

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](#). 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 [Table 3](#) to [Table 17](#).

A more detailed listing of the data parameters for this product can be found in the [SSF Collection Guide](#): ([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: Not applicable

Terra: Edition4 family

Aqua: Edition4 family

SSF-Edition4-1



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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 1](#) and the SSF_Header parameters are listed in [Table 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 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. SSF_Header

Item	Description	Units	Range	Elements	Bytes/ Elem
SSF-H1	SSF ID	N/A	118 or 1118	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-H15a	Satellite position X at hour start	km	-8000.0 .. 8000.0	1	8



Table 2. SSF_Header

Item	Description	Units	Range	Elements	Bytes/ Elem
SSF-H15b	Satellite position Y at hour start	km	-8000.0 .. 8000.0	1	8
SSF-H15c	Satellite position Z at hour start	km	-8000.0 .. 8000.0	1	8
SSF-H15d	N vector X at hour start	N/A	0.0 .. 1.0	1	8
SSF-H15e	N vector Y at hour start	N/A	0.0 .. 1.0	1	8
SSF-H15f	N vector Z at hour start	N/A	0.0 .. 1.0	1	8
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
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 3](#) to [Table 17](#) 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 16](#) and [Table 17](#) 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 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
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 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 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 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 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 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 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-38a	TOA Incoming Solar Radiation	$W m^{-2}$	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
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



Table 9. TOA and Surface Fluxes

Item	SDS Name (Parameter Name)	Units	Range	Dimensions	Data Type	Maximum Hourly Size (MB)
SSF-46a	CERES downward SW surface flux - Model B, clearsky	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-47a	CERES downward LW surface flux - Model B, clearsky	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-49a	CERES downward LW surface flux - Model C	W m ⁻²	0 .. 700	n	32-bit real	0.94
SSF-49b	CERES downward LW surface flux - Model C, clearsky	W m ⁻²	0 .. 700	n	32-bit real	0.94
SSF-49c	CERES net LW surface flux - Model C	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 10. Full Footprint Area

Item	SDS Name (Parameter Name)	Units	Range	Dimensions	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-59a	Surface pressure	hPa	0 .. 1100	n	32-bit real	0.94
SSF-59b	Constrained near-surface air temperature for DLF calculations	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-60a	Surface minus 750 mb air temperature difference	K	-200 .. 200	n	32-bit real	0.94

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Table 10. Full Footprint Area

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-60b	Estimated Inversion Strength	K	-200 .. 200	n	32-bit real	0.94
SSF-60c	750 mb minus surface air potential temperature difference	K	-200 .. 200	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
SSF-65a	Additional notes on cloud algorithms	N/A	0 .. 32766	n	16-bit integer	0.47
SSF-65b	Notes on cloud multilayer	N/A	0 .. 32766	n	16-bit integer	0.47

Table 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	CWG surface skin temperature	K	175 .. 375	n	32-bit real	0.94

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Table 11. Clear Footprint Area

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-79a	CWG precipitable water	cm	0.001 .. 10	n	32-bit real	0.94
SSF-80	Vertical temperature change	K	-30 .. 90	n	32-bit real	0.94

Table 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
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-94a	Mean cloud top temperature for cloud layer	K	100 .. 350	n x 2	32-bit real	1.87
SSF-94b	Mean cloud top height for cloud layer	km	0 .. 20	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



Table 12. Cloudy Footprint Area

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
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-102a	Mean cloud base temperature for cloud layer	K	100 .. 350	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 gen effect radius for cloud layer (3.7)	μm	0 .. 300	n x 2	32-bit real	1.87
SSF-106	Stddev of ice particle gen effect radius for cloud layer (3.7)	μm	0 .. 200	n x 2	32-bit real	1.87
SSF-106a	Mean asymmetry factor for cloud layer	N/A	0 .. 1	n x 2	32-bit real	1.87
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 (1.2)	μm	0 .. 40	n x 2	32-bit real	1.87
SSF-109	Mean ice particle gen effect radius for cloud layer (1.2)	μm	0 .. 300	n x 2	32-bit real	1.87
SSF-110	Mean logarithm of visible optical depth for cloud layer (1.2)	N/A	-6 .. 6	n x 2	32-bit real	1.87
SSF-110a	Mean water particle radius for cloud layer (2.1)	μm	0 .. 40	n x 2	32-bit real	1.87
SSF-110b	Mean ice particle gen effect radius for cloud layer (2.1)	μm	0 .. 300	n x 2	32-bit real	1.87
SSF-110c	Mean logarithm of visible optical depth for cloud layer (2.1)	N/A	-6 .. 6	n x 2	32-bit real	1.87
SSF-111	CO2 slicing percent coverages for cloud layer	N/A	0 .. 100	n x 2	32-bit real	1.87



Table 12. Cloudy Footprint Area

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-111a	Mean infrared emissivity for cloud layer - CO2 slicing	N/A	0 .. 2	n x 2	32-bit real	1.87
SSF-111b	Mean effective pressure for cloud layer - CO2 slicing	hPa	0 .. 1100	n x 2	32-bit real	1.87
SSF-111c	Mean effective temperature for cloud layer - CO2 slicing	K	100 .. 350	n x 2	32-bit real	1.87
SSF-112	Mean effective height for cloud layer - CO2 slicing	km	0 .. 20	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

Table 13. Multilayer Cloud Footprint Area

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-114a	Single layer/multilayer percent coverages	N/A	0 .. 100	n x 4	32-bit real	3.74
SSF-114b	Mean visible optical depth for multilayer	N/A	0 .. 400	n x 4	32-bit real	3.74
SSF-114c	Mean logarithm of visible optical depth for multilayer	N/A	-6 .. 6	n x 4	32-bit real	3.74
SSF-114d	Mean cloud infrared emissivity for multilayer	N/A	0 .. 2	n x 4	32-bit real	3.74
SSF-114e	Mean cloud top pressure for multilayer	hPa	0 .. 1100	n x 4	32-bit real	3.74
SSF-114f	Mean cloud top temperature for multilayer	K	100 .. 350	n x 4	32-bit real	3.74
SSF-114g	Mean cloud top height for multilayer	km	0 .. 20	n x 4	32-bit real	3.74
SSF-114h	Mean cloud particle phase for multilayer (3.7)	N/A	1 .. 2	n x 4	32-bit real	3.74
SSF-114i	Mean water particle radius for multilayer (3.7)	μm	0 .. 40	n x 4	32-bit real	3.74
SSF-114j	Mean ice particle gen effect radius for multilayer (3.7)	μm	0 .. 300	n x 4	32-bit real	3.74
SSF-114k	Mean water particle radius for multilayer (2.1)	μm	0 .. 40	n x 4	32-bit real	3.74
SSF-114l	Mean ice particle gen effect radius for multilayer (2.1)	μm	0 .. 300	n x 4	32-bit real	3.74



Table 14. 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	4.7
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	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 5	32-bit real	4.7
SSF-119	Stddev of imager radiances over clear area	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 5	32-bit real	4.7
SSF-120	Mean imager radiances over overcast cloud area	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 5	32-bit real	4.7
SSF-121	Stddev of imager radiances over overcast cloud area	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 5	32-bit real	4.7
SSF-122	Mean imager radiances over full CERES FOV	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 5	32-bit real	4.7
SSF-123	Stddev of imager radiances over full CERES FOV	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 5	32-bit real	4.7
SSF-126	Mean imager radiances over cloud layer 1 (no overlap)	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 5	32-bit real	4.7
SSF-127	Stddev of imager radiances over cloud layer 1 (no overlap)	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 5	32-bit real	4.7
SSF-128	Mean imager radiances over cloud layer 2 (no overlap)	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 5	32-bit real	4.7
SSF-129	Stddev of imager radiances over cloud layer 2 (no overlap)	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 5	32-bit real	4.7
SSF-130	Mean imager radiances over cloud layer 1 and 2 overlap	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 5	32-bit real	4.7
SSF-131	Stddev of imager radiances over cloud layer 1 and 2 overlap	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 5	32-bit real	4.7

The additional footprint imager radiance statistics described in [Table 15](#) are only available on Terra and Aqua SSF products.



Table 15. Additional Footprint Imager Radiance Statistics

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-131a	Additional imager channel central wavelength	μm	0.4 .. 15.0	n x 7	32-bit real	2.82
SSF-131b	Additional mean imager radiances over clear area	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 7	32-bit real	2.82
SSF-131c	Additional stddev of imager radiances over clear area	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 7	32-bit real	2.82
SSF-131d	Additional mean imager radiances over full CERES FOV	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	-1000 .. 1000	n x 7	32-bit real	2.82
SSF-131e	Additional stddev of imager radiances over full CERES FOV	$\text{W m}^{-2} \text{sr}^{-1} \mu\text{m}^{-1}$	0 .. 1000	n x 7	32-bit real	2.82

The MODIS land aerosol parameters described in Table 16 are only available on Terra and Aqua SSF products.

Table 16. 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 optical depth ratio small 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-138a	MOD04-based quality flag note optical depth land (0.470)	N/A	0 .. 90000000	n	32-bit integer	0.94
SSF-138b	MOD04-based quality flag note optical depth land (0.659)	N/A	0 .. 90000000	n	32-bit integer	0.94
SSF-139	MOD04 number pixels used 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 16. 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 (0.55)	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
SSF-145a	Percentage of CERES FOV with MODIS deep blue aerosol	N/A	0 .. 100	n	16-bit integer	0.47
SSF-145b	PSF-wtd MOD04 deep blue aerosol optical depth land (0.550)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-145c	PSF-wtd MOD04 deep blue aerosol optical depth land (0.412)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-145d	PSF-wtd MOD04 deep blue aerosol optical depth land (0.470)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-145e	PSF-wtd MOD04 deep blue aerosol optical depth land (0.659)	N/A	0.0 .. 5.0	n	32-bit real	0.94
SSF-145f	MOD04-based quality flag note deep blue optical depth land (0.659)	N/A	0 .. 90000000	n	32-bit integer	0.94
SSF-145g	PSF-wtd MOD04 deep blue angstrom exponent land	N/A	0.5 .. 5.0	n	32-bit real	0.94
SSF-145h	PSF-wtd MOD04 deep blue single scattering albedo land (0.412)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-145i	PSF-wtd MOD04 deep blue single scattering albedo land (0.470)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-145j	PSF-wtd MOD04 deep blue single scattering albedo land (0.659)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-145k	PSF-wtd MOD04 deep blue surface reflectance land (0.412)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-145l	PSF-wtd MOD04 deep blue surface reflectance land (0.470)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-145m	PSF-wtd MOD04 deep blue surface reflectance land (0.659)	N/A	0.0 .. 1.0	n	32-bit real	0.94

The MODIS ocean aerosol parameters described in [Table 17](#) are only available on Terra and Aqua SSF products.



Table 17. 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
SSF-156a	MOD04-based quality flag note optical depth average ocean	N/A	0 .. 90000000	n	32-bit integer	0.94
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
SSF-161	PSF-wtd MOD04 mean reflectance ocean (0.470)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-162	PSF-wtd MOD04 mean reflectance ocean (0.555)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-163	PSF-wtd MOD04 mean reflectance ocean (0.659)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-164	PSF-wtd MOD04 mean reflectance ocean (0.865)	N/A	0.0 .. 1.0	n	32-bit real	0.94



Table 17. MODIS Ocean Aerosols

Item	SDS Name (Parameter Name)	Units	Range	Dimen- sions	Data Type	Maximum Hourly Size (MB)
SSF-165	PSF-wtd MOD04 mean reflectance ocean (1.240)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-166	PSF-wtd MOD04 mean reflectance ocean (1.640)	N/A	0.0 .. 1.0	n	32-bit real	0.94
SSF-167	PSF-wtd MOD04 mean reflectance ocean (2.130)	N/A	0.0 .. 1.0	n	32-bit real	0.94

Estimated GigaBytes / Day:



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
10/13/11	R5V1	809	<ul style="list-style-type: none"> Initial version of SSF Edition4 DPC section. Changed ice particle effective radius to ice particle gen effect radius. (12/06/2012) Changed CERES SW TOA flux - downwards to TOA Incoming Solar Radiation. (12/06/2012) The ASDC footer was added to the bottom of the document. (06/11/2013) Eliminated section numbers from the Data Products Catalog. Specifically, in this document, section number 2.5 was removed. (12/06/2013) "mm" was changed to "µm." (03/28/2014) Updated some links to refer to the .pdf file instead of the .doc file and to refer to a specific .pdf document instead of the Website. (06/20/2014) 	<p>All</p> <p>Tables 2.5-9, 2.5-12, & 2.5-13</p> <p>All</p> <p>All</p> <p>Tables 12 & 13</p> <p>All</p>

