

## 2.11 Monthly Gridded TOA/Surface Fluxes and Clouds (SFC)

### EOSDIS Product Code: CER12

The Monthly Gridded TOA/Surface Fluxes and Clouds (SFC) archival data product contains hourly single satellite flux and cloud parameters averaged over 1.0-degree regions. Input to the SFC Subsystem is the Single 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. The science data are Vdata with multiple records. Each record contains spatially averaged data for an individual region.

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

- Region data
- Total-sky radiative fluxes at TOA and Surface
- Clear-sky radiative fluxes at TOA and Surface
- Cloud Layer properties
- Angular model scene classes
- Surface Emissivity

A complete listing of metadata and science parameters for this data product can be found in [Tables 2.11-1](#) through [Table 2.11-8](#).

**Level:** 3

**Frequency:** 1/Month

**Portion of Globe Covered**

**File:** Gridded Satellite Swath

**Record:** 1.0-Deg Equal-angle Region

**Time Interval Covered**

**File:** Month

**Record:** Hour

**Portion of Atmosphere Covered**

**File:** TOA and Surface

**Configuration Code**

**TRMM:** 015018 and greater

**Terra:** N/A

**Aqua:** N/A

## 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 2.11-2](#).

Table 2.11-1. SFC Metadata Summary

HDF Name	Description Table	Records	Number of Fields
CERES Baseline Header Metadata	<a href="#">Table B-1</a>	1	36
CERES_metadata Vdata	<a href="#">Table B-2</a>	1	14
SFC Product Specific Metadata	<a href="#">Table 2.11-2</a>	1	2

Table 2.11-2. SFC Product-specific Metadata

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

## SFC Science Data

All of the SFC science data are organized into various Vdata Structures, which are summarized in [Table 2.11-3](#). [Tables 2.11-4](#) through [Table 2.11-8](#) contain a list of parameters within each Vdata, including the field number, the field name, the data type, the units, the range, and the number of elements within each field.

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

Table 2.11-3. SFC Vdata Summary (1 of 2)

Vdata Name	Description Table	Records	Number of Fields	Vdata Size (MB)
Time and Position Data	<a href="#">Table 2.11-4</a>	n	6	170.3
Regional Identification Data	<a href="#">Table 2.11-5</a>	n	3	85.1
Surface Map and Full-Clear area Data	<a href="#">Table 2.11-6</a>	n	6	709.5
Imager Radiances Statistics	<a href="#">Table 2.11-7</a>	n	8	700.5
Angular Model Scene Type	<a href="#">Table 2.11-8</a>	n	7	731.3
TOA Fluxes (mean std num_obs)	<a href="#">Table 2.11-9</a>	n	8	681.2
Surface Fluxes (mean std num_obs)	<a href="#">Table 2.11-10</a>	n	9	1532.6
Surface Emissivity	<a href="#">Table 2.11-11</a>	n	2	56.8
Layer Cloud - HIGH (mean std num_obs)	<a href="#">Table 2.11-12</a>	n	15	1220.4
Layer Cloud - UPPERMID (mean std num_obs)	<a href="#">Table 2.11-13</a>	n	15	1220.4

Table 2.11-3. SFC Vdata Summary (2 of 2)

Vdata Name	Description Table	Records	Number of Fields	Vdata Size (MB)
Layer Cloud - LOWERMID (mean std num_obs)	<a href="#">Table 2.11-14</a>	n	15	1220.4
Layer Cloud - LOW (mean std num_obs)	<a href="#">Table 2.11-15</a>	n	15	1220.4
<b>Vdata TOTAL SIZE</b>				<b>11769.2</b>

Table 2.11-4. Time and Position Data

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

Table 2.11-5. Regional Identification Data

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
1	Region Number	32-Bit Float	N/A	1 .. 64800	1
2	Hour Box Number	32-Bit Float	N/A	1 .. 744	1
3	Num. Footprints in Region	32-Bit Float	N/A	1 .. 450	1
4	Colatitude	32-Bit Float	deg	1 .. 180	1
5	Longitude	32-Bit Float	deg	1 .. 360	1

Table 2.11-6. Other Regional Parameters

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
1	Alt. of Srf. above Sea	32-Bit Float	m	-1000.0 .. 10000.0	1
2	Surface Type Percentage	32-Bit Float	N/A	0.0 .. 100.0	20
3	Precipitable Water	32-Bit Float	cm	0.001 .. 10.0	1
4	Snow/Ice Percentage	32-Bit Float	N/A	0.0 .. 100.0	1
5	Aerosol Opt. Depth at 0.63um in clr	32-Bit Float	μm	-1.0 .. 5.0	1
6	Aerosol Opt. Depth at 1.6um in clr	32-Bit Float	μm	-1.0 .. 5.0	1

Table 2.11-7. Regional Imager Data

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
1	Imager Viewing Zenith Angle	32-Bit Float	deg	0 .. 360	1
2	Imager Relative Azimuth. Angle	32-Bit Float	deg	0 .. 360	1
3	Imager Channel Central Wavelength	32-Bit Float	$\mu\text{m}$	0.4 .. 15.0	5
4	Imager Mean Radiances	32-Bit Float	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	5
5	Imager Radiances over clear area	32-Bit Float	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	5

Table 2.11-8. Angular Model Scene Type Data for 20 Scenes

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
1	Incident Solar Flux	32-Bit Float	N/A	0.0 .. 1400.0	1
2	Area Coverage	32-Bit Float	N/A	0.0 .. 100.0	20
3	SW Scene ID	32-Bit Float	N/A	N/A	20
4	Albedo (mean)	32-Bit Float	N/A	0.0 .. 1.0	20
5	Albedo (std)	32-Bit Float	N/A	0.0 .. 1.0	20
6	LW (mean)	32-Bit Float	$\text{W m}^{-2}$	0.0 .. 400.0	20
7	LW (std)	32-Bit Float	$\text{W m}^{-2}$	0.0 .. 400.0	20

Table 2.11-9. TOA FLuxes (mean std num\_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
1	SW TOA Clear-sky	32-Bit Float	$\text{W m}^{-2}$	0.0 .. 1400.0	3
2	LW TOA Clear-sky	32-Bit Float	$\text{W m}^{-2}$	0.0 .. 500.0	3
3	WN TOA Clear-sky	32-Bit Float	$\text{W m}^{-2}$	2.0 .. 50.0	3
4	ALB TOA Clear-sky	32-Bit Float	N/A	0.0 .. 1.0	3
5	SW TOA Total-Sky	32-Bit Float	$\text{W m}^{-2}$	0.0 .. 1400.0	3
6	LW TOA Total-Sky	32-Bit Float	$\text{W m}^{-2}$	0.0 .. 500.0	3
7	WN TOA Total-Sky	32-Bit Float	$\text{W m}^{-2}$	2.0 .. 50.0	3
8	ALB TOA Total-Sky	32-Bit Float	N/A	0.0 .. 1.0	3

Table 2.11-10. Surface Fluxes Clear-Sky (mean std num\_obs) (1 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
1	SW SRF Model A Clear-Sky	32-Bit Float	$\text{W m}^{-2}$	0.0 .. 1400.0	3
2	LW SRF Model A Clear-Sky	32-Bit Float	$\text{W m}^{-2}$	0.0 .. 700.0	3

Table 2.11-10. Surface Fluxes Clear-Sky (mean std num\_obs) (2 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
3	WN SRF Model A Clear-Sky	32-Bit Float	W m <sup>-2</sup>	0.0 .. 65.0	3
4	Net. SW SRF Model A Clear-Sky	32-Bit Float	W m <sup>-2</sup>	0.0 .. 1400.0	3
5	Net. LW SRF Model A Clear-Sky	32-Bit Float	W m <sup>-2</sup>	-250.0 .. 50.0	3
6	SW SRF Model B Clear-Sky	32-Bit Float	W m <sup>-2</sup>	0.0 .. 1400.0	3
7	LW SRF Model B Clear-Sky	32-Bit Float	W m <sup>-2</sup>	0.0 .. 700.0	3
8	Net. SW SRF Model B Clear-Sky	32-Bit Float	W m <sup>-2</sup>	0.0 .. 1400.0	3
9	Net. LW SRF Model B Clear-Sky	32-Bit Float	W m <sup>-2</sup>	-250.0 .. 50.0	3
10	SW SRF Model A Total-Sky	32-Bit Float	W m <sup>-2</sup>	0.0 .. 1400.0	3
11	LW SRF Model A Total-Sky	32-Bit Float	W m <sup>-2</sup>	0.0 .. 700.0	3
12	WN SRF Model A Total-Sky	32-Bit Float	W m <sup>-2</sup>	0.0 .. 65.0	3
13	Net. SW SRF Model A Total-Sky	32-Bit Float	W m <sup>-2</sup>	0.0 .. 1400.0	3
14	Net. LW SRF Model A Total-Sky	32-Bit Float	W m <sup>-2</sup>	-250.0 .. 50.0	3
15	SW SRF Model B Total-Sky	32-Bit Float	W m <sup>-2</sup>	0.0 .. 1400.0	3
16	LW SRF Model B Total-Sky	32-Bit Float	W m <sup>-2</sup>	0.0 .. 700.0	3
17	Net. SW SRF Model B Total-Sky	32-Bit Float	W m <sup>-2</sup>	0.0 .. 1400.0	3
18	Net. LW SRF Model B Total-Sky	32-Bit Float	W m <sup>-2</sup>	-250.0 .. 50.0	3

Table 2.11-11. Surface Emissivity

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

Table 2.11-12. Layer Cloud Data - HIGH (mean std num\_obs) (1 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
1	Area Fraction Percentage	32-Bit Float	N/A	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Bottom Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	N/A	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	g m <sup>-2</sup>	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	g m <sup>-2</sup>	0.0 .. 10000.0	3
10	Liquid Particle Radius	32-Bit Float	mm	0.0 .. 40.0	3
11	Ice Particle Diameter	32-Bit Float	mm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 400.0	3

Table 2.11-12. Layer Cloud Data - HIGH (mean std num\_obs) (2 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	-6.0 .. 6.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.11-13. Layer Cloud Data - UPPERMID (mean std num\_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
1	Area Fraction Percentage	32-Bit Float	N/A	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Bottom Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	N/A	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	g m <sup>-2</sup>	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	g m <sup>-2</sup>	0.0 .. 10000.0	3
10	Liquid Particle Radius	32-Bit Float	mm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	mm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 400.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	-6.0 .. 6.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.11-14. Layer Cloud Data - LOWERMID (mean std num\_obs) (1 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
1	Area Fraction Percentage	32-Bit Float	N/A	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Cloud Base Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	N/A	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	g m <sup>-2</sup>	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	g m <sup>-2</sup>	0.0 .. 10000.0	3
10	Liquid Particle Radius	32-Bit Float	mm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	mm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 400.0	3

Table 2.11-14. Layer Cloud Data - LOWERMID (mean std num\_obs) (2 of 2)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	-6.0 .. 6.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

Table 2.11-15. Layer Cloud Data - LOW (mean std num\_obs)

Field No.	Field Name / Parameter	Data Type	Units	Range	No. of Elements
1	Area Fraction Percentage	32-Bit Float	N/A	0.0 .. 100.0	1
2	Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
3	Effective Temperature	32-Bit Float	K	100.0 .. 350.0	3
4	Effective Height	32-Bit Float	km	0.0 .. 20.0	3
5	Top Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
6	Bottom Pressure	32-Bit Float	hPa	0.0 .. 1100.0	3
7	Particle Phase	32-Bit Float	N/A	1.0 .. 2.0	3
8	Liquid Water Path	32-Bit Float	g m <sup>-2</sup>	0.0 .. 10000.0	3
9	Ice Water Path	32-Bit Float	g m <sup>-2</sup>	0.0 .. 10000.0	3
10	Liquid Particle Radius	32-Bit Float	mm	0.0 .. 40.0	3
11	Ice Particle Effective Diameter	32-Bit Float	mm	0.0 .. 300.0	3
12	Vis. Opt. Depth (linear)	32-Bit Float	N/A	0.0 .. 400.0	3
13	Vis. Opt. Depth (log)	32-Bit Float	N/A	-6.0 .. 6.0	3
14	Infrared Emissivity	32-Bit Float	N/A	0.0 .. 2.0	3
15	Vertical Aspect Ratio	32-Bit Float	N/A	0.0 .. 20.0	3

## SFC Revision Record

The Revision Record contains information pertaining to approved document changes. The table lists the date the Document Configuration Change Request (DCCR) was approved, the Release and Version Number, the DCCR number, a short description of the revision, and the revised sections. The document authors are listed on the cover. The Head of the CERES Data Management Team approves or disapproves the requested changes based on recommendations of the Configuration Control Board.

### SFC Revision Record

<b>DCCR Approval Date</b>	<b>Release/Version Number</b>	<b>DCCR Number</b>	<b>Description of Revision</b>	<b>Section(s) Affected</b>
5/29/02	R3V2	365	<ul style="list-style-type: none"> <li>• Updated parameters in Regional Identification Data, Regional Imager Data.</li> <li>• Updated format to comply with standards.</li> </ul>	Tables 2.11-5 & 2.11-7 All