SYN1deg-Day-lite

The SYN1deg-Day-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 daily 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. Daily 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-Daily contains daily 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 Daily File
Portion of Atmosphere Covered: TOA

Time Interval Covered: **Portion of Globe Covered:**
    File: All Months and Climatology   **File:** Zonal, Global, Regional
    Record: 1 Month   **Record:** 1-Deg Regions

Product Version:
    Terra: Edition2.6
    Aqua : Edition2.6

SYN1deg Metadata

The types of SYN1deg metadata are summarized in Table 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 1.   SYN1deg-Day 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-Day, which are shown in Table 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.   Daily Gridded Categories SYN1deg-Day

Number	Name	Description	Number of Records
1	1.0 Degree Regional	See Table 3	64800 x Days in Month
2	1.0 Degree Zonal	See Table 3	180 x Days in Month
4	Global	See Table 3	Days in Month

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

Number	Name	Description
1	Region parameters	See Table 4(a) & Table 4(b)
2	TOA Fluxes	See Table 5
3	CERES Cloud Properties	See Table 10

Table 4(a) and Table 4(b) List of the SDSs contained in the Regional Parameters Vgroup of SYN1deg-Day.

Table 4(a).   Region Parameters in SYN1deg-Day

SDS Name	Data Type	Units	Range	No. of Elements
Snow/Ice Percent Coverage	32-Bit Float	percent	0.0 .. 100.0	28 .. 31
Ocean Fraction Coverage	32-Bit Float	percent	0.0 .. 100.0	28 .. 31
Total Aerosol Visible optical Depth @ 0.55 microns	32-Bit Float	µm	-1.0 .. 5.0	28 .. 31
Total Aerosol Visible Optical Depth – Fine Mode @ 0.55 microns	32-Bit Float	µm	-1.0 .. 5.0	28 .. 31
Total Aerosol Visible Optical Depth Percent	32-Bit Float	percent	0.0 .. 100.0	28 .. 31
Wind Speed	32-Bit Float	m	-100.0 .. 100.0	28 .. 31
Skin Temperature	32-Bit Float	K	175 .. 375	28 .. 31
Precipitable Water	32-Bit Float	cm	0.001 .. 10.0	28 .. 31

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

SDS Name	Regional Monthly	Zonal Monthly	Global Monthly
Snow/Ice Percent Coverage	0	42	85
Ocean Fraction Coverage	1	43	86
Total Aerosol Visible optical Depth @ 0.55 microns	2	44	87
Total Aerosol Visible Optical Depth – Fine Mode @ 0.55 microns	3	45	88
Total Aerosol Visible Optical Depth Percent	4	46	89
Wind Speed	5	47	90
Skin Temperature	6	48	91
Precipitable Water	7	49	92

Table 5.   List of the Vgroups contained in the TOA Fluxes Vgroup in SYN1deg-Day

Vgroup Number	Vgroup Name	Daily Averages
1	Clear-Sky GEO Method	See Table 6(a) & Table 6(b)
2	Total-Sky GEO Method	See Table 7(a) & Table 7(b)
3	Number of Observations	See Table 8(a) & Table 8(b)
4	Incoming Solar Flux	See Table 9(a) & Table 9(b)

Table 6(a) and Table 6(b). List of the SDSs contained in the Clear-Sky TOA Flux Average Vgroup.

Table 6(a).   Clear-sky TOA Flux Average in SYN1deg-Day

SDS Name	Data Type	Units	Range	No. of Elements Monthly
Clear-sky TOA SW Flux - GEO Interpolation	32-Bit Float	Wm^{-2}	0.0 .. 800.0	28 .. 31
Clear-sky TOA LW Flux - GEO Interpolation	32-Bit Float	Wm^{-2}	0.0 .. 400.0	28 .. 31
Clear-sky TOA WN Flux - GEO Interpolation	32-Bit Float	Wm^{-2}	0.0 .. 400.0	28 .. 31
Clear-sky TOA Albedo - GEO Interpolation	32-Bit Float	N/A	0.0 .. 1.0	28 .. 31
Clear-sky TOA Net Flux - GEO Interpolation	32-Bit Float	Wm^{-2}	-300.0 .. 400.0	28 .. 31

Table 6(b).   SDS Index of Clear-Sky TOA Flux Data Average in SYN1deg-Day

Parameter Name	Regional Daily	Zonal Daily	Global Daily
Clear-sky TOA SW Flux - GEO Interpolation	8	50	93
Clear-sky TOA LW Flux - GEO Interpolation	9	51	94
Clear-sky TOA WN Flux - GEO Interpolation	10	52	95
Clear-sky TOA Albedo - GEO Interpolation	11	53	96
Clear-sky TOA Net Flux - GEO Interpolation	12	54	97

Table 7(a) and Table 7(b). List of the SDSs contained in the Total-Sky TOA Flux Average Vgroup.

Table 7(a).   Total-sky TOA Flux Average in SYN1deg-Day

SDS Name	Data Type	Units	Range	No. of Elements Monthly
Total-sky TOA SW Flux - GEO Interpolation	32-Bit Float	Wm^{-2}	0.0 .. 800.0	28 .. 31
Total-sky TOA LW Flux - GEO Interpolation	32-Bit Float	Wm^{-2}	0 .. 400	28 .. 31
Total-sky TOA WN Flux - GEO Interpolation	32-Bit Float	Wm^{-2}	0 .. 400	28 .. 31
Total-sky TOA Albedo - GEO Interpolation	32-Bit Float	N/A	0 .. 1	28 .. 31
Total-sky TOA Net Flux - GEO Interpolation	32-Bit Float	Wm^{-2}	-300 .. 400	28 .. 31

Table 7(b).   SDS Index of Total-Sky TOA Flux Data Average in SYN1deg-Day

Parameter Name	Regional Daily	Zonal Daily	Global Daily
Total-sky TOA SW Flux - GEO Interpolation	13	55	98
Total-sky TOA LW Flux - GEO Interpolation	14	56	99
Total-sky TOA WN Flux - GEO Interpolation	15	57	100
Total-sky TOA Albedo - GEO Interpolation	16	58	101
Total-sky TOA Net Flux - GEO Interpolation	17	59	102

Table 8(a) and Table 8(b). List of the SDSs contained in the Number of Observations Vgroup.

Table 8(a). Number of Observations in SYN1deg-Day

SDS Name	Data Type	Units	Range	No. of Elements Monthly
Clear-sky TOA SW Number of Obs. – GEO Daily	32-Bit Float	N/A	0 .. 24	28 .. 31
Clear-sky TOA LW Number of Obs. – GEO Daily	32-Bit Float	N/A	0 .. 24	28 .. 31
Total-sky TOA SW Number of Obs. – GEO Daily	32-Bit Float	N/A	0 .. 24	28 .. 31
Total-sky TOA LW Number of Obs. – GEO Daily	32-Bit Float	N/A	0 .. 24	28 .. 31

Table 8(b).   SDS Index of Number of Observations in SYN1deg-Day

Parameter Name	Regional Daily	Zonal Daily	Global Daily
Clear-sky TOA SW Number of Obs. – GEO Daily	18	60	103
Clear-sky TOA LW Number of Obs. – GEO Daily	19	61	104
Total-sky TOA SW Number of Obs. – GEO Daily	20	62	105
Total-sky TOA LW Number of Obs. – GEO Daily	21	63	106

Table 9(a) and Table 9(b). List of the SDSs contained in the Incoming Solar Vgroup.

Table 9(a).   Incoming Solar in SYN1deg-Day

SDS Name	Data Type	Units	Range	No. of Elements Monthly
Incoming Solar Flux	32-Bit Float	Wm^{-2}	0 .. 400	28 .. 31

Table 9(b).   SDS Index of Incoming Solar in SYN1deg-Day

Parameter Name	Zonal Daily	Global Daily
Incoming Solar Flux	64	107

Table 10.   List of the Vgroups contained in the CERES Day Time and Day and Night Time
Cloud Daily Vgroup in SYN1deg-Day

Vgroup Number	Vgroup Name	Monthly Averages
1	Day Time Clouds	See Table 11(a) & Table 11(b)
2	Day and Night Time Clouds	See Table 11(a) & Table 11(b)

Table 11(a) and Table 11(b). CERES Day Time and Day and Night Time Cloud Properties in
SYN1deg-Day.

Table 11(a).   Day Time and Day and Night Time CERES Cloud Averages in SYN1deg-Day

SDS Name	Data Type	Units	Range	No. of Elements
Cloud Area Fraction	32-Bit Float	percent	0.0 .. 100.0	28 .. 31
Cloud Effective Pressure	32-Bit Float	hPa	0.0 .. 1100.0	28 .. 31
Cloud Effective Temperature	32-Bit Float	K	180.0 .. 350.0	28 .. 31
Cloud Effective Height	32-Bit Float	m	-1000 .. 10000	28 .. 31
Cloud Particle Phase	32-Bit Float	fraction	1.0 .. 2.0	28 .. 31
Liquid Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	28 .. 31
Ice Water Path	32-Bit Float	gm^{-2}	0.0 .. 10000.0	28 .. 31
Water Particle Radius	32-Bit Float	micron	0.0 .. 40.0	28 .. 31
Ice Particle Effective Diam	32-Bit Float	micron	0.0 .. 300.0	28 .. 31
Cloud Visible Optical Depth	32-Bit Float	N/A	0.0 .. 100.0	28 .. 31

Table 11(b). SDS Index of day Time and Day and Night Time CERES Cloud Averages in SYN1deg-Day

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	22	65	108	32	75	118
Cloud Effective Pressure	23	66	109	33	76	119
Cloud Effective Temperature	24	67	110	34	77	120
Cloud Effective Height	25	68	111	35	78	121
Cloud Particle Phase	26	69	112	36	79	122
Liquid Water Path	27	70	113	37	80	123
Ice Water Path	28	71	114	38	81	124
Water Particle Radius	29	72	115	39	82	125
Ice Particle Effective Diam	30	73	116	40	83	126
Cloud Visible Optical Depth	31	74	117	41	84	127

SYN1deg Day

Total Record/File:	**64,981**
Total Bits/Record:	**4098**
Total Bytes/Record:	**512**
Total Bits/File:	**266,162,176**
Total Bytes/File:	**33,270,272**

SYN1deg-Day-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-Day-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
			• The ASDC footer was added to the bottom of the document. (06/05/2013)	All
			• Eliminated section numbers from the Data Products Catalog. Specifically, in this document, section number 2.17 was removed. (12/12/2013)	All
			• Updated some links to refer to the .pdf file instead of the .doc file. (06/20/2014)	All