear-sky Sfc Down SW Flux - Mod B	32-Bit Float	Wm ⁻²	0.0 .. 1400.0	72	3
Clear-sky Sfc Down LW Flux - Mod A	32-Bit Float	Wm ⁻²	0.0 .. 700.0	72	3
Clear-sky Sfc Down LW Flux - Mod B	32-Bit Float	Wm ⁻²	0.0 .. 700.0	72	3
Clear-sky Sfc Down WN Flux - Mod A	32-Bit Float	Wm ⁻²	0.0 .. 700.0	72	3

Table 2.13-17(b). SDS Index of Clear-Sky Down in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Clear-sky Sfc Down SW Flux - Mod A	47	106	155	204	253	302
Clear-sky Sfc Down SW Flux - Mod B	48	107	156	205	254	303
Clear-sky Sfc Down LW Flux - Mod A	49	108	157	206	255	304
Clear-sky Sfc Down LW Flux - Mod B	50	109	158	207	256	305
Clear-sky Sfc Down WN Flux - Mod A	51	110	159	208	257	306

Table 2.13-18(a) & (b) List of the SDSs contained in the Total-Sky Down Vgroup.

Table 2.13-18(a). Total-Sky Down in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Total-sky Sfc Down SW Flux - Mod A	32-Bit Float	Wm ⁻²	0.0 .. 1400.0	72	3
Total-sky Sfc Down SW Flux - Mod B	32-Bit Float	Wm ⁻²	0.0 .. 1400.0	72	3
Total-sky Sfc Down LW Flux - Mod A	32-Bit Float	Wm ⁻²	0.0 .. 700.0	72	3
Total-sky Sfc Down LW Flux - Mod B	32-Bit Float	Wm ⁻²	0.0 .. 700.0	72	3
Total-sky Sfc Down WN Flux - Mod A	32-Bit Float	Wm ⁻²	0.0 .. 700.0	72	3

Table 2.13-18(b). SDS Index of Total-Sky Down in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Total-sky Sfc Down SW Flux - Mod A	52	111	160	209	258	307
Total-sky Sfc Down SW Flux - Mod B	53	112	161	210	259	308
Total-sky Sfc Down LW Flux - Mod A	54	113	162	211	260	309
Total-sky Sfc Down LW Flux - Mod B	55	114	163	212	261	310
Total-sky Sfc Down WN Flux - Mod A	56	115	164	213	262	311

Table 2.13-19(a) & (b) List of the SDSs contained in the Surface Data Vgroup.

Table 2.13-19(a). Surface Data in SRBAVG1

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
LW Surface Emissivity	32-Bit Float	N/A	0.0 .. 1.0	24	1
WN Surface Emissivity	32-Bit Float	N/A	0.0 .. 1.0	24	1

Table 2.13-19(b). SDS Index of Surface Data in SRBAVG1

SDS Name	Regional Monthly Hourly	Regional Monthly	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
LW Surface Emissivity	57	116	165	214	263	312
WN Surface Emissivity	58	117	166	215	264	313

Total Bits/Region Record:	40,896
Total Bits/Zonal-Global Record:	65,792
Total Bytes/Region Record:	5,112
Total Bytes/Zonal-Global Record:	8,224
Total Records/File:	64,981
Total Bits/File:	6,932,692,628
Total Bytes/File:	866,586,616

Table 2.13-20 List of the Vgroups contained in the CERES and GEO Layer Cloud Properties (SRBAVG2) or CERES Layer Cloud Properties (SRBAVG3) Vgroups.

Table 2.13-20. CERES and GEO Layer Cloud Properties (SRBAVG2) and CERES Layer Cloud Properties (SRBAVG3)

Vgroup Number	Vgroup Name	Monthly Hourly Averages / Monthly (Hour) Averages
1	High	See Table 2.13-21(a) & (b)
2	Upper Middle	See Table 2.13-21(a) & (b)
3	Lower Middle	See Table 2.13-21(a) & (b)
4	Low	See Table 2.13-21(a) & (b)

Table 2.13-21(a) & (b) List of the SDSs contained in the High, Upper Middle, Lower Middle, Low Vgroups.

Table 2.13-21(a). High, Uppermid, Lowermid, Low (mean, stdev, num obs) in SRBAVG2 and SRBAVG3

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Cloud Area Fraction	32-Bit Float	N/A	0.0 .. 100.0	72	3
Cloud Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	72	3
Cloud Effective Temperature	32-Bit Float	K	180.0 .. 350.0	72	3
Cloud Effective Height	32-Bit Float	km	0.0 .. 20.0	72	3
Cloud Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	72	3
Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	72	3
Cloud Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	72	3
Liquid Water Path	32-Bit Float	gm ⁻²	0.0 .. 10000.0	72	3
Ice Water Path	32-Bit Float	gm ⁻²	0.0 .. 10000.0	72	3
Water Particle Radius	32-Bit Float	micron	0.0 .. 40.0	72	3
Ice Particle Effective Diam	32-Bit Float	micron	0.0 .. 300.0	72	3
Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	72	3
Cloud Visible Optical Depth - lin	32-Bit Float	N/A	0.0 .. 100.0	72	3

Table 2.13-21(a). High, Uppermid, Lowermid, Low (mean, stdev, num obs) in SRBAVG2 and SRBAVG3

SDS Name	Data Type	Units	Range	No. of Elements Monthly Hourly	No. of Elements Monthly
Cloud Visible Optical Depth - log	32-Bit Float	N/A	0.0 .. 100.0	72	3
Cloud Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	72	3

Table 2.13-21(b). SDS Index of High, Uppermid, Lowermid, Low (mean, stdev, num obs) in SRBAVG2 and SRBAVG3

SDS Name	Regional Monthly Hourly	Regional Monthly	Zonal Monthly Hourly	Zonal Monthly	Global Monthly Hourly	Global Monthly
Cloud Area Fraction	0 15 30 45	60 75 90 105	120 135 150 165	180 195 210 225	240 255 270 285	300 315 330 345
Cloud Effective Pressure	1 16 31 46	61 76 91 106	121 136 151 166	181 196 211 226	241 256 271 286	301 316 331 346
Cloud Effective Temperature	2 17 32 47	62 77 92 107	122 137 152 167	182 197 212 227	242 257 272 287	302 317 332 347
Cloud Effective Height	3 18 33 48	63 78 93 108	123 138 153 168	183 198 213 228	243 258 273 288	303 318 333 348
Cloud Top Pressure	4 19 34 49	64 79 94 109	124 139 154 169	184 199 214 229	244 259 274 289	304 319 334 349
Cloud Base Pressure	5 20 35 50	65 80 95 110	125 140 155 170	185 200 215 230	245 260 275 290	305 320 335 350
Cloud Particle Phase	6 21 36 51	66 81 96 111	126 141 156 171	186 201 216 231	246 261 276 291	306 321 336 351
Liquid Water Path	7 22 37 52	67 82 97 112	127 142 157 172	187 202 217 232	247 262 277 292	307 322 337 352
Ice Water Path	8 23 38 53	68 83 98 113	128 143 158 173	188 203 218 233	248 263 278 293	308 323 338 353
Water Particle Radius	9 24 39 54	69 84 99 114	129 144 159 174	189 204 219 234	249 264 279 294	309 324 339 354
Ice Particle Effective Diam	10 25 40 55	70 85 100 115	130 145 160 175	190 205 220 235	250 265 280 295	310 325 340 355
Infrared Emissivity	11 26 41 56	71 86 101 116	131 146 161 176	191 206 221 236	251 266 281 296	311 326 341 356
Cloud Visible Optical Depth - lin	12 27 42 57	72 87 102 117	132 147 162 177	192 207 222 237	252 267 282 297	312 327 342 357
Cloud Visible Optical Depth - log	13 28 43 58	73 88 103 118	133 148 163 178	193 208 223 238	253 268 283 298	313 328 343 358
Cloud Vertical Aspect Ratio	14 29 44 59	74 89 104 119	134 149 164 179	194 209 224 239	254 269 284 299	314 329 344 359

Color Red - High Cloud
 Color Green - Uppermid Cloud
 Color Blue - Lowermid Cloud
 Color Black - Low Cloud

Total Bits/Record: 219,424
Total Bytes/Record: 27,256
Total Record/File: 64,981
Total Bits/File: 14,258,390,944
Total Bytes/File: 1,771,122,136

SRBAVG Revision Record

The product Revision Record contains information pertaining to approved document changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The document authors are listed on the cover.

SRBAVG Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
6/17/02	R3V2	368	<ul style="list-style-type: none"> • Changed column clouds to layer clouds and deleted the angular model scene types. • Added SRBAVG3. • Added SRBAVG3 and the Vgroup names. • Added region number, colatitude and longitude. • Changed ERBE-like to non-GEO. • Changed the net flux range. • Changed the net flux range and the ERBE-like to non-GEO. • Added another Vgroup name for cloud. • Changed the number of elements monthly hourly of the total cloud area fraction from 24 to 72. • Updated format to comply with standards. 	<p style="text-align: center;">2.12</p> <p style="text-align: center;">2.12-2 & 3</p> <p style="text-align: center;">2.12-5</p> <p style="text-align: center;">2.12-6</p> <p style="text-align: center;">2.12-7</p> <p style="text-align: center;">2.12-8, 9,12,13</p> <p style="text-align: center;">2.12-10 & 11</p> <p style="text-align: center;">2.12-20</p> <p style="text-align: center;">2.12-21</p> <p style="text-align: center;">All</p>
3/25/04	R3V3	516	<ul style="list-style-type: none"> • Updated information to add "Edition2A" to Terra under Product Version. • Updated format to comply with standards. 	<p style="text-align: center;">2.12</p> <p style="text-align: center;">All</p>
11/08/04	R3V4	566	<ul style="list-style-type: none"> • Updated information to add "Edition2C" to Terra under Product Version. • Updated to add the SDS Index tables. • Updated format to comply with standards. 	<p style="text-align: center;">2.12</p> <p style="text-align: center;">2.12</p> <p style="text-align: center;">All</p>
02/26/08	R4V1	671	<ul style="list-style-type: none"> • Updated Product Version. • The EOSDIS Product Code line was removed from the document. (6/17/2008) • Section numbering was changed due to insertion of the ISCCP D2-like DPC. (09/23/2008) 	<p style="text-align: center;">Product Version Section Sec. 2.12</p> <p style="text-align: center;">All</p>

2.14 Monthly Cloud Averages (ISCCP-D2like-GEO)

The Monthly Cloud Averages (ISCCP-D2like-GEO) archival data product contains 3-hourly (GMT based) monthly and monthly 1° gridded regional daytime mean cloud properties as a function of 18 cloud types, similar to the [ISCCP D2](#) product, where the cloud properties are stratified by pressure, optical depth, and phase. The GEO ISCCP-D2like is a 5-satellite, daytime 3-hourly GMT, 8km nominal resolution, geostationary-only cloud product limited to 60°N to 60°S. The GEO ISCCP-D2like is a daytime-only product, where the cloud retrievals incorporate only a visible and IR channel common to all geostationary satellites for spatial consistency. The geostationary calibration is normalized to Terra-MODIS. The GEO cloud properties are from the same source as the SRBAVG product, however they are not temporally interpolated. Input to the Subsystem is the Gridded GEO Narrowband Radiances (GGEO) archival data product. Each GEO ISCCP-D2like covers a single month. The science data are Scientific Data Sets (SDSs) with multiple records. Each record contains spatially averaged data for an individual region. All Edition ISCCP-D2like HDF files from Terra/Aqua, GEO composite and merged products, will have the same structure and read program and will differ from this current Beta1 version.

The major categories of data output on the ISCCP-D2like-GEO HDF file is as follows:

- Regional Identification Parameters
- D2like-GEO 18 Cloud Types for monthly-3-hourly/monthly

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

Frequency: 1/Month

Portion of Atmosphere Covered: Clouds

Time Interval Covered:

File: 1 Month

Record: 1 Month

Portion of Globe Covered:

File: Entire Global

Record: 1-Deg Regions

Product Version:

GEO Composite: Beta1

ISCCP-D2like-GEO Metadata

The ISCCP-D2like-GEO metadata are summarized in [Table 2.14-1](#). These metadata 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. ISCCP-D2like 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 science data are organized into the HDF Grid data type and are contained in one ISCCP-D2like-GEO HDF file, which are shown in [Table 2.14-2](#) to [Table 2.14-5](#). Each table contains a list of the parameters, including SDS index, SDS Name, data type, units, range, and number of elements within each field.

All SDS names with a suffix of -MH refer to monthly 3-hourly and a suffix of -M to monthly mean.

Table 2.14-2. Temporal Vgroups

Vgroup Number	Vgroup Name	Monthly 3-Hourly Averages/ Monthly Averages
1	Monthly 3-Hourly Averages	See Table 2.14-3
2	Monthly Averages	See Table 2.14-3

Table 2.14-3. Vgroup Types

Vgroup Number	Vgroup Name	Monthly 3-Hourly Averages/ Monthly Averages
1	Regional Identification Parameters	See Table 2.14-4
2	D2like-GEO 18 Cloud Types	See Table 2.14-5

Table 2.14-4. Regional Identification Parameters

SDS Index		SDS Name	Data Type	Units	Range	No. of Elements	
0	9	Colatitude	32-Bit Float	Degree	0 .. 180	8*180*360	1*180*360
1	10	Longitude	32-Bit Float	Degree	0 .. 360	8*180*360	1*180*360

See [Table 2.9-7](#) for a complete list of the 8 GMT-based monthly 3-hourly time increments

Black = (MH) Monthly 3-Hourly
 Red = (M) Monthly Mean

Table 2.14-5. ISCCP-D2like-GEO Cloud Types

SDS Index		SDS Name	Data Type	Units	Range	No. of Elements	
2	11	Number Of Observations	32-Bit Float	N/A	N/A	8*180*360	1*180*360
3	12	Total Cloud Area Fraction	32-Bit Float	Percent	0.0 .. 100.0	8*180*360	1*180*360
4	13	Cloud Area Fraction	32-Bit Float	Percent	0.0 .. 100.0	8*18*180*360	1*18*180*360
5	14	Effective Pressure	32-Bit Float	hPa	0 .. 1100	8*18*180*360	1*18*180*360
6	15	Effective Temperature	32-Bit Float	K	100 .. 350	8*18*180*360	1*18*180*360
7	16	Log (Visible) Optical Depth - MH	32-Bit Float	N/A	-6 .. 6	8*18*180*360	1*18*180*360
8	17	Liquid/Ice Water Path - MH	32-Bit Float	N/A	0 .. 400	8*18*180*360	1*18*180*360

Black = (MH) Monthly 3-Hourly
 Red = (M) Monthly Mean

Table 2.14-6. List of the 18 Cloud Types used in Table 2.14-5

Cloud Type	Name	Phase	(Pressure Level, Optical Depth Level)
1	Cumulus	Liquid	(Low, Thin)
2	Stratocumulus	Liquid	(Low, Mid-thick)
3	Stratus	Liquid	(Low, Thick)
4	Cumulus	Ice	(Low, Thin)
5	Stratocumulus	Ice	(Low, Mid-thick)
6	Stratus	Ice	(Low, Thick)
7	Alto cumulus	Liquid	(Mid, Thin)
8	Altostratus	Liquid	(Mid, Mid-thick)
9	Nimbostratus	Liquid	(Mid, Thick)

Table 2.14-6. List of the 18 Cloud Types used in Table 2.14-5

Cloud Type	Name	Phase	(Pressure Level, Optical Depth Level)
10	Alto cumulus	Ice	(Mid, Thin)
11	Alto stratus	Ice	(Mid, Mid-thick)
12	Nimbo stratus	Ice	(Mid, Thick)
13	Cirrus	Liquid	(High, Thin)
14	Cirro stratus	Liquid	(High, Mid-thick)
15	Deep Convection	Liquid	(High, Thick)
16	Cirrus	Ice	(High, Thin)
17	Cirro stratus	Ice	(High, Mid-thick)
18	Deep Convection	Ice	(High, Thick)

Table 2.14-7. List of the 8 GMT-based monthly 3-hourly indices used in this document

Time index	Time increment
1	00-03 GMT
2	03-06 GMT
3	06-09 GMT
4	09-12 GMT
5	12-15 GMT
6	15-18 GMT
7	18-21 GMT
8	21-24 GMT
1	00-24 GMT Monthly

Black = (MH) Monthly 3-Hourly
 Red = (M) Monthly Mean

Table 2.14-8. Definition of the 180x360 regions used in this document

There are 180 1° equal latitude bins and 360 1° equal longitude bins
The latitude index #1 is defined at 89.5°N and index #180 is defined at 89.5°S
The longitude index #1 is defined at 0.5°E and index #360 is defined at 359.5°W

Total Bits/Region Record:	27,072
Total Bytes/Region Record:	3,384
Total Records/File:	64,800
Total Bits/File:	1,754,265,600
Total Bytes/File:	219,283,200

ISCCP-D2like-GEO Revision Record

The product Revision Record contains information pertaining to approved document changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The document authors are listed on the cover.

ISCCP-D2like-GEO Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
05-28-2008	R5V1	672	• Initial version.	All

3.0 Internal Data Products

This section describes the internal CERES data products which are stored 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
- Frequency - How often the product is received or produced
- Configuration Code - Unique identifier that defines the software and input file versions used to produce the products
- 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.

Internal Data Products Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

Internal Data Products Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none">• Updated format to comply with standards.	All

3.1 Instrument Production Data Set (INSTR)

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 are unique to a particular spacecraft. There are six basic pieces of information contained in a normal CERES data packet (e.g., science output format):

1. Packet Header - Same CCSDS format for all instruments.
2. Time (secondary header) - format 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 3.1-1](#) and the Terra Level 0 file format is illustrated in [Figure 3.1-2](#). [Table 3.1-1](#) and [Table 3.1-2](#) lists the parameters and sizes for TRMM Level 0 files. [Table 3.1-3](#) and [Table 3.1-4](#) lists the parameters and sizes for Terra Level 0 files. [Table 3.1-5](#) and [Table 3.1-6](#) lists the parameters and sizes for Aqua and NPP Level 0 files.

Level: 0
Type: Internal
Frequency: 1/Day

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

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

Portion of Atmosphere Covered
File: N/A

Level 0 File Definitions

File Header (48 to 52 Bytes)
Instrument Data Packets (Number of Packets x 7132 Bytes)
File Footer (QAC) (Total = Length of QAC Footer (4) + [Number of Entries x 5] Bytes)
File Footer (MDUL) (Total = Length of MDUL Footer (4) + [Number of Entries x 5] Bytes)

QAC - List of packet IDs known to be corrupted or unusable
 (Minimum number of QAC entries is always = 1)

MDUL - List of packet IDs missing

Figure 3.1-1. TRMM Level 0 File Format

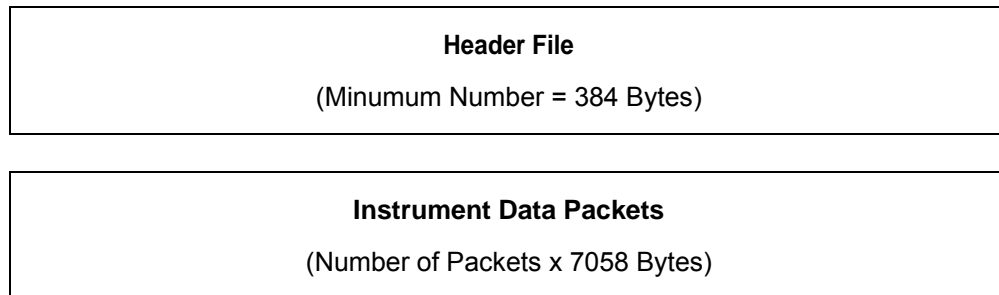


Figure 3.1-2. Terra Level 0 File Format

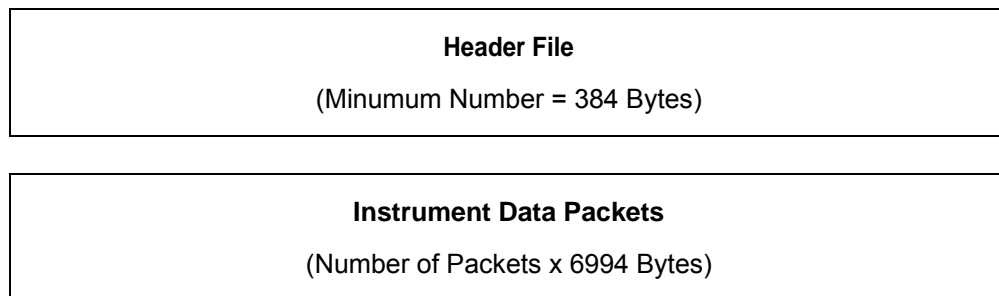


Figure 3.1-3. Aqua and NPP Level 0 File Format

Table 3.1-1. TRMM Instrument Production Data Set (INSTR)

Description	Element Number	Units	Range	Elements per Record	Bits per Element
INSTR_PDS FILE HEADER					
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_DATA_PACKET [1..13091]					
Primary Packet_Header					
Version Number	1	N/A	N/A	1	3
Type	2	N/A	N/A	1	1
Secondary Header Flag	3	N/A	N/A	1	1
APID	4	N/A	N/A	1	11
Sequence Flags	5	N/A	N/A	1	2
Packet Sequence Count	6	N/A	N/A	1	14
Packet Length	7	N/A	N/A	1	16
Secondary Packet_Header					
Time Data	8	N/A	N/A	1	64
Instrument_Packet_Status					
Spare 1	9	N/A	N/A	1	16

Table 3.1-1. TRMM Instrument Production Data Set (INSTR)

Description	Element Number	Units	Range	Elements per Record	Bits per Element
Timecode ID	10	N/A	N/A	1	1
Quicklook Flag	11	N/A	N/A	1	1
Instrument ID	12	N/A	N/A	1	5
Data Version	13	N/A	N/A	1	5
Data Indicator	14	N/A	N/A	1	4
Packet Counter	15	N/A	0..65535	1	16
Spare 2	16	N/A	N/A	1	16
Spare 3	17	N/A	N/A	1	16
Measurement_Data (1 of the 5 following record types):					
Science_Record [660]					
Azimuth Position Count	18	count	0..65535	660	16
Elevation Position Count	19	count	0..65535	660	16
Total Detector Output	20	count	0..4095	660	12
WN Detector Output	21	count	0..4095	660	12
SW Detector Output	22	count	0..4095	660	12
Instrument Analog Data - (Reference 3)	23	-	-	660	12
Memory_Record [660]					
Azimuth Position Count	19	count	0..65535	660	16
Elevation Position Count	20	count	0..65535	660	16
DAP Memory Dump Data	21	N/A	0..65535	660	16
ICP Memory Dump Data	22	N/A	0..65535	660	16
Fill Data	23	N/A	0..15	660	4
Instrument Analog Data - (Reference 3)	24	-	-	660	12
Gimbal_Record [660]					
Azimuth Position Count	19	count	0..65535	660	16
Elevation Position Count	20	count	0..65535	660	16
Elevation Error	21	count	0..65535	660	16
Azimuth Error	22	count	0..65535	660	16
Fill Data	23	N/A	0..15	660	4
Instrument Analog Data - (Reference 3)	24	-	-	660	12
Processor_Op_Record [660]					
Azimuth Position Count	19	count	0..65535	660	16
Elevation Position Count	20	count	0..65535	660	16
DAP Timing	21	N/A	0..65535	660	16
ICP Timing	22	N/A	0..65535	660	16

Table 3.1-1. TRMM Instrument Production Data Set (INSTR)

Description	Element Number	Units	Range	Elements per Record	Bits per Element
Fill Data	23	N/A	0..15	660	4
Instrument Analog Data - (Reference 3)	24	-	-	660	12
Fixed_Record [660]					
Fixed Pattern in Elevation Field	19	N/A	0..65535	660	16
Fixed Pattern for Azimuth Field	20	N/A	0..65535	660	16
Fixed Pattern for Total Channel Field	21	N/A	0..4095	660	12
Fixed Pattern for WN Channel Field	22	N/A	0..4095	660	12
Fixed Pattern for SW Channel Field	23	N/A	0..4095	660	12
Fixed Pattern for Analog Field	24	N/A	0..4095	660	12
Instrument Digital Status - (Reference 3)	25	-	-	1	2960
Fill Data	26	N/A	N/A	1	1104
INSTR_PDS FILE FOOTER					
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

Table 3.1-2. TRMM Instrument Production Data Set Sizes

Description	Sizes
Total Header Bits/File:	416
Maximum Data Bits/ Packet Record:	57,056
Maximum Records/File:	13,091
Maximum Data Bits/File:	746,920,096
Minimum Footer Bits/File:	72
Total Bits/File:	746,920,584
Total Bytes/File:	93,365,073
Total MBytes/file (1MB = 1024*1024 Bytes):	89.04

Table 3.1-3. Terra Instrument Production Data Set (INSTR)

Description	Element Number	Units	Range	Elements per Record	Bits per Element
INSTR_PDS Header File					
See Reference 8, Table 8.1.2.7-1. PDS/EDS Construction Record					
INSTR_PDS_DATA_PACKET [1..13091]					
Primary Packet_Header					
Version Number	1	N/A	N/A	1	3
Type	2	N/A	N/A	1	1
Secondary Header Flag	3	N/A	N/A	1	1
APID	4	N/A	N/A	1	11
Sequence Flags	5	N/A	N/A	1	2
Packet Sequence Count	6	N/A	N/A	1	14
Packet Length	7	N/A	N/A	1	16
Secondary Packet_Header					
Time Data	8	N/A	N/A	1	64
Quick Look Flag	9	N/A	N/A	1	8
Instrument_Packet_Status					
Spare 1	10	N/A	N/A	1	8
Timecode ID	11	N/A	N/A	1	1
Quicklook Flag	12	N/A	N/A	1	1
Instrument ID	13	N/A	N/A	1	5
Data Version	14	N/A	N/A	1	5
Data Indicator	15	N/A	N/A	1	4
Packet Counter	16	N/A	N/A	1	16
Spare 2	17	N/A	N/A	1	16
Spare 3	18	N/A	N/A	1	16
Measurement_Data (1 of the 5 following record types):					
Science_Record [660]					
Azimuth Position Count	19	count	0..65535	660	16
Elevation Position Count	20	count	0..65535	660	16
Total Detector Output	21	count	0..4095	660	12
WN Detector Output	22	count	0..4095	660	12
SW Detector Output	23	count	0..4095	660	12
Instrument Analog Data - (Reference 3)	24	-	-	660	12
Memory_Record [660]					

Table 3.1-3. Terra Instrument Production Data Set (INSTR)

Description	Element Number	Units	Range	Elements per Record	Bits per Element
Azimuth Position Count	19	count	0..65535	660	16
Elevation Position Count	20	count	0..65535	660	16
DAP Memory Dump Data	21	N/A	0..65535	660	16
ICP Memory Dump Data	22	N/A	0..65535	660	16
Fill Data	23	N/A	0..15	660	4
Instrument Analog Data - (Reference 3)	24	-	-	660	12
Gimbal_Record [660]					
Azimuth Position Count	19	count	0..65535	660	16
Elevation Position Count	20	count	0..65535	660	16
Elevation Error	21	count	0..65535	660	16
Azimuth Error	22	count	0..65535	660	16
Fill Data	23	N/A	0..15	660	4
Instrument Analog Data - (Reference 3)	24	-	-	660	12
Processor_Op_Record [660]					
Azimuth Position Count	19	count	0..65535	660	16
Elevation Position Count	20	count	0..65535	660	16
DAP Timing	21	N/A	0..65535	660	16
ICP Timing	22	N/A	0..65535	660	16
Fill Data	23	N/A	0..15	660	4
Instrument Analog Data - (Reference 3)	24	-	-	660	12
Fixed_Record [660]					
Fixed Pattern in Elevation Field	19	N/A	0..65535	660	16
Fixed Pattern for Azimuth Field	20	N/A	0..65535	660	16
Fixed Pattern for Total Channel Field	21	N/A	0..4095	660	12
Fixed Pattern for WN Channel Field	22	N/A	0..4095	660	12
Fixed Pattern for SW Channel Field	23	N/A	0..4095	660	12
Fixed Pattern for Analog Field	24	N/A	0..4095	660	12
Instrument Digital Status - (Reference 3)	25	-	-	1	2960
Terra_Ancillary_Data					
Ancillary Time Stamp	26	count	0..1.84x10 ¹	1	64
GPS/UTC Time Conversion	27	count	0..4.29x10 ⁹	1	32
Solar Array Current	28	count	0..255	1	8
Mag Coil Current X	29	count	0..255	1	8
Mag Coil Current Y	30	count	0..255	1	8
Mag Coil Current Z	31	count	0..255	1	8

Table 3.1-3. Terra Instrument Production Data Set (INSTR)

Description	Element Number	Units	Range	Elements per Record	Bits per Element
Satellite Position (X) Count	32	count	0..4.29x10 ⁹	1	32
Satellite Position (Y) Count	33	count	0..4.29x10 ⁹	1	32
Satellite Position (Z) Count	34	count	0..4.29x10 ⁹	1	32
Satellite Velocity (X) Count	35	count	0..4.29x10 ⁹	1	32
Satellite Velocity (Y) Count	36	count	0..4.29x10 ⁹	1	32
Satellite Velocity (Z) Count	37	count	0..4.29x10 ⁹	1	32
Satellite Attitude (Roll) Count	38	count	0..65535	1	16
Satellite Attitude (Pitch) Count	39	count	0..65535	1	16
Satellite Attitude (Yaw) Count	40	count	0..65535	1	16
Satellite Attitude Rate (Roll) Count	41	count	0..65535	1	16
Satellite Attitude Rate (Pitch) Count	42	count	0..65535	1	16
Satellite Attitude Rate (Yaw) Count	43	count	0..65535	1	16
Solar X Position	44	count	0..255	1	8
Solar Y Position	45	count	0..255	1	8
Solar Z Position	46	count	0..255	1	8
Lunar X Position	47	count	0..255	1	8
Lunar Y Position	48	count	0..255	1	8
Lunar Z Position	49	count	0..255	1	8

Table 3.1-4. Terra Instrument Production Data Set Sizes

Description	Sizes
Header File:	
Total Header Bits/File (typical max):	5,760
Total Bytes/File:	720
Total MBytes/file (1MB = 1024*1024 Bytes):	0.0007
Data File:	
Maximum Data Bits/ Packet Record:	56,464
Maximum Records/File:	13,091
Maximum Data Bits/File:	739,170,224
Minimum Footer Bits/File:	0
Total Bits/File:	739,170,224
Total Bytes/File:	92,396,278

Table 3.1-4. Terra Instrument Production Data Set Sizes

Description	Sizes
Total MBytes/file (1MB = 1024*1024 Bytes):	88.12

Table 3.1-5. Aqua and NPP Instrument Production Data Set (INSTR)

Description	Element Number	Units	Range	Elements per Record	Bits per Element
INSTR_PDS File Header					
See Reference 8, Table 8.1.2.7-1. PDS/EDS Construction Record					
INSTR_PDS_DATA_PACKET [1..13091]					
Primary Packet_Header					
Version Number	1	N/A	N/A	1	3
Type	2	N/A	N/A	1	1
Secondary Header Flag	3	N/A	N/A	1	1
APID	4	N/A	N/A	1	11
Sequence Flags	5	N/A	N/A	1	2
Packet Sequence Count	6	N/A	N/A	1	14
Packet Length	7	N/A	N/A	1	16
Secondary Packet_Header					
Time Data	8	N/A	N/A	1	64
Quick Look Flag	9	N/A	N/A	1	8
Instrument_Packet_Status					
Spare 1	10	N/A	N/A	1	8
Timecode ID	11	N/A	N/A	1	1
Quicklook Flag	12	N/A	N/A	1	1
Instrument ID	13	N/A	N/A	1	5
Data Version	14	N/A	N/A	1	5
Data Indicator	15	N/A	N/A	1	4
Packet Counter	16	N/A	N/A	1	16
Spare 2	17	N/A	N/A	1	16
Spare 3	18	N/A	N/A	1	16
Measurement_Data (1 of the 5 following record types):					
Science_Record [660]					

Table 3.1-5. Aqua and NPP Instrument Production Data Set (INSTR)

Description	Element Number	Units	Range	Elements per Record	Bits per Element
Azimuth Position Count	19	count	0..65535	660	16
Elevation Position Count	20	count	0..65535	660	16
Total Detector Output	21	count	0..4095	660	12
WN Detector Output	22	count	0..4095	660	12
SW Detector Output	23	count	0..4095	660	12
Instrument Analog Data - (Reference 3)	24	-	-	660	12
Memory_Record [660]					
Azimuth Position Count	19	count	0..65535	660	16
Elevation Position Count	20	count	0..65535	660	16
DAP Memory Dump Data	21	N/A	0..65535	660	16
ICP Memory Dump Data	22	N/A	0..65535	660	16
Fill Data	23	N/A	0..15	660	4
Instrument Analog Data - (Reference 3)	24	-	-	660	12
Gimbal_Record [660]					
Azimuth Position Count	19	count	0..65535	660	16
Elevation Position Count	20	count	0..65535	660	16
Elevation Error	21	count	0..65535	660	16
Azimuth Error	22	count	0..65535	660	16
Fill Data	23	N/A	0..15	660	4
Instrument Analog Data - (Reference 3)	24	-	-	660	12
Processor_Op_Record [660]					
Azimuth Position Count	19	count	0..65535	660	16
Elevation Position Count	20	count	0..65535	660	16
DAP Timing	21	N/A	0..65535	660	16
ICP Timing	22	N/A	0..65535	660	16
Fill Data	23	N/A	0..15	660	4
Instrument Analog Data - (Reference 3)	24	-	-	660	12
Fixed_Record [660]					
Fixed Pattern in Elevation Field	19	N/A	0..65535	660	16
Fixed Pattern for Azimuth Field	20	N/A	0..65535	660	16
Fixed Pattern for Total Channel Field	21	N/A	0..4095	660	12
Fixed Pattern for WN Channel Field	22	N/A	0..4095	660	12
Fixed Pattern for SW Channel Field	23	N/A	0..4095	660	12
Fixed Pattern for Analog Field	24	N/A	0..4095	660	12
Instrument Digital Status - (Reference 3)	25	-	-	1	2960

Table 3.1-6. Aqua and NPP Instrument Production Data Set Sizes

Description	Sizes
Header File:	
Total Header Bits/File (typical max):	5,760
Total Header Bytes/File:	720
Total MBytes/file (1MB = 1024*1024 Bytes):	0.0007
Data File:	
Maximum Data Bits/ Packet Record:	55,952
Maximum Records/File:	13,091
Maximum Data Bits/File:	732,467,632
Minimum Footer Bits/File:	0
Total Bits/File:	732,467,632
Total Bytes/File:	91,558,454
Total MBytes/file (1MB = 1024*1024 Bytes):	87.32

INSTR Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

INSTR Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. 	All
N/A	R3V2	N/A	<ul style="list-style-type: none"> • Updated to add Aqua Level-0 File Format. • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) 	3.1 All Sec. 3.1
N/A	R5V1	N/A	<ul style="list-style-type: none"> • Added new satellite (NPP) format, which matches Aqua formats. 	Sec. 3.1, Fig. 3.1-3, Table 3.1-5, & Table 3.1-6

3.2 Instrument Earth Scans (IES)

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 an 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 the 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 contain only Earth-viewing measurements. For the Tropical Rainfall Measuring Mission (TRMM) mission, there are approximately 225 Earth-viewing footprints (records) that are stored on an IES from each 3.3-second half-scan. The IES product size is derived by using the number of 3.3-second half-scans per hour (approximately 1091) times the number of Earth-viewing measurements per half-scan (approximately 225 for TRMM and 195 for Terra). This yields approximately 245475 and 212745 measurements per TRMM and Terra IES data products, respectively. The product size used within this catalog is determined using the TRMM numbers. The summary of HDF structures is shown in [Table 3.2-1](#). The metadata are listed in [Appendix B, Table 3.2-2](#), and [Table 3.2-3](#). The complete listing of science parameters for this data product can be found in [Tables 3.2-4](#) and [3.2-5](#).

Level: 1B
Frequency: 1/Hour
Configuration Code: 009001 and greater

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

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

Portion of Atmosphere Covered
File: Satellite Altitude

Instrument Earth Scans (IES) Definition

Table 3.2-1 summarizes the contents and estimated product size of each data structure type contained within an IES file. Each IES product contains three metadata structures and three Vdata structures.

Table 3.2-1. IES HDF Structure Summary

Name	Description Table	Records	Number of Fields	Nominal Size (Bytes)
CERES Baseline Header Metadata	Table B-1	1	36	~25907
CERES_metadata Vdata	Table B-2	1	14	~1024
IES Product-specific Metadata	Table 3.2-2	1	11	~66
IES Header Vdata	Table 3.2-3	1	22	132
Along Track Sort Index	Table 3.2-4	n: 1..245,475	2	1,963,800
IES Data Record	Table 3.2-5	n: 1..245,475	30	33,384,600
Total Size (Bytes):				35,375,529
Total Size (MBytes, including ~0.2% HDF overhead; 1MByte = 1024²Bytes):				33.8

IES Metadata

The IES product includes three metadata structures. These include the CERES Baseline Header Metadata and the CERES_metadata Vdata Metadata, which are listed in [Appendix B](#). The IES-specific metadata parameters are listed in [Table 3.2-2](#). An IES Header Vdata is also included as part of the IES metadata and the parameters are listed in [Table 3.2-3](#).

Table 3.2-2. IES Product-Specific Metadata

Item	Parameter Name	Units	Range	Data Type
1	ScanMode	N/A	XtrkOnly, RapsOnly, FapsOnly, Raps/Faps, Xtrk/Raps, Xtrk/Faps, Xtrk/Raps/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	uint32

IES Vdata

The IES product contains three Vdata structures: the IES Header Vdata (Table 3.2-3), the Along-track Sort Index Vdata (Table 3.2-4), and the IES Data Record (Table 3.2-5). These data structures are listed below, where each list contains the field number, the field or parameter name, the data type, the units, and the range. The fields are listed in the order they are written to an IES. Data types are referenced by their HDF classification (e.g. Char8, Float32, Float64, Int8, UInt8, Int16, UInt16, Int32, UInt32, Int64, UInt64).

Table 3.2-3. IES Header Vdata

Field No.	Field Name	Data Type	Units	Range
1	Whole Julian Day	float64	day	2449353 .. 2458500
2	Fractional Julian Day	float64	day	-0.01 .. 1.01
3	Hour Number	uint32	N/A	0 .. 23
4	Colatitude of Subsatellite Point at Surface at Hour Start	float32	deg	0.0 .. 180.0
5	Longitude of Subsatellite Point at Surface at Hour Start	float32	deg	0.0 .. 360.0
6	Colatitude of Subsatellite Point at Surface at Hour End	float32	deg	0.0 .. 180.0
7	Longitude of Subsatellite Point at Surface at Hour End	float32	deg	0.0 .. 360.0
8	Along-track Angle of Satellite at Hour End	float32	deg	0.0 .. 360.0
9	Number of Footprints	uint32	N/A	0 .. 245475
10	Earth-Sun Distance at Hour Start	float32	AU	0.98 .. 1.02
11	Satellite Position X	float64	km	-8000.0 .. 8000.0
12	Satellite Position Y	float64	km	-8000.0 .. 8000.0
13	Satellite Position Z	float64	km	-8000.0 .. 8000.0
14	Satellite Velocity X	float64	km sec ⁻¹	-10.0 .. 10.0
15	Satellite Velocity Y	float64	km sec ⁻¹	-10.0 .. 10.0
16	Satellite Velocity Z	float64	km sec ⁻¹	-10.0 .. 10.0
17	N Vector X	float64	N/A	0.0 .. 1.0
18	N Vector Y	float64	N/A	0.0 .. 1.0
19	N Vector Z	float64	N/A	0.0 .. 1.0
20	Satellite Type	uint32	N/A	0 = TRMM, 1 = Terra, 2 = EOS-AM2, 3 = EOS-PM1, 4 = EOS-PM2
21	Instrument Type	uint32	N/A	0 = PFM, 1 = FM1, 2 = FM2, 3 = FM3, 4 = FM4, 5 = FM5

Table 3.2-3. IES Header Vdata

Field No.	Field Name	Data Type	Units	Range
22	Instrument Scan Mode	uint32	N/A	0 = Crosstrack, 1 = RAPS, 2 = FAPS, 3 =Transitional
Number of bytes per Vdata record:				132

Table 3.2-4. Along-track Sort Index

Field No.	Field Name	Data Type	Units	Range
1	Footprint_index	uint32	N/A	1 .. n
2	Along_Track_Angle	float32	N/A	-20.0 .. 360.0
Number of bytes per Vdata record:				8

Table 3.2-5. IES Data Record

Field No.	Field Name / Parameter	Data Type	Units	Range
1	Colatitude of CERES FOV at TOA	float32	deg	0.0 .. 180.0
2	Longitude of CERES FOV at TOA	float32	deg	0.0 .. 360.0
3	Colatitude of CERES FOV at Surface	float32	deg	0.0 .. 180.0
4	Longitude of CERES FOV at Surface	float32	deg	0.0 .. 360.0
5	CERES Viewing Zenith at Surface	float32	deg	0.0 .. 90.0
6	CERES Solar Zenith at Surface	float32	deg	0.0 .. 180.0
7	CERES Relative Azimuth at Surface	float32	deg	0.0 .. 360.0
8	CERES Viewing Azimuth at Surface wrt North	float32	deg	0.0 .. 360.0
9	Cross-track Angle of CERES FOV at Surface	float32	deg	-90.0 .. 90.0
10	Along-track Angle of CERES FOV at Surface	float32	deg	-20.0 .. 360.0
11	Cone Angle of CERES FOV at Satellite	float32	deg	0.0 .. 90.0
12	Clock Angle of CERES FOV at Satellite wrt Inertial Velocity	float32	deg	0.0 .. 360.0
13	Rate of Change of Cone Angle	float32	deg sec ⁻¹	-100.0 .. 100.0
14	Rate of Change of Clock Angle	float32	deg sec ⁻¹	-10.0 .. 10.0
15	X Component of Satellite Inertial Velocity	float64	km sec ⁻¹	-10.0 .. 10.0
16	Y Component of Satellite Inertial Velocity	float64	km sec ⁻¹	-10.0 .. 10.0
17	Z Component of Satellite Inertial Velocity	float64	km sec ⁻¹	-10.0 .. 10.0
18	Radius of Satellite from Center of Earth at Observation	float64	km	6000.0 .. 8000.0
19	CERES TOT Filtered Radiance, Upwards	float32	W m ⁻² sr ⁻¹	0.0 .. 700.0

Table 3.2-5. IES Data Record

Field No.	Field Name / Parameter	Data Type	Units	Range
20	CERES SW Filtered Radiance, Upwards	float32	W m ⁻² sr ⁻¹	-10.0 .. 510.0
21	CERES WN Filtered Radiance, Upwards	float32	W m ⁻² sr ⁻¹	0.0 .. 50.0
22	Colatitude of Subsatellite Point at Surface at Observation	float32	deg	0.0 .. 180.0
23	Longitude of Subsatellite Point at Surface at Observation	float32	deg	0.0 .. 360.0
24	Colatitude of Subsolar Point at Surface at Observation	float32	deg	0.0 .. 180.0
25	Longitude of Subsolar Point at Surface at Observation	float32	deg	0.0 .. 360.0
26	Scan Sample Number	uint16	N/A	1 .. 660
27	Packet Number	uint16	N/A	0 .. 32767
28	Time of Observation	float64	day	2449353.0 .. 2458500.0
29	Radiance and mode flags	uint32	N/A	0 .. (2**31)-1
30	Absolute Packet Number	uint32	N/A	0 .. 65535
Number of bytes per Vdata record:				136

IES Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

IES Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none">• Updated format to comply with standards.• The EOSDIS Product Code line was removed from the document. (6/17/2008)	All Sec. 3.2

3.3 ERBE-like Regional Data (EID-6)

The ERBE-like Regional Data (EID-6) product is generated daily by the ERBE-like Inversion Subsystem (2.0). It contains data for each 2.5° region observed during a day; there are 10,368 possible regions. The EID-6 is a CERES Internal Data Product used to pass 2.5° regional statistics calculated in Subsystem 2.0 to Subsystem 3.0. The EID-6 contains the following data as determined on a regional basis.

- 2.5° one-dimensional region number
- Whole and fractional Julian date
- Average of shortwave and longwave TOA flux estimates
- Number of individual shortwave and longwave TOA flux estimates
- Standard deviation for shortwave and longwave TOA flux estimates
- Minimum and maximum individual estimates of shortwave and longwave radiant fluxes at the TOA
- Geographic scene type
- Cloud fraction (fraction of measurements associated with clear, partly-cloudy, mostly-cloudy, and overcast sky)
- Albedo fraction (fraction of shortwave measurements associated with clear, partly-cloudy, mostly-cloudy, and overcast sky)
- Satellite and Sun geometry [cosine of the solar zenith angle (shortwave estimates), spacecraft zenith angles (all estimates), relative azimuth angles (shortwave estimates)]
- Standard deviation for clear-sky albedos
- Average for longwave, clear sky TOA flux estimates
- Standard deviation for longwave, clear-sky TOA flux estimates
- Number of individual longwave, clear-sky TOA flux estimates

A complete listing of parameters for this data product can be found in [Table 3.3-1](#).

Level: 2

Frequency: 1/Day

Configuration Code: 000000 and greater

Time Interval Covered

File: Day

Record: N/A

Portion of Globe Covered

File: Regional

Record: Individual Region

Portion of Atmosphere Covered

File: TOA

Table 3.3-1. ERBE-like Daily Regional Averages (EID-6)

Description	Units	Range	Elements/Record	Bits/Elem	Elem Num
EID-6					
EID-6_File_Header					
Logical Header (RKEY)	N/A		1	64	
Logical Header (IBUF)	N/A		9	288	
Production Date	N/A		1	64	
Production Time	N/A		1	80	
Data Begin Date	N/A		6	384	
Data End Date	N/A		6	384	
EID-6_Regional_Data_Records					
Region number	number	1 .. 10368	1	64	1
Julian day	day	2449353 .. 2458500	1	64	2
Julian time	day	0 .. 1	1	64	3
Regional_Average_Estimates					
SW flux average value	W m ⁻²	0 .. 1400	1	64	4
LW flux average value	W m ⁻²	50 .. 450	1	64	5
Regional_SW_Statistics					
SW flux number of values	number	0 .. 500	1	64	6
SW flux standard deviation	W m ⁻²	0 .. 1400	1	64	7
SW flux minimum value	W m ⁻²	0 .. 1400	1	64	8
SW flux maximum value	W m ⁻²	0 .. 1400	1	64	9
Regional_LW_Statistics					
LW flux number of values	number	0 .. 500	1	64	10
LW flux standard deviation	W m ⁻²	0 .. 400	1	64	11
LW flux minimum value	W m ⁻²	50 .. 450	1	64	12
LW flux maximum value	W m ⁻²	50 .. 450	1	64	13
Geo_Scene					
Geographic Scene Type	N/A	1 .. 5	1	64	14
Clear-sky fraction	N/A	0 .. 1	1	64	15
Partly-cloudy fraction	N/A	0 .. 1	1	64	16
Mostly-cloudy fraction	N/A	0 .. 1	1	64	17
Overcast fraction	N/A	0 .. 1	1	64	18
Albedos					
Albedo for Clear-sky	N/A	0 .. 1	1	64	19

Table 3.3-1. ERBE-like Daily Regional Averages (EID-6)

Description	Units	Range	Elements/Record	Bits/Elem	Elem Num
Albedo for partly-cloudy	N/A	0 .. 1	1	64	20
Albedo for mostly-cloudy	N/A	0 .. 1	1	64	21
Albedo for overcast	N/A	0 .. 1	1	64	22
Angular_Averages					
Average of cosines of solar zenith angles	N/A	0 .. 1	1	64	23
Average of spacecraft zenith angles	deg	0 .. 90	1	64	24
Average of relative azimuth angles	deg	0 .. 180	1	64	25
Clear-sky_Statistics					
Clear-sky albedo standard deviation	N/A	0 .. 1	1	64	26
Clear-sky LW flux average value	W m ⁻²	50 .. 450	1	64	27
Clear-sky LW flux standard deviation	W m ⁻²	0 .. 400	1	64	28
Clear-sky LW flux number of values	number	0 .. 500	1	64	29
Spares					
Spare	N/A	N/A	1	64	30
Spare	N/A	N/A	1	64	31

TRMM Sizes		
	Total Data Bits/Record:	1984
	Total Records/File (TRMM):	27597
	Total Data Bits/File:	54752448
	Total Bits/File:	54752448
	Total MB/File:	6.5
Terra Sizes		
	Total Data Bits/Record:	1984
	Total Records/File (Terra):	72845
	Total Data Bits/File:	144524480
	Total Bits/File:	144524480
	Total MB/File:	17.2
Aqua Sizes		
	Total Data Bits/Record:	1984
	Total Records/File (Aqua):	72597
	Total Data Bits/File:	141423488
	Total Bits/File:	141423488
	Total MB/File:	16.9
Note: The sizing estimate for the EID6 in the "Internal Products Summary" Table 1.0-4 is for Terra.		

EID6 Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

EID6 Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none">• Updated format to comply with standards.• The EOSDIS Product Code line was removed from the document. (6/17/2008)	All Sec. 3.3

3.4 Clear Reflectance History (CRH)

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 product has visible albedo 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 3.4-1](#).

Level: 3	Portion of Globe Covered
Frequency: Every Day	File: Global
Configuration Code: 013006 and greater	Record: 1/6-Deg by 1/6-Deg
Time Interval Covered	Portion of Atmosphere Covered
File: Life of Mission	File: Surface
Record: Every Day	

Table 3.4-1. Clear Reflectance History (CRH)

Description	Param Num	Units	Range	Bits/Elem
CRH 0.6 micron 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
Total Bits/CRH Data Set:				149,299,200
Total MBytes/CRH Data Set:				17.8

CRH Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

CRH Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none">• Updated format to comply with standards.• The EOSDIS Product Code line was removed from the document. (6/17/2008)	All Sec. 3.4

3.5 Synoptic Radiative Fluxes and Clouds Intermediate (SYNI)

The Synoptic Radiative Fluxes and Clouds Intermediate (SYNI) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single scanner instrument. Flux data from the TSIB product, along with MOA data, are used to calculate radiate flux profiles, cloud conditions, and aerosol optical depths using the same models as the Instantaneous SARB subsystem. There are data for every hour of the month for each 1-degree region. These data are organized into 180 zonal files, each of which contains nested regions depending on the colatitude.

The SYNI contains the following a priori and observed input:

- Regional data
- Cloud category properties for four (low, lower middle, upper middle and high) cloud layers
- Observed CERES TOA clear-sky and all-sky fluxes
- MODIS based spectral aerosol optical depths

The SYNI contains the following constrained (tuned) vertical flux profiles for both clear-sky and total-sky conditions evaluated at the TOA, 70mb, 200mb, 500mb, and surface:

- Longwave, Shortwave, and Window channels upward and downward.

The constrained (tuned) and initial (untuned) profiles for the following are included for pristine (clear-sky no-aerosol), clear-sky, total-sky-no-aerosol, and total-sky conditions:

- Longwave upward at the surface and TOA.
- Longwave downward at the surface.
- Shortwave upward at the surface and TOA.
- Shortwave downward at the surface.
- Window channel upward at the surface and TOA.
- Window channel downward at the surface.

The adjustments to the radiative transfer model input parameters between the initial and the constrained (adjusted) passes are also contained on the SYNI. These parameters include:

- Surface albedo and skin temperature
- Total column precipitable water, upper tropospheric relative humidity, and column ozone
- Aerosol optical depth
- Cloud optical depth, fractional area, and effective temperature

The SYNI contains the direct and diffuse shortwave surface fluxes for total-sky, clear-sky, pristine and actinic conditions. The SYNI also contains surface UVA and UVB downwelling and direct diffuse ratios for total-sky, clear-sky, pristine, and total-sky-no-aerosol conditions.

Level: 3

Frequency: 1/Month

Portion of Atmosphere Covered: Surface, Internal and TOA

Time Interval Covered:

File: Monthly

Record: Hourly

Portion of Globe Covered:

File: 1 colatitude zone

Record: 1 degree equal angle region

Product Version:

TRMM: N/A

Terra: Beta3

Aqua: Beta4

SYNI Data Fields

The SYNI contains 162 data fields which are parameter collections of one-degree regional data where multiple dimensions refer to pressure levels, cloud conditions, or bandwidths. Product sizing information is given in [Table 3.5-1](#).

Table 3.5-1. Product Sizing Information

Name	Units	Range	Dim	Data Type
Photosynthetically active radiation over surface	W m ⁻²	0 .. 780	1	32 bit-real
Direct/diffuse surface ratio	N/A	0 .. 30	1	32 bit-real
Corrected initial broadband surface albedo	N/A	0 .. 1	1	32 bit-real
Number of atmospheric levels	N/A	0 .. 5	1	32 bit integer
Pressure levels	hPa	0 .. 1100	5	32 bit-real
SW flux - upward – pristine	W m ⁻²	0 .. 1400	2	32 bit-real
SW flux - downward – pristine	W m ⁻²	0 .. 1400	2	32 bit-real
LW flux - upward – pristine	W m ⁻²	0 .. 850	2	32 bit-real
LW flux - downward – pristine	W m ⁻²	0 .. 700	2	32 bit-real
WN flux - upward – pristine	W m ⁻²	0 .. 370	2	32 bit-real
WN flux - downward – pristine	W m ⁻²	0 .. 370	2	32 bit-real
SW flux - upward for clear-sky	W m ⁻²	0 .. 1400	5	32 bit-real
SW flux - downward for clear-sky	W m ⁻²	0 .. 1400	5	32 bit-real
LW flux - upward for clear-sky	W m ⁻²	0 .. 850	5	32 bit-real
LW flux - downward for clear-sky	W m ⁻²	0 .. 700	5	32 bit-real
WN flux - upward for clear-sky	W m ⁻²	0 .. 370	5	32 bit-real
WN flux - downward for clear-sky	W m ⁻²	0 .. 370	5	32 bit-real
SW flux - upward for total-sky	W m ⁻²	0 .. 1400	5	32 bit-real
SW flux - downward for total-sky	W m ⁻²	0 .. 1400	5	32 bit-real
LW flux - upward for total-sky	W m ⁻²	0 .. 850	5	32 bit-real
LW flux - downward for total-sky	W m ⁻²	0 .. 700	5	32 bit-real
WN flux - upward for total-sky	W m ⁻²	0 .. 370	5	32 bit-real
WN flux - downward for total-sky	W m ⁻²	0 .. 370	5	32 bit-real
SW flux adjustment at surface - upward - pristine	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at TOA - upward – pristine	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at surface - downward - pristine	W m ⁻²	-1400 .. 1400	1	32 bit-real
LW flux adjustment at surface - upward - pristine	W m ⁻²	-600 .. 600	1	32 bit-real
LW flux adjustment at surface - downward - pristine	W m ⁻²	-700 .. 700	1	32 bit-real
LW flux adjustment at TOA - upward – pristine	W m ⁻²	-700 .. 700	1	32 bit-real
WN flux adjustment at surface - upward - pristine	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at surface - downward - pristine	W m ⁻²	-50 .. 50	1	32 bit-real

Table 3.5-1. Product Sizing Information

Name	Units	Range	Dim	Data Type
WN flux adjustment at TOA - upward – pristine	W m ⁻²	-50 .. 50	1	32 bit-real
SW flux adjustment at surface - upward for clear-sky	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at TOA - upward for clear-sky	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at surface - downward for clear-sky	W m ⁻²	-1400 .. 1400	1	32 bit-real
LW flux adjustment at surface - upward for clear-sky	W m ⁻²	-600 .. 600	1	32 bit-real
LW flux adjustment at surface - downward for clear-sky	W m ⁻²	-700 .. 700	1	32 bit-real
LW flux adjustment at TOA - upward for clear-sky	W m ⁻²	-700 .. 700	1	32 bit-real
WN flux adjustment at surface - upward for clear-sky	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at surface - downward for clear-sky	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at TOA - upward for clear-sky	W m ⁻²	-50 .. 50	1	32 bit-real
SW flux adjustment at surface - upward for total-sky	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at TOA - upward for total-sky	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at surface - downward for total-sky	W m ⁻²	-1400 .. 1400	1	32 bit-real
LW flux adjustment at surface - upward for total-sky	W m ⁻²	-600 .. 600	1	32 bit-real
LW flux adjustment at surface - downward for total-sky	W m ⁻²	-700 .. 700	1	32 bit-real
LW flux adjustment at TOA - upward for total-sky	W m ⁻²	-700 .. 700	1	32 bit-real
WN flux adjustment at surface - upward for total-sky	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at surface - downward for total-sky	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at TOA - upward for total-sky	W m ⁻²	-50 .. 50	1	32 bit-real
WN filtered radiance -satellite emulated	W m ⁻² sr ⁻¹	0 .. 50	1	32 bit-real
WN filtered radiance adjustment-satellite emulated	W m ⁻² sr ⁻¹	0 .. 50	1	32 bit-real
WN flux - satellite emulated – TOA	W m ⁻²	2 .. 50	1	32 bit-real
WN flux adjustment - satellite emulated – TOA	W m ⁻²	2 .. 50	1	32 bit-real
Total LW unfiltered radiance - satellite emulated	W m ⁻² sr ⁻¹	0 .. 200	1	32 bit-real
Total LW unfiltered radiance adjustment - satellite emulated	W m ⁻² sr ⁻¹	0 .. 200	1	32 bit-real
Total column precipitable water – initial	cm	0 .. 10	1	32 bit-real
Total column precipitable water – adjustment	cm	-10 .. 10	1	32 bit-real
Upper tropospheric precipitable water – initial	cm	0 .. 10	1	32 bit-real
Upper tropospheric precipitable water - adjustment	cm	-10 .. 10	1	32 bit-real
Upper tropospheric humidity – initial	N/A	0.0 .. 100.0	1	32 bit-real

Table 3.5-1. Product Sizing Information

Name	Units	Range	Dim	Data Type
Upper tropospheric humidity – adjustment	N/A	0.0 .. 100.0	1	32 bit-real
Surface albedo – adjustment	N/A	-1 ..1	1	32 bit-real
Aerosol optical depth – initial	N/A	0 .. 2	1	32 bit-real
Aerosol optical depth – adjustment	N/A	-2 .. 2	1	32 bit-real
Skin temperature – initial	K	175 .. 375	1	32 bit-real
Skin temperature – adjustment	K	-50 .. 50	1	32 bit-real
Column ozone – initial	DU	0 .. 1000	1	32 bit-real
Column ozone source flag	N/A	0 .. 3	1	32 bit integer
Aerosol constituency flags	N/A	01000000 .. 18999999	7	32 bit integer
Aerosol and Surface Albedo Sources Flag	N/A	0 .. 900	1	32 bit integer
Mean visible optical depth- adjustment	N/A	-400 .. 400	4	32 bit-real
Mean cloud fractional area – adjustment	N/A	-1 .. 1	4	32 bit-real
Mean cloud effective temperature - adjustment	K	-50 .. 50	4	32 bit-real
Number of tuning iterations	N/A	0 .. 1	1	32 bit integer
Constraint status flag	N/A	0 .. 600	1	32 bit integer
FuLiou model error code	N/A	1 .. 3500	1	32 bit integer
TOA downwelling UVB	W m ⁻²	0 .. 100	1	32 bit-real
TOA downwelling UVA	W m ⁻²	0 .. 100	1	32 bit-real
TOA downwelling PAR	W m ⁻²	0 .. 600	1	32 bit-real
Downward UVB at surface for total-sky	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVB at surface for total-sky	W m ⁻²	0 .. 100	1	32 bit-real
Downward UVA at surface for total-sky	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVA at surface for total-sky	W m ⁻²	0 .. 100	1	32 bit-real
MATCH aerosol optical depth	N/A	0 .. 2	1	32 bit-real
Downward UVB at surface for clear-sky	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVB at surface for clear-sky	W m ⁻²	0 .. 100	1	32 bit-real
Downward UVA at surface for clear-sky	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVA at surface for clear-sky	W m ⁻²	0 .. 100	1	32 bit-real
Broadband surface albedo	N/A	0 .. 1	1	32 bit-real
Downward UVB at surface for pristine-sky	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVB at surface for pristine-sky	W m ⁻²	0 .. 100	1	32 bit-real
Downward UVA at surface for pristine-sky	W m ⁻²	0 .. 100	1	32 bit-real

Table 3.5-1. Product Sizing Information

Name	Units	Range	Dim	Data Type
Direct Diffuse UVA at surface for pristine-sky	W m ⁻²	0 .. 100	1	32 bit-real
Snow grain radius using broadband retrieval	um	0 .. 2000	1	32 bit-real
Downward UVB at surface for cloudy-sky with no aerosol	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVB at surface for cloudy-sky with no aerosol	W m ⁻²	0 .. 100	1	32 bit-real
Downward UVA at surface for cloudy-sky with no aerosol	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVA at surface for cloudy-sky with no aerosol	W m ⁻²	0 .. 100	1	32 bit-real
Upward UVB at surface for total sky	W m-2	0 .. 100	1	32 bit-real
Surface total-sky UV-Index	N/A	0 .. 30	1	32 bit-real
Surface clear-sky UV-Index	N/A	0 .. 30	1	32 bit-real
Surface pristine-sky UV-Index	N/A	0 .. 30	1	32 bit-real
Surface cloudy-sky with no aerosol UV-Index	N/A	0 .. 30	1	32 bit-real
PAR at surface for total-sky	W m-2	0 .. 700	1	32 bit-real
Direct Diffuse PAR at surface for total-sky	W m-2	0 .. 700	1	32 bit-real
PAR Purv for total sky	W m-2	0 .. 700	1	32 bit-real
Direct Diffuse PAR Purv for total sky	W m-2	0 .. 700	1	32 bit-real
PAR ChlorA for total sky	W m-2	0 .. 700	1	32 bit-real
Direct Diffuse PAR ChlorA for total sky	W m-2	0 .. 700	1	32 bit-real
PAR at surface for clear-sky	W m-2	0 .. 700	1	32 bit-real
Direct Diffuse PAR at surface for clear-sky	W m-2	0 .. 700	1	32 bit-real
PAR at surface for pristine-sky	W m-2	0 .. 700	1	32 bit-real
Direct Diffuse PAR at surface for pristine-sky	W m-2	0 .. 700	1	32 bit-real
Upwards SW TOA pristine-sky correction	W m-2	0 .. 1500	1	32 bit-real
Downwards SW surface pristine-sky correction	W m-2	0 .. 1500	1	32 bit-real
SW flux - upward for cloudy-sky with no aerosol	W m ⁻²	0 .. 1400	2	32 bit-real
SW flux - downward for cloudy-sky with no aerosol	W m ⁻²	0 .. 1400	2	32 bit-real
LW flux - upward for cloudy-sky with no aerosol	W m ⁻²	0 .. 850	2	32 bit-real
LW flux - downward for cloudy-sky with no aerosol	W m ⁻²	0 .. 700	2	32 bit-real
WN flux - upward for cloudy-sky with no aerosol	W m ⁻²	0 .. 370	2	32 bit-real
WN flux - downward for cloudy-sky with no aerosol	W m ⁻²	0 .. 370	2	32 bit-real
SW flux adjustment at surface - upward for cloudy-sky with no aerosol	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at TOA - upward for cloudy-sky with no aerosol	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at surface - downward for cloudy sky with no aerosol	W m ⁻²	-1400 .. 1400	1	32 bit-real

Table 3.5-1. Product Sizing Information

Name	Units	Range	Dim	Data Type
LW flux adjustment at surface - upward for cloudy sky with no aerosol	W m ⁻²	-600 .. 600	1	32 bit-real
LW flux adjustment at surface - downward for cloudy-sky with no aerosol	W m ⁻²	-700 .. 700	1	32 bit-real
LW flux adjustment at TOA - upward for cloudy sky with no aerosol	W m ⁻²	-700 .. 700	1	32 bit-real
WN flux adjustment at surface - upward for cloudy-sky with no aerosol	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at surface - downward for cloudy-sky with no aerosol	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at TOA - upward for cloudy-sky with no aerosol	W m ⁻²	-50 .. 50	1	32 bit-real
Spectral interval – SW	TBD	TBD	15	32 bit-real
Diffuse SW broadband for total sky	W m ⁻²	0 .. 1450	1	32 bit-real
Diffuse SW broadband for clear sky	W m ⁻²	0 .. 1450	1	32 bit-real
Diffuse SW broadband for pristine sky	W m ⁻²	0 .. 1450	1	32 bit-real
Diffuse SW broadband for cloudy-sky with no aerosol	W m ⁻²	0 .. 1450	1	32 bit-real
Direct SW broadband for total sky	W m ⁻²	0 .. 1450	1	32 bit-real
Direct SW broadband for clear sky	W m ⁻²	0 .. 1450	1	32 bit-real
Direct SW broadband for pristine sky	W m ⁻²	0 .. 1450	1	32 bit-real
Direct SW broadband for cloudy-sky with no aerosol	W m ⁻²	0 .. 1450	1	32 bit-real
Hour of month	N/A	0 .. 744	1	32 bit integer
Region number	N/A	0 .. 64800	1	32 bit integer

Table 3.5-2. Sizing Information

Data Quantity	Size (GB)
Zonal SYNI Size	0.23
Monthly TOTAL SYNI Size	42.40

SYNI Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

SYNI Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R4V1	N/A	<ul style="list-style-type: none">• New Data Products Catalog section. (6/24/2008)	All

3.6 TSI Product

The TSI Zonal Data product is generated monthly by the TISA subsystem (7.1). It contains data for every hour of the month for each 1-degree region; there are 180 zonal files each contains nested regions depending on the colatitude. The TSI data are the CERES Internal Data Product used to provide hourly TOA fluxes and cloud informations to Subsystem 8.1. The TSI contains the following data as determined on a regional basis.

- Julian time and region location with sun geometry, view zenith angles and relative azimuth angles.
- Radiative fluxes for both Clear-sky and Total-sky at TOA fluxes and land and ocean aerosol optical depths.
- The TOA flux data flags.
- Cloud category properties for four cloud layers.
- Surface Emissivities and Skin Temperature.
- Overlap data for eleven cloud conditions.

Level: 3

Frequency: 1/Month

Configuration Code: 000000 and greater

Portion of Globe Covered

File: 180 Zonal

Record: 1-Deg Equal-angle Regions

Time Interval Covered

File: Monthly

Record: Hour

Table 3.6-1. TSI Data Record

Description	Element Number	Units	Range	Elements/Record	Data Type	Bits/Elem
Julian Hour	1	N/A	0 .. 235959	1	32 bit real	32
Region Number	2	N/A	1 .. 64800	1	32 bit integer	32
Hour box number	3	N/A	1 .. 744	1	32 bit integer	32
Surface altitude	4	m	1000 .. 100000	1	32 bit real	32
Cosine – Solar Zenith Angle	5	deg	-1.0 .. 1.0	1	32 bit real	32
Surface percent coverage	6	N/A	0 .. 100	20	32 bit real	640
Spacecraft Zenith Angle	7	deg	0 .. 180	1	32 bit real	32
Geo-stationary satellite ID	8	N/A	N/A	1	32 bit integer	32
Relative Azimuth Angle	9	deg	0 .. 180	1	32 bit real	32
Aerosol Optical Depth at 0.63um in clr	10	N/A	0 .. 5.0	1	32 bit real	32
Aerosol Optical Depth at 1.60 um in clr	11	N/A	0 .. 5.0	1	32 bit real	32
Infrared Radiance	12	$W m^{-2} sr^{-1} mm^{-1}$	1000.0 .. 1000.0	1	32 bit real	32
Imager Radiance Field of View	13	$W m^{-2} sr^{-1} \mu m^{-1}$	1000.0 .. 1000.0	1	32 bit real	32
Data flag	14	N/A	1111 .. 3333	1	32 bit real	32
Total SW mean	15	$W m^{-2}$	0 .. 1400	1	32 bit real	32
Total SW std	16	N/A	N/A	1	32 bit real	32
Total LW mean	17	$W m^{-2}$	0 .. 500	1	32 bit real	32
Total LW std	18	N/A	N/A	1	32 bit real	32
Total albedo mean	19	$W m^{-2}$	0 .. 1	1	32 bit real	32
Total albedo std	20	N/A	N/A	1	32 bit real	32
Total WN mean	21	$W m^{-2}$	0 .. 50	1	32 bit real	32
Total WN std	22	N/A	N/A	1	32 bit real	32
Clear SW mean	23	$W m^{-2}$	0 .. 1400	1	32 bit real	32
Clear SW std	24	N/A	N/A	1	32 bit real	32
Clear LW mean	25	$W m^{-2}$	0 .. 500	1	32 bit real	32
Clear LW std	26	N/A	N/A	1	32 bit real	32
Clear albedo mean	27	$W m^{-2}$	0 .. 1	1	32 bit real	32
Clear albedo std	28	N/A	N/A	1	32 bit real	32
Clear WN mean	29	$W m^{-2}$	0 .. 50	1	32 bit real	32
Clear WN std	30	N/A	N/A	1	32 bit real	32
Cloud area fraction	31	Percent	0 .. 100	4	32 bit real	128
Cloud optical depth – linear - mean	32	N/A	0 .. 400	4	32 bit real	128

Table 3.6-1. TSI Data Record

Description	Element Number	Units	Range	Elements/Record	Data Type	Bits/Elem
Cloud optical depth – linear - std	33	N/A	N/A	4	32 bit real	128
Cloud optical depth – log – mean	34	N/A	-6 .. 6	4	32 bit real	128
Cloud optical depth – log – std	35	N/A	N/A	4	32 bit real	128
Cloud infrared emissivity – mean	36	N/A	0 .. 2	4	32 bit real	128
Cloud infrared emissivity – std	37	N/A	N/A	4	32 bit real	128
Cloud liquid water path – mean	38	g m ⁻²	0 .. 10000	4	32 bit real	128
Cloud liquid water path – std	39	N/A	N/A	4	32 bit real	128
Cloud ice water path – mean	40	g m ⁻²	0 .. 10000	4	32 bit real	128
Cloud ice water path – std	41	N/A	N/A	4	32 bit real	128
Cloud top pressure – mean	42	hPA	0 .. 1100	4	32 bit real	128
Cloud top pressure – std	43	N/A	N/A	4	32 bit real	128
Cloud effective pressure - mean	44	hPA	0 .. 1100	4	32 bit real	128
Cloud effective pressure - std	45	N/A	N/A	4	32 bit real	128
Cloud effective temperature – mean	46	K	100 .. 350	4	32 bit real	128
Cloud effective temperature - std	47	N/A	N/A	4	32 bit real	128
Cloud effective height - mean	48	km	0 .. 20	4	32 bit real	128
Cloud effective height - std	49	N/A	N/A	4	32 bit real	128
Cloud bottom pressure - mean	50	hPA	0 .. 20	4	32 bit real	128
Cloud bottom pressure - std	51	N/A	N/A	4	32 bit real	128
Cloud liquid particle size - mean	52	µm	0 .. 12	4	32 bit real	128
Cloud liquid particle size - std	53	N/A	N/A	4	32 bit real	128
Cloud ice particle size - mean	54	µm	0 .. 300	4	32 bit real	128
Cloud ice particle size -std	55	N/A	N/A	4	32 bit real	128
Cloud phase - mean	56	N/A	1.0 .. 2.0	4	32 bit real	128
Cloud phase - std	57	N/A	N/A	4	32 bit real	128
Cloud aspect ratio - mean	58	N/A	1.0 .. 20.0	4	32 bit real	128
Cloud aspect ratio - std	59	N/A	N/A	4	32 bit real	128
Area fraction overlap	60	N/A	0 .. 1.0	4	32 bit real	128
LW surface emissivity	61	N/A	0 .. 1	1	32 bit real	32
WN surface emissivity	62	N/A	0 .. 1	1	32 bit real	32
Surface skin temperature	63	K	175 .. 375	1	32 bit real	32
Initial aerosol optical depth	64	N/A	0.0 .. 5.0	1	32 bit real	32
Aerosol constituency ratio	65	N/A	0.0 .. 100.0	7	32 bit real	224
Aerosol optical depth - 0.47 µm - land	66	N/A	0.0 .. 5.0	1	32 bit real	32
Aerosol optical depth - 0.55 µm - land	67	N/A	0.0 .. 5.0	1	32 bit real	32

Table 3.6-1. TSI Data Record

Description	Element Number	Units	Range	Elements/Record	Data Type	Bits/Elem
Aerosol optical depth - 0.66 μm - land	68	N/A	0.0 .. 5.0	1	32 bit real	32
Aerosol optical depth - 0.47 μm - ocean	69	N/A	0.0 .. 5.0	1	32 bit real	32
Aerosol optical depth - 0.55 μm - ocean	70	N/A	0.0 .. 5.0	1	32 bit real	32
Aerosol optical depth - 0.66 μm - ocean	71	N/A	0.0 .. 5.0	1	32 bit real	32
Aerosol optical depth - 0.47 μm - ocean	72	N/A	0.0 .. 5.0	1	32 bit real	32
Aerosol optical depth - 0.55 μm - ocean	73	N/A	0.0 .. 5.0	1	32 bit real	32
Aerosol optical depth - 0.66 μm - ocean	74	N/A	0.0 .. 5.0	1	32 bit real	32
Aerosol optical depth - 0.87 μm - ocean	75	N/A	0.0 .. 5.0	1	32 bit real	32
Aerosol optical depth - 1.24 μm - ocean	76	N/A	0.0 .. 5.0	1	32 bit real	32
Aerosol optical depth - 1.64 μm - ocean	77	N/A	0.0 .. 5.0	1	32 bit real	32
Aerosol optical depth - 2.13 μm - ocean	78	N/A	0.0 .. 5.0	1	32 bit real	32

Total Data Bits/Record: 5408
Total Data Bytes/Record: 676
Max. Total Records/File: 267,840
Total Data Bits/File: 1,448,478,720
Total Data Bytes/File: 181,059,840
Total MBytes/File: 181.06

TSI Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

TSI Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R4V1	N/A	<ul style="list-style-type: none">• New Data Products Catalog section. (6/24/2008)	All

3.7 Gridded GEO Narrowband Radiances (GGEO)

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 year/month data date, the actual data starting and ending dates, and the first and the last zones found on the file.

Each data record, called an hourbox, contains data particular to a single grid region and hour. The number of hourboxes on the file is determined by the number of data hours per day, the maximum number of days per month (plus one day for overlap hours), and the number of regions in the nested grid for the zones contained on the file (8 hours per day x 32 days per month x 38520 regions on globe = 9861120 hourboxes maximum). 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 3.7-1](#). Following is a brief explanation of the parameters.

- 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.
- The clear sky visible and infrared radiance statistics give mean for the pixels within the hourbox.
- The cloud parameter statistics give mean for the pixels within the hourbox.

Level: 3

Frequency: Monthly

Configuration Code: 007002 and greater

Portion of Globe Covered

File: Global

Record: 1-Deg Equal-angle Regions

Time Interval Covered

File: Monthly

Record: Every Third Hour

Portion of Atmosphere Covered

File: TOA

Table 3.7-1. Gridded GEO Narrowband Radiances (GGEO) Summary Table

Name	Description Table	Records	Number of Fields	Nominal Size (Bytes)
CERES Baseline Header Metadata	Table B-1	1	36	~25907
CERES_Metadata Vdata	Table B-2	1	14	~1024
GGEO Header Record	Table 3.7-2	1	8	40
GGEO Data Record	Table 3.7-2	9861120	49	196

Table 3.7-2. GGEO Header Record

Description	Element Number	Units	Range	Elements/Record	Bits/Elem	Bits/Rec
Year/Month Data Date (yyyymm)		N/A	N/A	1	32	32
Data Starting Date (yyyddd)		N/A	N/A	1	32	32
Data Ending Date (yyyddd)		N/A	N/A	1	32	32
First Zone on File		N/A	N/A	1	32	32
Last Zone on File		N/A	N/A	1	32	32
Record Size		N/A	N/A	1	32	32
Code Version		N/A	N/A	1	32	32
File Version		N/A	N/A	1	32	32

Table 3.7-3. GGEO Data Record

Description	Element Number	Units	Range	Elements/Record	Bits/Elem	Elem Num	Bits/Rec
Satellite Number	1	N/A	N/A	1	32	1	32
Time	2	hhmmss	0 .. 235959	1	32	2	32
Cos of Satellite Zenith Angle	3	N/A	-1.0 .. 1.0	1	32	3	32
Cos of Solar Zenith Angle	4	N/A	-1.0 .. 1.0	1	32	4	32
Relative Azimuth Angle	5	deg	0.0 .. 180.0	1	32	5	32
visible radiance: mean, var, num obs	6	W m ⁻² sr ⁻¹	0.0 .. 20.0	3	32	6	96
infrared radiance: mean, var, num obs	7	W m ⁻² sr ⁻¹ mm ⁻¹	0.0 .. 600.0	3	32	9	96
clear sky visible radiance: mean	8	W m ⁻² sr ⁻¹	0.0 .. 20.0	1	32	12	96
clear sky infrared radiance: mean	9	W m ⁻² sr ⁻¹ mm ⁻¹	0.0 .. 600.0	1	32	13	96
Lower cloud: Area fraction	10	percent	0.0 .. 100.0	1	32	14	32

Table 3.7-3. GGEO Data Record

Description	Element Number	Units	Range	Elements/Record	Bits/Elem	Elem Num	Bits/Rec
Lower cloud: Effective temperature	11	K	100.0 .. 350.0	1	32	15	32
Lower cloud: Effective pressure	12	hPa	0.0 .. 1100.0	1	32	16	32
Lower cloud: Bottom pressure	13	hPa	0.0 .. 1100.0	1	32	17	32
Lower cloud: Top pressure	14	hPa	0.0 .. 1100.0	1	32	18	32
Lower cloud: Vis. optical depth (linear)	15	N/A	0.0 .. 400.0	1	32	19	32
Lower cloud: Vis. optical depth (log)	16	N/A	-6.0 .. 6.0	1	32	20	32
Lower cloud: Infrared emissivity	17	N/A	0.0 .. 2.0	1	32	21	32
Lower cloud: Particle phase	18	N/A	1.0 .. 2.0	1	32	22	32
LowMid cloud: Area fraction	19	percent	0.0 .. 100.0	1	32	23	32
LowMid cloud: Effective temperature	20	K	100.0 .. 350.0	1	32	24	32
LowMid cloud: Effective pressure	21	hPa	0.0 .. 1100.0	1	32	25	32
LowMid cloud: Bottom pressure	22	hPa	0.0 .. 1100.0	1	32	26	32
LowMid cloud: Top pressure	23	hPa	0.0 .. 1100.0	1	32	27	32
LowMid cloud: Vis. optical depth (linear)	24	N/A	0.0 .. 400.0	1	32	28	32
LowMid cloud: Vis. optical depth (log)	25	N/A	-6.0 .. 6.0	1	32	29	32
LowMid cloud: Infrared emissivity	26	N/A	0.0 .. 2.0	1	32	30	32
LowMid cloud: Particle phase	27	N/A	1.0 .. 2.0	1	32	31	32
UpperMid cloud: Area fraction	28	percent	0.0 .. 100.0	1	32	32	32
UpperMid cloud: Effective temperature	29	K	100.0 .. 350.0	1	32	33	32
UpperMid cloud: Effective pressure	30	hPa	0.0 .. 1100.0	1	32	34	32
UpperMid cloud: Bottom pressure	31	hPa	0.0 .. 1100.0	1	32	35	32
UpperMid cloud: Top pressure	32	hPa	0.0 .. 1100.0	1	32	36	32
UpperMid cloud: Vis. optical depth (linear)	33	N/A	0.0 .. 400.0	1	32	37	32
UpperMid cloud: Vis. optical depth (log)	34	N/A	-6.0 .. 6.0	1	32	38	32

Table 3.7-3. GGEO Data Record

Description	Element Number	Units	Range	Elements/Record	Bits/Elem	Elem Num	Bits/Rec
UpperMid cloud: Infrared emissivity	35	N/A	0.0 .. 2.0	1	32	39	32
UpperMid cloud: Particle phase	36	N/A	1.0 .. 2.0	1	32	40	32
High cloud: Area fraction	37	percent	0.0 .. 100.0	1	32	41	32
High cloud: Effective temperature	38	K	100.0 .. 350.0	1	32	42	32
High cloud: Effective pressure	39	hPa	0.0 .. 1100.0	1	32	43	32
High cloud: Bottom pressure	40	hPa	0.0 .. 1100.0	1	32	44	32
High cloud: Top pressure	41	hPa	0.0 .. 1100.0	1	32	45	32
High cloud: Vis. optical depth (linear)	42	N/A	0.0 .. 400.0	1	32	46	32
High cloud: Vis. optical depth (log)	43	N/A	-6.0 .. 6.0	1	32	47	32
High cloud: Infrared emissivity	44	N/A	0.0 .. 2.0	1	32	48	32
High cloud: Particle phase	45	N/A	1.0 .. 2.0	1	32	49	32

Total Meta Bits/File: 70 752
Total Data Bits/Record: 1 568
Total Meta data Records: 200
Total Header Records: 1
Total Records/File: 9 861 321
Total Data Bits/File: 61 850 205 312
Total Bits/File: 61 850 205 312
Total Bytes/File: 1 932 818 916
Total MBytes/File: 1932.8

GGEO Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

GGEO Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. 	All
N/A	R3V2	N/A	<ul style="list-style-type: none"> • Updated Data record information in summary table. 	3.7-1
			<ul style="list-style-type: none"> • Added new parameters to Header record. • Added clear sky radiances and cloud parameters. • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) • Section numbering was changed because of the SYNI and TSI Data Product Catalog additions. (6/23/2008) 	3.7-2 3.7-3 All Sec. 3.7 All

3.8 Meteorological, Ozone, and Aerosol Data (MOA)

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 one 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 European Centre for Medium Range Weather Forecasting (ECMWF), 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. The number of global regions, records and file sizes 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 x 0.5). For certain primary meteorological data sources, the MOA file also contains the input skin temperature data on their native grid. All data are temporally interpolated to provide data to the CERES processing system on either every hour or every six hours, depending on the primary meteorological data source.

The MOA contains the pressure, geopotential height, skin temperature, and u-vector and v-vector wind speed at the surface; 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 speed data; the 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 3.8-1](#) and [Table 3.8-2](#). The sizes of the MOA files and of the parameters they contain are given in [Table 3.8-3](#).

Level: 3

Frequency: 1/Hour or 1 every 6 Hours

Configuration Code: 009010 and greater

Portion of Globe Covered

File: Global

Record: One region

Time Interval Covered

File: 1 hour

Record: 1 hour

Portion of Atmosphere Covered

File: Surface to TOA

Table 3.8-1. Meteorological, Ozone, and Aerosol (MOA) Header

Description	Parameter Number	Units	Range	Elements/Record	Data Type
Header					
Date and Hour		N/A	ASCII string	27	Character
MOA Processing Date		N/A	ASCII string	19	Character
Byte Buffer for Compiler Compatibilities		N/A	ASCII string	2	Character
MOA Grid Index		N/A	1 .. 7	1	32-bit Integer
Number of MOA Regions		N/A	13104 .. 44012	1	32-bit Integer
Temperature, Humidity, and Ozone Profile Fixed Pressure Levels		hPa	0 .. 1100	58	32-bit Real
Wind Speed Profile Pressure levels		hPa	0 .. 1100	18	32-bit Real

Table 3.8-2. MOA Regional Record

Description	Parameter Number	Units	Range	Elements/Record	Data Type
MOA Regional Record					
MOA Region Number	1	N/A	1 .. 44012	1	32-bit Integer
Surface Pressure	2	hPa	0 .. 1100	1	32-bit Real
Surface Geopotential Height	3	m	-100 .. 10000	1	32-bit Real
Surface Skin Temperature	4	K	175 .. 375	1	32-bit Real
Surface Wind Speed, U-Vector	5	m sec ⁻¹	-100 .. 100	1	32-bit Real
Surface Wind Speed, V-Vector	6	m sec ⁻¹	-100 .. 100	1	32-bit Real
Flag, Sea Surface State	7	N/A	0 .. 9	1	32-bit Integer
Flag, Source Surface Data	8	N/A	0 .. 4	1	32-bit Integer
Temperature Profiles	9	K	175 .. 375	58	32-bit Real
Specific Humidity Profiles	10	g g ⁻¹	0.00001 .. .03	58	32-bit Real
Wind Speed Profile, U-Vector	11	m sec ⁻¹	-100 .. 100	18	32-bit Real
Wind Speed Profile, V-Vector	12	m sec ⁻¹	-100 .. 100	18	32-bit Real
Flag, Source Meteorological Profiles	13	N/A	0 .. 4	1	32-bit Integer
Tropopause Height	14	hPa	50 .. 450	1	32-bit Real
Air Mass Index	15	N/A	0 .. 10	1	32-bit Integer
Column Precipitable Water	16	cm	0.001 .. 10.000	1	32-bit Real
Column Averaged Relative Humidity	17	N/A	0 .. 100	1	32-bit Real
Microwave Precipitable Water	18	g cm ⁻²	0.001 .. 10.000	1	32-bit Real
Microwave Precipitable Water, std	19	g cm ⁻²	TBD	1	32-bit Real
Flag, Source Microwave Column Precipitable Water	20	N/A	0 .. 6	1	32-bit Integer

Table 3.8-2. MOA Regional Record

Description	Parameter Number	Units	Range	Elements/Record	Data Type
Ozone Mass Mixing Ratio Profiles	21	g g ⁻¹	0.0 .. 0.00005	58	32-bit Real
Flag, Source Ozone Profile Data	22	N/A	0 .. 3	1	32-bit Integer
Column Ozone	23	DU	0 .. 1000	1	32-bit Real
Flag, Source Column Ozone	24	N/A	0 .. 3	1	32-bit Integer
Optical Depth, Total Column	25	N/A	0 .. 2	1	32-bit Real
Flag, Source Optical Depth, Total Column	26	N/A	0 .. 1	1	32-bit Integer
SSM/I Regional Water Vapor Data					
Microwave Precipitable Water for SSM/I Region		g cm ⁻²	0.001 .. 10.000	200	32-bit Real
Skin Temperature Data					
Surface Temperature Data for GEOS3 or ECMWF Region		K	175 .. 375	180 or 200	32-bit Real

Table 3.8-3. MOA File and Parameter Sizes for Primary Data Sources

	DAO-GEOS2	DAO-GEOS3	ECMWF
Total Meta Megabytes/File	0.00034	0.00034	0.00034
Total Data Megabytes/MOA Regional Record	0.00088	0.00088	0.00088
Total MOA Regional Records/File	13104	44012	44012
Total MOA Regional Record Megabytes/File	12.1	40.7	40.7
Total Megabytes/SSM/I Record	0.00088	0.00088	0.00088
Total SSM/I Records	1296	1296	1296
Total SSM/I Data Megabytes/File	1.2	1.2	1.2
Total Megabytes/Skin Temperature Record	0	0.00088	0.00088
Total Skin Temperature Records	0	724	2048
Total Skin Temperature Megabytes/File	0	0.6	1.9
Total Megabytes/File	13.3	42.5	43.8
Total Files/Day	24	4	4
Total Megabytes/Day	319.2	170	175.2
Total Megabytes/Month	9895.2	5270	5431.2
Total Gigabytes/Month	9.9	5.3	5.4

Note: The MOA sizes shown in the Internal Products Summary, [Table 1.0-4](#), are based on the sizes shown above in the ECMWF column.

MOA Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

MOA Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> Updated format to comply with standards. 	All
03/01/06	R3V2	615	<ul style="list-style-type: none"> Updated Table 3.8-2 to correct units and ranges for specific humidity profiles and values for ozone source flags. Changed Range of Column Ozone parameter. Updated format to comply with standards. The EOSDIS Product Code line was removed from the document. (6/17/2008) Section numbering was changed because of the SYNI and TSI Data Product Catalog additions. (6/23/2008) 	Table 3.8-2 Table 3.8-2 All Sec. 3.8 All

4.0 Ancillary Data Products

This section describes the ancillary non-CERES data products which are stored 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 (Primary, 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 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.

Ancillary Data Products Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

Ancillary Data Products Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none">• Updated format to comply with standards.	All

4.1 VIRS Cloud Imager Data (VIRS CID)

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 4.1-1](#) 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 4.1-2](#) and [4.1-3](#). 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: 1B
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 4.1-1. 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 4.1-2	756 288
Scan Status	Vdata Structures	1 .. 11, 817	Table 4.1-3	1 796 184
Navigation	Vdata Structures	1 .. 11, 817	Table 4.1-4	8 319 168
Geolocation	SDS Data Structures	1 .. 11, 817	Table 4.1-5	197 391 168
Calibration Counts	SDS Data Structures	1 .. 11, 817	Table 4.1-5	5 672 160
Local Direction	SDS Data Structures	1 .. 11, 817	Table 4.1-5	20 419 776
Channels	SDS Data Structures	1 .. 11, 817	Table 4.1-5	246 738 960
Total VIRS Megabytes/File:				57.37

Table 4.1-2. 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 4.1-3. 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

Table 4.1-3. Scan Status VData

Field Name	Description	Field Num	Num Records	Data Type	Units	Range
virMode	VIRS Mode	14	1 .. 11, 817	8-bit integer	N/A	0 .. 3
virAbnCon	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 4.1-4. 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 4.1-5. 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	$\text{mW cm}^{-2\text{sr}^{-1}}\text{mm}^{-1}$	TBD

VIRS CID Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

VIRS CID Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none">• Updated format to comply with standards.• The EOSDIS Product Code line was removed from the document. (6/17/2008)	All Sec. 4.1

4.2 MODIS Cloud Imager Data (MODIS CID)

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 4.2-1](#), 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 4.2-2](#) through [4.2-3](#). The MODIS Geolocation HDF Structure Summary, [Table 4.2-4](#), 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 4.2-4](#) and [4.2-5](#). 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 28	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: 1B
Type: Ancillary
Frequency: 1 per 5.0-Min

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

Time Interval Covered
File: 5.0-Min
Record: Instantaneous

Portion of Atmosphere Covered
File: Satellite Altitude

Table 4.2-1. 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 4.2-2	72
MODIS Level 1-B SDS	SDSs	1 .. 1044	Table 4.2-3	294 693 396
Total MODIS Level-1B Bytes/File:				294 723 468

Table 4.2-2. 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 4.2-3. 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	$W\ m^{-2}sr^{-1}mm^{-1}$	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	$W\ m^{-2}sr^{-1}mm^{-1}$	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	$W\ m^{-2}sr^{-1}mm^{-1}$	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	$W\ m^{-2}sr^{-1}mm^{-1}$	TBD

Table 4.2-3. MODIS Level-1B Science Data Sets

SDS Name	Description	Rank	Dimensions	Data Type	Units	Range
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 mm ⁻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 4.2-4. 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 4.2-5	59 678 050
Total MODIS Geolocation Bytes/File:				59 718 050

Table 4.2-5. MODIS Geolocation Science Data Sets

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

Table 4.2-5. MODIS Geolocation Science Data Sets

SDS Name	Description	Rank	Dimensions	Data Type	Units	Range
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 dimension	32-bit float	TBD	TBD
sun_ref	Unit Sun vector in ECR frame at scan center time	2	{200, 3} scan x vector dimension	32-bit float	TBD	TBD
Mirror side	Mirror side	1	{200} scan	16-bit integer	TBD	TBD
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

Table 4.2-5. MODIS Geolocation Science Data Sets

SDS Name	Description	Rank	Dimensions	Data Type	Units	Range
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 CID_MODIS Geolocation Data CID_MODIS Total Data
Volume

Total Bytes/File: 294 ,723,468	Total Bytes/File: 59,748,050	TotalMbytes/Granule: 338.1
Total Mbytes/File: 281.1	Total Mbytes/File: 56.98	Total Mbytes/Hour: 57.0
Total Mbytes/Hour: 3,372.2	Total Mbytes/Hour: 683.8	Total Mbytes/Day: 97,367
Total Mbytes/Day: 80,948	Total Mbytes/Day: 16,410	Total Mbytes/Month: 3,018,378

MODIS CID Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

MODIS CID Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none">• Updated format to comply with standards.• The EOSDIS Product Code line was removed from the document. (6/17/2008)	All Sec. 4.2

4.3 VIIRS Cloud Imager Data (VIIRS CID)

VIIRS Cloud Imager Data (CID_VIIRS) from the NPP spacecraft is a Level-1B data set with sixteen of the VIIRS channels. CID_VIIRS contains the calibrated radiances and geolocation data. The sizes listed in the following data description reflect the estimated number of scan line records (1536) for moderate resolution in about 5 minutes of data. The file is written in Hierarchical Data Format (HDF) and is composed of Scientific Data Sets (SDS).

The VIIRS Level-1B HDF Structure Summary, [Table 4.3-1](#), 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 [Table 4.3-2](#) through [Table 4.3-4](#).

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 ASDC. The channels currently requested by the CERES Science Team are

Channels	Micron	Resolution (km)	Channels	Micron	Resolution (km)
I1	0.64	0.375 & 0.750	M8	1.24	0.750
I3	1.61	0.375 & 0.750	M9	1.378	0.750
I4	3.74	0.375 & 0.750	M10	1.61	0.750
I5	11.45	0.375 & 0.750	M11	2.25	0.750
M1	0.412	0.750	M12	3.70	0.750
M2	0.445	0.750	M14	8.55	0.750
M3	0.488	0.750	M15	10.763	0.750
M4	0.555	0.750	M16	12.013	0.750
M5	0.672	0.750	DNB	0.7	0.750
M7	0.865	0.750			

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

Portion of Globe Covered
File: Satellite Swath
Record: .375 – 0.750-km by .375 – 0.750-km

Time Interval Covered
File: ~5.0-Min
Record: Instantaneous

Portion of Atmosphere Covered
File: Satellite Altitude

Table 4.3-1. VIIRS Level-1B HDF Structure Summary

HDF Name	HDF Structure Type	Num Records	Table Number	Size (bytes)
VIIRS Global Attribute	HDF annotations	3		396,871
VIIRS Level 1-B Imagery SDS	SDSs	4...3200	Table 4.3-2	409,974,879
VIIRS Level 1-B Moderate SDS	SDSs	1...1600	Table 4.3-3	
VIIRS Level 1-B Day/Night SDS	SDSs	4064	Table 4.3-4	
Total VIIRS Level-1B Bytes/File (HDF compressed):				410,371,750

Table 4.3-2. VIIRS Level-1B Imagery Science Data Sets

SDS Name	Description	Rank	Dimensions	Data Type	Unit	Range
Radiance_Img_I1_Avg	Radiances for I1 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	$W m^{-2}sr^{-1} mm^{-1}$	TBD
Radiance_Img_I3_Avg	Radiances for I3 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	$W m^{-2}sr^{-1} mm^{-1}$	TBD
Radiance_Img_I4_Avg	Radiances for I4 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	$W m^{-2}sr^{-1} mm^{-1}$	TBD
Radiance_Img_I5_Avg	Radiances for I5 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	$W m^{-2}sr^{-1} mm^{-1}$	TBD
Reflectance_Img_I1_Sub	Reflectance for I1 in imagery resolution	2	(3072,3200)	Unsigned 2-byte integer	N/A	TBD
Reflectance_Img_I1_Avg	Reflectance for I1 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	N/A	TBD
Reflectance_Img_I3_Sub	Reflectance for I3 in imagery resolution	2	(3072,3200)	Unsigned 2-byte integer	N/A	TBD
Reflectance_Img_I3_Avg	Reflectance for I3 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	N/A	TBD
BrightTemp_Img_I4_Sub	Brightness temperature for I4 at imagery resolution	2	(3072,3200)	Unsigned 2-byte integer	°K	TBD

Table 4.3-2. VIIRS Level-1B Imagery Science Data Sets

SDS Name	Description	Rank	Dimensions	Data Type	Unit	Range
BrightTemp_Img_I4_Avg	Brightness temperature for I4 at moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	°K	TBD
BrightTemp_Img_I5_Sub	Brightness temperature for I5 at imagery resolution	2	(3072,3200)	Unsigned 2-byte integer	°K	TBD
BrightTemp_Img_I5_Avg	Brightness temperature for I5 at moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	°K	TBD
QF_VIIRS_I1_SDR_1_Sub	Quality control flag for I1	2	(3072,3200)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_I1_SDR_3	Scan quality control flag for I1	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_I3_SDR_1_Sub	Quality control flag for I3	2	(3072,3200)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_I3_SDR_3	Scan quality control flag for I3	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_I4_SDR_1_Sub	Quality control flag for I4	2	(3072,3200)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_I4_SDR_3	Scan quality control flag for I4	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_I5_SDR_1_Sub	Quality control flag for I5	2	(3072,3200)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_I5_SDR_3	Scan quality control flag for I5	2	(192,4)	Unsigned 4-byte integer	N/A	TBD

Table 4.3-3. VIIRS Level-1B Moderate Science Data Sets

SDS Name	Description	Rank	Dimensions	Data Type	Unit	Range
scanStartTime_G	Time at the beginning of the scan	1	(192)	8-byte float	Sec	TBD
scanMidTime_G	Time at the mid of the scan	1	(192)	8-byte float	Sec	TBD
NumScans	Number of scan lines	1	(1)	4-byte integer	N/A	TBD
Latitude_Sub	Geodetic latitude	2	(1536,1600)	4-byte float	Deg	-90 to 90
Longitude_Sub	Geodetic longitude	2	(1536,1600)	4-byte float	Deg	-180 to 180

Table 4.3-3. VIIRS Level-1B Moderate Science Data Sets

SDS Name	Description	Rank	Dimensions	Data Type	Unit	Range
TerrainHgt_Mod_Sub	Terrain height	2	(1536,1600)	4-byte float	TBD	TBD
SatelliteRange_Sub	Sensor location	2	(1536,1600)	4-byte float	TBD	TBD
SenAziAng_Mod_Sub	Sensor azimuth angle	2	(1536,1600)	4-byte float	Deg	TBD
SenZenAng_Mod_Sub	Sensor zenith angle	2	(1536,1600)	4-byte float	Deg	TBD
SolAziAng_Mod_Sub	Solar azimuth angle	2	(1536,1600)	4-byte float	Deg	TBD
SolZenAng_Mod_Sub	Solar zenith angle	2	(1536,1600)	4-byte float	Deg	TBD
Radiance_Mod_M10_Sub	Radiances for M10 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	W m ⁻² sr ⁻¹ mm	TBD
Radiance_Mod_M11_Sub	Radiances for M11 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	W m ⁻² sr ⁻¹ mm	TBD
Radiance_Mod_M12_Sub	Radiances for M12 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	W m ⁻² sr ⁻¹ mm	TBD
Radiance_Mod_M14_Sub	Radiances for M14 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	W m ⁻² sr ⁻¹ mm	TBD
Radiance_Mod_M15_Sub	Radiances for M15 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	W m ⁻² sr ⁻¹ mm	TBD
Radiance_Mod_M16_Sub	Radiances for M16 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	W m ⁻² sr ⁻¹ mm	TBD
Radiance_Mod_M3_Sub	Radiances for M3 in moderate resolution	2	(1536,1600)	4-byte float	W m ⁻² sr ⁻¹ mm	TBD
Radiance_Mod_M4_Sub	Radiances for M4 in moderate resolution	2	(1536,1600)	4-byte float	W m ⁻² sr ⁻¹ mm	TBD
Radiance_Mod_M5_Sub	Radiances for M5 in moderate resolution	2	(1536,1600)	4-byte float	W m ⁻² sr ⁻¹ mm	TBD
Radiance_Mod_M7_Sub	Radiances for M7 in moderate resolution	2	(1536,1600)	4-byte float	W m ⁻² sr ⁻¹ mm	TBD
Reflectance_Mod_M10_Sub	Reflectance for M10 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	N/A	TBD

Table 4.3-3. VIIRS Level-1B Moderate Science Data Sets

SDS Name	Description	Rank	Dimensions	Data Type	Unit	Range
Reflectance_Mod_M11_Sub	Reflectance for M11 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	N/A	TBD
Reflectance_Mod_M3_Sub	Reflectance for M3 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	N/A	TBD
Reflectance_Mod_M4_Sub	Reflectance for M4 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	N/A	TBD
Reflectance_Mod_M5_Sub	Reflectance for M5 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	N/A	TBD
Reflectance_Mod_M7_Sub	Reflectance for M7 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	N/A	TBD
Reflectance_Mod_M8_Sub	Reflectance for M8 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	N/A	TBD
Reflectance_Mod_M9_Sub	Reflectance for M9 in moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	N/A	TBD
BrightTemp_Mod_M12_Sub	Brightness temperature for M12 at moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	°K	TBD
BrightTemp_Mod_M14_Sub	Brightness temperature for M14 at moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	°K	TBD
BrightTemp_Mod_M15_Sub	Brightness temperature for M15 at moderate resolution	2	(1536,1600)	4-byte float	°K	TBD
BrightTemp_Mod_M16_Sub	Brightness temperature for M16 at moderate resolution	2	(1536,1600)	Unsigned 2-byte integer	°K	TBD
QF_VIIRS_GEO_MOD_2_Sub	Quality control flag for geolocation	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_M10_SDR_1_Sub	Quality control flag for M10	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_M10_SDR_3	Scan quality control flag for M10	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_M11_SDR_1_Sub	Quality control flag for M11	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD

Table 4.3-3. VIIRS Level-1B Moderate Science Data Sets

SDS Name	Description	Rank	Dimensions	Data Type	Unit	Range
QF_VIIRS_M11_SDR_3	Scan quality control flag for M11	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_M12_SDR_1_Sub	Quality control flag for M12	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_M12_SDR_3	Scan quality control flag for M12	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_M14_SDR_1_Sub	Quality control flag for M14	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_M14_SDR_3	Scan quality control flag for M14	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_M15_SDR_1_Sub	Quality control flag for M15	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_M15_SDR_3	Scan quality control flag for M15	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_M16_SDR_1_Sub	Quality control flag for M16	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_M16_SDR_3	Scan quality control flag for M16	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_M3_SDR_1_Sub	Quality control flag for M3	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_M3_SDR_3	Scan quality control flag for M3	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_M4_SDR_1_Sub	Quality control flag for M4	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_M4_SDR_3	Scan quality control flag for M4	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_M5_SDR_1_Sub	Quality control flag for M5	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_M5_SDR_3	Scan quality control flag for M5	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_M7_SDR_1_Sub	Quality control flag for M7	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_M7_SDR_3	Scan quality control flag for M7	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_M8_SDR_1_Sub	Quality control flag for M8	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_M8_SDR_3	Scan quality control flag for M8	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_M9_SDR_1_Sub	Quality control flag for M9	2	(1536,1600)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_M9_SDR_3	Scan quality control flag for M9	2	(192,4)	Unsigned 4-byte integer	N/A	TBD

Table 4.3-4. VIIRS Level-1B DNB Science Data Sets

SDS Name	Description	Rank	Dimensions	Data Type	Unit	Range
Latitude_DNB	Geodetic latitude	2	(1536,2032)	4-byte float	Deg	-90 to 90
Longitude_DNB	Geodetic longitude	2	(1536,2032)	4-byte float	Deg	-180 to 180
TerrainHgt_Mod_DNB	Terrain height	2	(1536,2032)	4-byte float	TBD	TBD
MoonAziAng_DNB	Lunar azimuth angle	2	(1536,2032)	4-byte float	Deg	TBD
MoonZenAng_DNB	Lunar zenith angle	2	(1536,2032)	4-byte float	Deg	TBD
SenAziAng_Mod_DNB	Sensor azimuth angle	2	(1536,2032)	4-byte float	Deg	TBD
SenZenAng_Mod_DNB	Sensor zenith angle	2	(1536,2032)	4-byte float	Deg	TBD
SolAziAng_Mod_DNB	Solar azimuth angle	2	(1536,2032)	4-byte float	Deg	TBD
SolZenAng_Mod_DNB	Solar senith angle	2	(1536,2032)	4-byte float	Deg	TBD
Radiance_Dnb	Radiances for DNB in DNB resolution	2	(1536,2032)	4-byte float	W m ⁻² sr ⁻¹ mm	TBD
QF_VIIRS_DNB_SDR_1	Quality control flag for DNB	2	(1536,2032)	Unsigned 1-byte integer	N/A	TBD
QF_VIIRS_DNB_SDR_3	Scan quality control flag for DNB	2	(192,4)	Unsigned 4-byte integer	N/A	TBD
QF_VIIRS_GEO_DNB_2	Quality control flag for DNB geolocation	2	(1536,2032)	Unsigned 1-byte integer	N/A	TBD

CID_VIIRS Total Data Volume

Total Mbytes/Granule: 205.6
Total Mbytes/Hour: 2,467.2
Total Mbytes/Day: 59,212.8
Total Mbytes/Month: 1,835,597

VIIRS CID Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

VIIRS CID Revision Record

SCCR Approval Date	Release/ Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R5V1	N/A	<ul style="list-style-type: none"> • New CERES-NPP Data Products Catalog section. 	All
N/A	R5V2	N/A	<ul style="list-style-type: none"> • 3 more SDSs from M5 (0.672 micro meter), M10 (1.61 micro meter) and M12 (3.7 micro meter) were added with the same sub-sampling scheme as the other sub-setted Moderate bands. • Created the dimensions in Table 4.3-4. 	Table 4.3-3 Table 4.3-4

4.4 Surface Map (SURFMAP)

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 4.4-1](#) 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	Portion of Globe Covered
Frequency: Variable	File: Global
Configuration Code: 009000 and greater	Record: 1/6-Deg by 1/6-Deg
Time Interval Covered	Portion of Atmosphere Covered
File: Variable	File: Surface
Record: Variable	

Table 4.4-1. SURFMAP Product

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

SURFMAP Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

SURFMAP Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) • Section numbering was changed due to insertion of the VIIRS DPC. (9/17/2008) 	All Sec. 4.4 All

4.5 Geostationary Narrowband Radiances (GEO)

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 five sets of B1 data currently available (including two sets of METEOSAT). Others may be added in the future as other satellites are launched. The five sets currently available are

- 1) Geostationary Meteorological Satellite (GMS) in GMS format
- 2) Meteorological Satellite (METEOSAT) in METEOSAT format (2 satellites)
- 3) Geostationary Operational Environmental Satellite (GOES-East) in Canadian format
- 4) Geostationary Operational Environmental Satellite (GOES-West) 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: 4.8 MB per Hour
- 2) METEOSAT: 4.8 MB per Hour
- 3) GOES-East: 8.7 MB per Hour
- 4) GOES-West: 11.0 MB per Hour

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 the CERES Project.

GEO Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

GEO Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. 	All
N/A	R3V2	N/A	<ul style="list-style-type: none"> • Updated data file sizes. • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) • Section numbering was changed due to insertion of the VIIRS DPC. (9/17/2008) 	All All Sec. 4.5 All

4.6 Aerosol Data (APD)

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 4.6-1. APD File Sizes

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

APD Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

APD Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) • Section numbering was changed due to insertion of the VIIRS DPC. (9/17/2008) 	All Sec. 4.6 All

4.7 Gridded Analysis Product (GAP)

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. These data are primarily obtained from the European Centre for Medium Range Weather Forecasts (ECMWF) on a 0.5° latitude x 0.5° longitude grid. ECMWF's analysis data are available every six hours, while their forecast data are available every three hours. A secondary data set is also available from the Data Assimilation Office (DAO) on either a 2.0° latitude x 2.5° longitude grid (GEOS-2), or on a 1.0° latitude x 1.0° longitude grid (GEOS-3), depending on the data date desired. DAO/GEOS-2 data are available for the TRMM timeframe, while DAO/GEOS-3 data are available beginning with the TERRA launch. DAO's diagnostic products are available every three hours, while their prognostic products are available every six hours. The Regrid Meteorological, Ozone, and Aerosol Data Subsystem interpolates these data temporally and vertically to conform with CERES processing requirements. The ECMWF Input Products are shown in [Table 4.7-1](#). The DAO Input Products are shown in [Tables 4.7-2](#) and [4.7-3](#).

Level: 3

Type: Ancillary

Frequency: Every 3 or 6 hours

Portion of Globe Covered

File: Global

Record: 0.5° x 0.5° , 2° x 2.5° , or 1° x 1° region

Time Interval Covered

File: Every 3 or 6 hours

Record: Every 3 or 6 hours

Portion of Atmosphere Covered

File: Surface to TOA

o

Table 4.7-1. ECMWF Input Products

ECMWF File Name	ECMWF File Size (Daily)	Temporal Resolution	Products Used by CERES
ecmwf130.yyyymmdd	11 MB	Six hourly	Vertical profiles of temperature
ecmwf131.yyyymmdd	11 MB	Six hourly	Vertical profiles of U-component of wind
ecmwf132.yyyymmdd	11 MB	Six hourly	Vertical profiles of V-component of wind
ecmwf133.yyyymmdd	33 MB	Six hourly	Vertical profiles of specific humidity
ecmwf152.yyyymmdd	365 KB	Six hourly	Surface pressure
ecmwf235.yyyymmdd	2.1 MB	Three hourly	Forecast and current skin temperatures
TOTAL SIZE	68.5 MB		

Table 4.7-2. DAO/GEOS-2 Input Products

DAO File Name	DAO File Size (Daily)	Temporal Resolution	Products Used by CERES
ceres_geos2_trmm.pave.yyyymmdd	419 KB	Three hourly	Surface pressure
ceres_geos2_trmm.phis.yyyymmdd	209 KB	Six hourly	Surface height
ceres_geos2_trmm.ps.yyyymmdd	209 KB	Six hourly	Surface pressure
ceres_geos2_trmm.q10m.yyyymmdd	419 KB	Three hourly	Specific humidity at 10 meters
ceres_geos2_trmm.sphu.yyyymmdd	7.5 MB	Six hourly	Vertical profiles of specific humidity
ceres_geos2_trmm.t10m.yyyymmdd	419 KB	Three hourly	Temperature at 10 meters
ceres_geos2_trmm.tg.yyyymmdd	419 KB	Six hourly	Ground Temperature
ceres_geos2_trmm.tmpu.yyyymmdd	7.5 MB	Six hourly	Vertical profiles of temperature
ceres_geos2_trmm.tropp.yyyymmdd	209 KB	Six hourly	Tropopause height
ceres_geos2_trmm.u10m.yyyymmdd	419 KB	Three hourly	Wind speed u-vectors at 10 meters
ceres_geos2_trmm.uwnd.yyyymmdd	7.5 MB	Six hourly	Vertical profiles of wind speed u-vectors
ceres_geos2_trmm.v10m.yyyymmdd	419 KB	Three hourly	Wind speed v-vectors at 10 meters
ceres_geos2_trmm.vwnd.yyyymmdd	7.5 MB	Six hourly	Vertical profiles of wind speed v-vectors
TOTAL SIZE	33.1 MB		

Table 4.7-3. DAO/GEOS-3 Input Products

DAO File Name	DAO File Size (Daily)	Temporal Resolution	Products Used by CERES
DAS.Ilk.asm.tsyn2d_mis_x.AM100.yyyyymmdd00.yyyyymmdd21.V01	46 MB	Three hourly	Surface pressure, surface height, specific humidity at 10 meters, temperature at 10 meters, ground temperature, tropopause height, wind speed u-vectors at 10 meters, and wind speed v-vectors at 10 meters
DAS.Ilk.asm.tsyn2d_mis_x.AM100.yyyyymmnd00.yyyyymmnd21.V01	46 MB	Three hourly	Surface data for the next day
DAS.Ilk.asm.tsyn3d_mis_p.AM100.yyyyymmdd00.yyyyymmdd18.V01	300 MB	Six hourly	Vertical profiles of specific humidity, temperature, wind speed u-vectors, and wind speed v-vectors
DAS.Ilk.asm.tsyn3d_mis_p.AM100.yyyyymmnd00.yyyyymmnd18.V01	300 MB	Six hourly	Vertical profile data for the next day
TOTAL SIZE	692 MB		

Note: A combination of ECMWF and DAO/GEOS-3 files sizes are used in the Ancillary Products Summary [Table 1.0-5](#).

GAP Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

GAP Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) • Section numbering was changed due to insertion of the VIIRS DPC. (9/17/2008) 	All Sec. 4.7 All

4.8 Microwave Humidity (MWH)

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 4.8-1](#).

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: Total column

Table 4.8-1. MWH File Sizes

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

MWH Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

MWH Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) • Section numbering was changed due to insertion of the VIIRS DPC. (9/17/2008) 	All Sec. 4.8 All

4.9 Ozone Profile Data (OPD)

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 4.9-1](#).

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 4.9-1. OPD File Sizes

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

OPD Revision Record

The product Revision Record contains information pertaining to approved section changes. The table lists the date the Software Configuration Change Request (SCCR) was approved, the Release and Version Number, the SCCR number, a short description of the revision, and the revised sections. The authors are listed on the document cover.

OPD Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R3V1	N/A	<ul style="list-style-type: none"> • Updated format to comply with standards. • The EOSDIS Product Code line was removed from the document. (6/17/2008) • Section numbering was changed due to insertion of the VIIRS DPC. (9/17/2008) 	All Sec. 4.9 All

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4. TRW DRL 55067.300.008E; In-flight Measurement Analysis (Rev. E), March 1997.
5. TSDIS Science Users Interface Control Specification Volume 3, Level 1 File Specifications, Release 3.06, July 8, 1998
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6. MODIS Level 1B 1km Earth View Data Product Specification, Version 2.0, Release 1, March 1997. URL: <http://ltpwww.gsfc.nasa.gov/MODIS/>
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8. TRW 2311 B301.00; ICD between EDOS and the EOS Ground System Elements; August 1996.

Appendix A Acronyms, Abbreviations and Unit Definitions

ADM	Angular Distribution Model
APD	Aerosol Data
AVG	Monthly Regional Radiative Fluxes and Clouds
BDS	Bidirectional Scans
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
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 Gridded Radiative 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 TOA/Surface Fluxes and Clouds
SMOBA	Stratospheric Monitoring Group Ozone Blended Analysis
SRB	Surface Radiation Budget
SRBAVG	Monthly TOA/Surface Averages
SSF	Single Scanner Footprint TOA/Surface Fluxes and 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, Top of Atmosphere
TOMS	Total Ozone Mapping Spectrometer
TRMM	Tropical Rainfall Measuring Mission
UM	Upper Middle
VIRS	Visible Infrared Scanner
WN	Window
Xtrk	Crosstrack
ZAVG	Monthly Zonal and Global Radiative Fluxes and Clouds

Unit Definitions

Units	Definition
AU	Astronomical Unit, Astronomical Units
cm	centimeter, centimeters
count	count, counts
day	day, Julian date
deg	degree, degrees
deg sec ⁻¹	degrees per second
DU	Dobson Unit
fraction	fraction 0..1
g kg ⁻¹	grams per kilogram
g m ⁻²	grams per square meter
hhmmss	hour, minute, second
hour	hour, hours
hPa	hectoPascals
in-oz	inch-ounces
K	Kelvin
km	kilometer, kilometers
km sec ⁻¹	kilometers per second
m	meter, meters
mA	milliamp, milliamps
micron	micrometer, micrometers, micron
msec	millisecond, milliseconds
mW cm ⁻² sr ⁻¹ μm ⁻¹	milliWatts per square centimeter per steradian per micron
m sec ⁻¹	meters per second
N/A	not applicable, none, unitless, dimensionless
percent	percent, percentage 0..100
rad	radian, radians
sec	second, seconds
volt	volt, volts
W h m ⁻²	Watt hours per square meter
W ² m ⁻⁴	square Watts per meter to the 4th
W m ⁻²	Watts per square meter
W m ⁻² sr ⁻¹	Watts per square meter per steradian
W m ⁻² sr ⁻¹ μm ⁻¹	Watts per square meter per steradian per micron
C	degrees centigrade
μm	micrometer, micrometers, micron, microns

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 24-27 and two choices for parameters 28-31. 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

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, Terra-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	CERHRofDay	N/A	1 .. 24	s(2)	1
11	RangeBeginningDate	N/A	1997-11-19 .. 2050-12-31	date	1
12	RangeBeginningTime	N/A	00:00:00.000000Z .. 24:00:00.000000Z	time	1
13	RangeEndingDate	N/A	1997-11-19 .. 2050-12-31	date	1
14	RangeEndingTime	N/A	00:00:00.000000Z .. 24:00:00.000000Z	time	1
15	AssociatedPlatformShortName	N/A	TRMM, Terra, Aqua, TBD	s(20)	1-4

Table B-1. CERES Baseline Header Metadata

Item	Parameter Name	Units	Range	Data Type	No. of Elements
16	AssociatedInstrumentShortName	N/A	PFM, FM1, FM2, FM3, FM4, FM5, TBD	s(20)	1-4
17	AssociatedSensorShortName	N/A	Total Detector, Window Detector, ShortWave Detector	s(20)	3
18	LocalGranuleID	N/A	N/A	s(80)	1
19	PGEVersion	N/A	N/A	s(10)	1
20	CERProductionDateTime	N/A	N/A	datetime	1
21	LocalVersionID	N/A	N/A	s(60)	1
22	ProductGenerationLOC	N/A	SGI_xxx, TBD	s(255)	1
23	NumberOfRecords	N/A	1 .. 9 999 999 999	I10	1
24	WestBoundingCoordinate	deg	-180.0 .. 180.0	F11.6	1
25	NorthBoundingCoordinate	deg	-90.0 .. 90.0	F11.6	1
26	EastBoundingCoordinate	deg	-180.0 .. 180.0	F11.6	1
27	SouthBoundingCoordinate	deg	-90.0 .. 90.0	F11.6	1
24	GRingPointLatitude	deg	-90.0 .. 90.0	F11.6	3 .. 100
25	GRingPointLongitude	deg	-180.0 .. 180.0	F11.6	3 .. 100
26	GRingPointSequenceNo	N/A	0 .. 99999	I5	3 .. 100
27	ExclusionGRingFlag	N/A	Y (= YES), N (= NO)	s(1)	1
28	CERWestBoundingCoordinate	deg	0.0 .. 360.0	F11.6	1
29	CERNorthBoundingCoordinate	deg	0.0 .. 180.0	F11.6	1
30	CEREastBoundingCoordinate	deg	0.0 .. 360.0	F11.6	1
31	CERSouthBoundingCoordinate	deg	0.0 .. 180.0	F11.6	1
28	CERGRingPointLatitude	deg	0.0 .. 180.0	F11.6	3 .. 100
29	CERGRingPointLongitude	deg	0.0 .. 360.0	F11.6	3 .. 100
30	GRingPointSequenceNo	N/A	0 .. 99999	I5	3 .. 100
31	ExclusionGRingFlag	N/A	Y (= YES), N (= NO)	s(1)	1
32	AutomaticQualityFlag	N/A	Passed, Failed, or Suspect	s(64)	1
33	AutomaticQualityFlagExplanation	N/A	N/A	s(255)	1
34	QAGranuleFilename	N/A	N/A	s(255)	1
35	ValidationFilename	N/A	N/A	s(255)	1
36	ImagerShortName	N/A	VIRS, MODIS, TBD	s(20)	1
37	InputPointer	N/A	N/A	s(255)	800
38	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, Terra, Aqua, 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)