2.17 SYN1deg-Month-lite

The SYN1deg-Month-lite product provides CERES-observed temporally interpolated top-of-atmosphere (TOA) radiative fluxes and coincident MODIS-derived cloud and aerosol properties. Each parameter is available at monthly 1°–regional, zonal and global time-space scales. TOA fluxes are provided for clear and all-sky conditions in the longwave (LW), shortwave (SW), and window (WN) regions. The regional means are determined for 1° equal-angle grid boxes calculated by first interpolating each parameter between the times of the CERES observations in order to produce a complete 1-hourly time series for the month. After interpolation, the time series is used to produce mean parameters. Monthly means are calculated using the combination of observed and interpolated parameters from all days containing at least one CERES observation.

CERES SYN1deg uses 3-hourly radiance and cloud property data from geostationary imagers to more accurately model variability between CERES observations. To use GEO data to enhance diurnal sampling, several steps are involved. First GEO radiances are cross-calibrated with the MODIS imager using only data that is coincident in time and ray-matched in angle. Next, the GEO cloud retrievals are inferred from the calibrated GEO radiances. The GEO radiances are converted from narrowband to broadband using empirical regressions, and then broadband GEO TOA fluxes using ADMs and directional models. To ensure GEO and CERES TOA fluxes are consistent, a normalization technique is used. Instantaneous matched gridded fluxes from CERES and GEO are regressed against one another over a month from the 5°×5° latitude-longitude regions. The regression relation is then applied to all GEO fluxes to remove biases that depend upon cloud amount, solar and view zenith angles as well as regional dependencies. The all-sky GEO-LW TOA fluxes use the same approach as in Edition2 and employ regional instantaneous normalization.

CERES Edition2.6 uses Edition2 algorithms with Edition3 CERES instrument calibration and is a limited parameter precursor product for the full parameter products available after Edition3 has been processed.

SYN1deg-Month contains monthly parameters on a regional, zonal and global basis:

- All-sky and clear-sky radiative SW, LW, and Net fluxes at TOA
- Total cloud properties (not 4-layered) for day and day/night (24-hour)
- Auxiliary parameters, for example aerosol, skin temperature, wind speed used as input to process the CERES fluxes

Level: 4
Frequency: 1 Monthly File
Portion of Atmosphere Covered: TOA

Time Interval Covered:
File: All Months and Climatology
Record: 1 Month

Portion of Globe Covered:
File: Zonal, Global, Regional
Record: 1-Deg Regions

Product Version:

Terra: Edition2.6

Aqua : Edition2.6

SYN1deg Metadata

The types of SYN1deg metadata are summarized in Table 2.17-1 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 2.17-1. SYN1deg-Month 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 SYN1deg science data are organized into the HDF Grid data type and are contained in: SYN1deg-Month, which is shown in Table 2.17-2 below. The 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.

SYN1deg Scientific Data Sets

Table 2.17-2. Monthly Gridded Categories of SYN1deg-Month

Number	Name	Description	No. of Records
1	1.0 Degree Regional	See Table 2.17-3	64800
2	1.0 Degree Zonal	See Table 2.17-3	180
3	Global	See Table 2.17-3	1

Table 2.17-3. List of Regional Parameters used to Define Groups of Other Parameters

Number	Name	Description
1	Region parameters	See Table 2.17-4
2	TOA Fluxes	See Table 2.17-5
3	CERES Cloud Properties	See Table 2.17-10

Table 2.17-4(a) and Table 2.17-4(b). List of the SDSs contained in the Regional Parameters Vgroup.

Table 2.17-4(a). Region Parameters in SYN1deg-Month

SDS Name	Data Type	Units	Range	No. of Elements
Snow/Ice Percent Coverage	32-Bit Float	percent	0.0 .. 100.0	1
Ocean Fraction Coverage	32-Bit Float	percent	0.0 .. 100.0	1
Total Aerosol Visible optical Depth @ 0.55 microns	32-Bit Float	μm	-1.0 .. 5.0	1
Total Aerosol Visible Optical Depth – Fine Mode @ 0.55 microns	32-Bit Float	μm	-1.0 .. 5.0	1
Total Aerosol Visible Optical Depth Percent	32-Bit Float	percent	0.0 .. 100.0	1
Wind Speed	32-Bit Float	m	-100.0 .. 100.0	1
Skin Temperature	32-Bit Float	K	175 .. 375	1
Precipitable Water	32-Bit Float	cm	0.001 .. 10.0	1

Table 2.17-4(b). SDS Index of Region Parameters in SYN1deg-Month

SDS Name	Regional Monthly	Zonal Monthly	Global Monthly
Snow/Ice Percent Coverage	0	38	77
Ocean Fraction Coverage	1	39	78
Total Aerosol Visible optical Depth @ 0.55 microns	2	40	79
Total Aerosol Visible Optical Depth – Fine Mode @ 0.55 microns	3	41	80
Total Aerosol Visible Optical Depth Percent	4	42	81
Wind Speed	5	43	82
Skin Temperature	6	44	83
Precipitable Water	7	45	84

Table 2.17-5. List of the Vgroups contained in the TOA Flux Monthly Vgroup in SYN1deg-Month

Vgroup Number	Vgroup Name	Monthly Averages
1	Clear-sky GEO Method	See Table 2.17-6(a) and (b)
2	Total-sky GEO Method	See Table 2.17-7(a) and (b)
3	Solar Insolation	See Table 2.17-8(a) and (b)

Table 2.17-6(a) and Table 2.17-6(b). List of SDS contains in Clear-sky TOA Flux Averages in SYN1deg-Month

Table 2.17-6(a). Clear-sky TOA Flux Averages in SYN1deg-Month

Parameter Name	Data Type	Units	Range	No. of Elements Monthly
Clear-sky TOA SW Flux - GEO Interpolation	32-Bit Float	W m^{-2}	0 .. 800	1
Clear-sky TOA LW Flux - GEO Interpolation	32-Bit Float	W m^{-2}	0 .. 400	1
Clear-sky TOA WN Flux - GEO Interpolation	32-Bit Float	W m^{-2}	0 .. 400	1
Clear-sky TOA Albedo - GEO Interpolation	32-Bit Float	N/A	0.0 .. 1.0	1
Clear-sky TOA Net Flux - GEO Interpolation	32-Bit Float	W m^{-2}	-300.0 .. 400.0	1

Table 2.17-6(b). SDS Index of Clear-sky TOA Flux Averages in SYN1deg-Month

SDS Name	Regional Monthly	Zonal Monthly	Global Monthly
Clear-sky TOA SW Flux - GEO Interpolation	8	46	85
Clear-sky TOA LW Flux - GEO Interpolation	9	47	86
Clear-sky TOA WN Flux - GEO Interpolation	10	48	87
Clear-sky TOA Albedo - GEO Interpolation	11	49	88
Clear-sky TOA Net Flux - GEO Interpolation	12	50	89

Table 2.17-7(a) and Table 2.17-7(b). List of SDS contains in Total-sky TOA Flux Averages in SYN1deg-Month

Table 2.17-7(a). Total-sky TOA Flux Averages in SYN1deg-Month

Parameter Name	Data Type	Units	Range	No. of Elements Monthly
Total-sky TOA SW Flux - GEO Interpolation	32-Bit Float	W m^{-2}	0 .. 800	1
Total-sky TOA LW Flux - GEO Interpolation	32-Bit Float	W m^{-2}	0 .. 400	1
Total-sky TOA WN Flux - GEO Interpolation	32-Bit Float	W m^{-2}	0 .. 400	1
Total-sky TOA Albedo - GEO Interpolation	32-Bit Float	N/A	0.0 .. 1.0	1
Total-sky TOA Net Flux - GEO Interpolation	32-Bit Float	W m^{-2}	-300.0 .. 400.0	1

Table 2.17-7(b). SDS Index of Total-sky TOA Flux Averages in SYN1deg-Month

SDS Name	Regional Monthly	Zonal Monthly	Global Monthly
Total-sky TOA SW Flux - GEO Interpolation	13	51	90
Total-sky TOA LW Flux - GEO Interpolation	14	52	91
Total-sky TOA WN Flux - GEO Interpolation	15	53	92
Total-sky TOA Albedo - GEO Interpolation	16	54	93
Total-sky TOA Net Flux - GEO Interpolation	17	55	94

Table 2.17-8(a) and Table 2.17-8(b). List of SDS contains in Solar Insolation in SYN1deg-Month

Table 2.17-8(a). Solar Insolation Averages in SYN1deg-Month

Parameter Name	Data Type	Units	Range	No. of Elements Monthly
Solar Insolation	32-Bit Float	W m^{-2}	0 .. 400	1

Table 2.17-8(b). SDS Index of Solar Incoming Flux Averages in SYN1deg-Month

SDS Name	Zonal Monthly	Global Monthly
Solar Insolation	56	95

Table 2.17-9. List of the Vgroups contained in the CERES Day Time and Day and Night Time Cloud Monthly Vgroup in SYN1deg-Month

Vgroup Number	Vgroup Name	Monthly Averages
1	Day Time Clouds	See Table 2.17-10(a) and (b)
2	Day and Night Time Clouds	See Table 2.17-10(a) and (b)

Table 2.17-10(a) and Table 2.17-10(b). List of the SDS contained in the CERES Day Time and Day and Night Time Cloud Monthly Vgroup in SYN1deg-Month

Table 2.17-10(a). CERES Day Time and Day and Night Time Cloud Averages in SYN1deg-Month

SDS Name	Data Type	Units	Range	No. of Elements
Cloud Area Fraction	32-Bit Float	percent	0.0 .. 100.0	1
Cloud Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	1
Cloud Effective Temperature	32-Bit Float	K	180.0 .. 350.0	1
Cloud Effective Height	32-Bit Float	m	-1000 .. 10000	1
Cloud Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	1
Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	1
Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	1
Water Particle Radius	32-Bit Float	micron	0.0 .. 40.0	1
Ice Particle Effective Diam	32-Bit Float	micron	0.0 .. 300.0	1
Cloud Visible Optical Depth	32-Bit Float	N/A	0.0 .. 100.0	1

Table 2.17-10(b). SDS Index of CERES Cloud Averages in SYN1deg-Month

SDS Name	Day time Regional Monthly	Day time Zonal Monthly	Day time Global Monthly	Day & Night Regional Monthly	Day & Night Zonal Monthly	Day & Night Global Monthly
Cloud Area Fraction	18	57	96	28	67	106
Cloud Effective Pressure	19	58	97	29	68	107
Cloud Effective Temperature	20	59	98	30	69	108
Cloud Effective Height	21	60	99	31	70	109
Cloud Particle Phase	22	61	100	32	71	110
Liquid Water Path	23	62	101	33	72	111
Ice Water Path	24	63	102	34	73	112
Water Particle Radius	25	64	103	35	74	113
Ice Particle Effective Diam	26	65	104	36	75	114
Cloud Visible Optical Depth	27	66	105	37	76	115

SYN1deg Month

Total Record/File: **64,981**
Total Bits/Record: **3,712**
Total Bytes/Record: **464**
Total Bits/File: **241,209,472**
Total Bytes/File: **30,151,184**

SYN1deg-Month-lite 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.

SYN1deg-Month-lite Revision Record

SCCR Approval Date	Release/ Version Number	SCCR Number	Description of Revision	Section(s) Affected
07/26/11	R5V1	860	• New document.	All