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 SYN_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

Vgroup Number	Vgroup Name	Daily 3-Hourly Averages
1	Time and Position	See Table 2.10-5
2	Observed TOA Fluxes	See Table 2.10-6
3	Cloud Layer - High	See Table 2.10-7(a) & (b)
4	Cloud Layer - UpperMid	See Table 2.10-7(a) & (b)
5	Cloud Layer - LowerMid	See Table 2.10-7(a) & (b)
6	Cloud Layer - Low	See Table 2.10-7(a) & (b)
7	Stowe-Ignatov Aerosol Optical Depth	See Table 2.10-8
8	MODIS Aerosol Optical Depth	See Table 2.10-9
9	Tuned Pristine Fluxes	See Table 2.10-10
10	Tuned ClearSky Flux Profiles	See Table 2.10-11
11	Tuned TotalSky-NoAerosol Fluxes	See Table 2.10-12
12	Tuned TotalSky Flux Profiles	See Table 2.10-13
13	Untuned Pristine Fluxes	See Table 2.10-14
14	Untuned ClearSky Fluxes	See Table 2.10-15
15	Untuned TotalSky-NoAerosol Fluxes	See Table 2.10-16

Table 2.10-3. List of the Vgroups contained in the Monthly Hourly Averages and Monthly Averages Vgroups in AVG

Vgroup Number	Vgroup Name	Daily 3-Hourly Averages
16	Untuned TotalSky Fluxes	See Table 2.10-17
17	Satellite Emulated WN TOA Fluxes	See Table 2.10-18
18	TOA Flux Error	See Table 2.10-19
19	Number of Hourboxes	See Table 2.10-20
20	Constrainment Adjustments	See Table 2.10-21
21	Surface SW Direct/Diffuse Fluxes	See Table 2.10-22
22	UVA - UVB Fluxes	See Table 2.10-23
23	PAR Fluxes	See Table 2.10-24
24	Pristine-Sky SW MultiStream Correction	See Table 2.10-25

SYN Science Data

The Scientific Data Sets (SDS) are divided into tables which map to Vgroups of the same name. All of the SYN science data are organized into the HDF-EOS Grid data type, which is shown in Table 2.10-5 below. All parameter tables contain a list of the gridded parameters, which includes the SDS index, field number, the field name, the data type, the units, the range, and the number of elements within each field. The 3 dimensions are based on the 1° CERES regional data of 8 3-hourly means of hourly computations for the given daily file. The first 2 dimensions Nlat and Nlon corresponds to the CERES region index, the next dimension is Ngmt and refers to the time index. On a few parameters, the last dimension is Nlev and defines the atmospheric profile levels. Only the means are given, unlike the AVG and ZAVG files. This ordering is used by the C programming language and most HDF viewers, such as IDL. 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.

Table 2.10-4(a). Nlat, Nlon dimensions that define the CERES equal angle 1° latitude by longitude grid

Dimension	No of indices	Definition
Nlat	180	Index #1 is defined at 89.5°N and #180 is at 89.5°S
Nlon	360	Index #1 is defined at 179.5°W and #360 is at 179.5°E

Table 2.10-4(b). Ngmt dimension that defines the 8 3-hourly GMT time increments. For the Monthly Ngmt only has one index

Ngmt index	3-hourly daily 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

Table 2.10-4(c). Nlev dimension that define the atmospheric profile levels

Nlev	Atmospheric level
1	TOA (30 km)
2	70mb
3	200mb
4	500mb
5	Surface

Table 2.10-4(d). IGBP Surface types used in Table 2.10-5. For a geographical distribution of the scene types, see http://snowdog.larc.nasa.gov/surf/pages/sce_type.html

Nsfc	Surface Type
1	Evergreen Needle Forest
2	Evergreen Broadleaf Forest
3	Deciduous Needle Forest
4	Deciduous Broadleaf Forest
5	Mixed Forest
6	Closed Shrubs
7	Open Shrubs
8	Woody Savannas
9	Savannas
10	Grassland
11	Wetlands
12	Crops
13	Urban

Table 2.10-4(d). IGBP Surface types used in Table 2.10-5. For a geographical distribution of the scene types, see http://snowdog.larc.nasa.gov/surf/pages/sce_type.html

Nsfc	Surface Type
14	Crop/Mosaic
15	Permanent Snow/Ice
16	Barren Desert
17	Water
18	Tundra
19	Land Snow
20	Sea Ice

Table 2.10-5. Table of Time and Position. Nsfc dimension is defined in Table 2.10-4(d)

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-0	Region number	32-bit real	N/A	1 .. 64800	Nlon*Nlat
SYN-1	Colatitude	32-bit real	Degree	0 .. 180	Nlon*Nlat
SYN-2	Longitude	32-bit real	Degree	0 .. 360	Nlon*Nlat
SYN-3	Surface altitude above sea level	32-bit real	m	-1000 .. 10000	Nlon*Nlat *Ngmt
SYN-4	Surface type percent coverage	32-bit real	Percent	0 .. 100	Nlon*Nlat Ngmt*Nsfc

Table 2.10-6. Observed TOA Fluxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-5	SW TOA Total-Sky	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-6	LW TOA Total-Sky	32-bit real	W m^{-2}	0 .. 500	Nlon*Nlat*Ngmt
SYN-7	WN TOA Total-Sky	32-bit real	W m^{-2} μm^{-1}	2 .. 50	Nlon*Nlat*Ngmt
SYN-8	SW TOA Clear-Sky	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-9	LW TOA Clear-Sky	32-bit real	W m^{-2}	0 .. 500	Nlon*Nlat*Ngmt
SYN-10	WN TOA Clear-Sky	32-bit real	W m^{-2} μm^{-1}	2 .. 50	Nlon*Nlat*Ngmt

Table 2.10-7(a). Cloud Properties for Four Cloud Layers

SDS Name	DataType	Units	Range	No of Elements
Area Fraction Percentage	32-bit real	Percent	0 .. 100	Nlon*Nlat*Ngmt
Vis. Opt. Depth (linear)	32-bit real	N/A	0 .. 400	Nlon*Nlat*Ngmt
Vis. Opt. Depth (log)	32-bit real	N/A	-6 .. 6	Nlon*Nlat*Ngmt
Infrared Emissivity	32-bit real	N/A	0 .. 1	Nlon*Nlat*Ngmt
Liquid Water Path	32-bit real	g m^{-2}	0 .. 10000	Nlon*Nlat*Ngmt

Table 2.10-7(a). Cloud Properties for Four Cloud Layers

SDS Name	DataType	Units	Range	No of Elements
Ice Water Path	32-bit real	g m^{-2}	0 .. 10000	Nlon*Nlat*Ngmt
Top Pressure	32-bit real	hPa	0 .. 1100	Nlon*Nlat*Ngmt
Effective Pressure	32-bit real	hPa	0 .. 1100	Nlon*Nlat*Ngmt
Effective Temperature	32-bit real	K	100 .. 350	Nlon*Nlat*Ngmt
Effective Height	32-bit real	km	0 .. 20	Nlon*Nlat*Ngmt
Bottom Pressure	32-bit real	hPa	0 .. 1100	Nlon*Nlat*Ngmt
Liquid Particle Radius	32-bit real	μm	0 .. 40	Nlon*Nlat*Ngmt
Ice Particle Diameter	32-bit real	μm	0 .. 300	Nlon*Nlat*Ngmt
Particle Phase	32-bit real	N/A	1 .. 2	Nlon*Nlat*Ngmt
Vertical Aspect Ratio	32-bit real	N/A	0 .. 20	Nlon*Nlat*Ngmt

Table 2.10-7(b). SDS Index of High, Uppermid, Lowermid, and Low Cloud Properties

SDS Name	Regional Daily 3- Hourly			
Area Fraction Percentage	11	26	41	56
Vis. Opt. Depth (linear)	12	27	42	57
Vis. Opt. Depth (log)	13	28	43	58
Infrared Emissivity	14	29	44	59
Liquid Water Path	15	30	45	60
Ice Water Path	16	31	46	61
Top Pressure	17	32	47	62
Effective Pressure	18	33	48	63
Effective Temperature	19	34	49	64
Effective Height	20	35	50	65
Bottom Pressure	21	36	51	66
Liquid Particle Radius	22	37	52	67
Ice Particle Diameter	23	38	53	68
Particle Phase	24	39	54	69
Vertical Aspect Ratio	25	40	55	70

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

Table 2.10-8. Stowe-Ignatov Aerosol Optical Depth

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-71	Aerosol visible optical depth - 0.63 μm	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-72	Aerosol visible optical depth - 1.6 μm	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt

Table 2.10-9. MODIS Aerosol Optical Depth

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-73	Initial Aerosol Optical Depth	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-74	Aerosol Opt. Depth at 0.47 μm in Land	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-75	Aerosol Opt. Depth at 0.55 μm in Land	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-76	Aerosol Opt. Depth at 0.66 μm in Land	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-77	Aerosol Opt. Depth at 0.47 μm in Ocean	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-78	Aerosol Opt. Depth at 0.55 μm in Ocean	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-79	Aerosol Opt. Depth at 0.66 μm in Ocean	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-80	Aerosol Opt. Depth at 0.87 μm in Ocean	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-81	Aerosol Opt. Depth at 1.24 μm in Ocean	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-82	Aerosol Opt. Depth at 1.64 μm in Ocean	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-83	Aerosol Opt. Depth at 2.13 μm in Ocean	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt

Table 2.10-10. Tuned Pristine Fluxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-84	Tuned Pristine SW Surface Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-85	Tuned Pristine SW Surface Down	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-86	Tuned Pristine SW TOA Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-87	Tuned Pristine LW Surface Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt
SYN-88	Tuned Pristine LW Surface Down	32-bit real	W m^{-2}	0 .. 700	Nlon*Nlat*Ngmt
SYN-89	Tuned Pristine LW TOA Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt
SYN-90	Tuned Pristine WN Surface Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt
SYN-91	Tuned Pristine WN Surface Down	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt
SYN-92	Tuned Pristine WN TOA Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt

Table 2.10-11. Tuned ClearSky Flux Profiles, Table 2.10-4(c) defines Nlev

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-93	Tuned Clear-Sky SW Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt*Nlev
SYN-94	Tuned Clear-Sky SW Down	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt*Nlev
SYN-95	Tuned Clear-Sky LW Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt*Nlev
SYN-96	Tuned Clear-Sky LW Down	32-bit real	W m^{-2}	0 .. 700	Nlon*Nlat*Ngmt*Nlev
SYN-97	Tuned Clear-Sky WN Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt*Nlev
SYN-98	Tuned Clear-Sky WN Down	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt*Nlev

Table 2.10-12. Tuned TotalSky-NoAerosol Fluxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-99	Tuned Total-Sky-NoAerosol SW Surface Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-100	Tuned Total-Sky-NoAerosol SW Surface Down	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-101	Tuned Total-Sky-NoAerosol SW TOA Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-102	Tuned Total-Sky-NoAerosol LW Surface Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt
SYN-103	Tuned Total-Sky-NoAerosol LW Surface Down	32-bit real	W m^{-2}	0 .. 700	Nlon*Nlat*Ngmt
SYN-104	Tuned Total-Sky-NoAerosol LW TOA Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt
SYN-105	Tuned Total-Sky-NoAerosol WN Surface Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt
SYN-106	Tuned Total-Sky-NoAerosol WN Surface Down	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt
SYN-107	Tuned Total-Sky-NoAerosol WN TOA Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt

Table 2.10-13. Tuned TotalSky Flux Profiles, Table 2.10-4(c) defines Nlev

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-108	Tuned Total-Sky SW Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt*Nlev
SYN-109	Tuned Total-Sky SW Down	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt*Nlev
SYN-110	Tuned Total-Sky LW Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt*Nlev
SYN-111	Tuned Total-Sky LW Down	32-bit real	W m^{-2}	0 .. 700	Nlon*Nlat*Ngmt*Nlev
SYN-112	Tuned Total-Sky WN Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt*Nlev
SYN-113	Tuned Total-Sky WN Down	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt*Nlev

Table 2.10-14. Untuned Pristine Fluxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-114	Untuned Pristine SW Surface Up	32-bit real	W m^{-2}	0 .. 1500	Nlon*Nlat*Ngmt
SYN-115	Untuned Pristine SW Surface Down	32-bit real	W m^{-2}	0 .. 1500	Nlon*Nlat*Ngmt
SYN-116	Untuned Pristine SW TOA Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-117	Untuned Pristine LW Surface Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt
SYN-118	Untuned Pristine LW Surface Down	32-bit real	W m^{-2}	0 .. 700	Nlon*Nlat*Ngmt
SYN-119	Untuned Pristine LW TOA Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt
SYN-120	Untuned Pristine WN Surface Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt
SYN-121	Untuned Pristine WN Surface Down	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt
SYN-122	Untuned Pristine WN TOA Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt

Table 2.10-15. Untuned ClearSky Fluxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-123	Untuned Clear-Sky SW Surface Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-124	Untuned Clear-Sky SW Surface Down	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-125	Untuned Clear-Sky SW TOA Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-126	Untuned Clear-Sky LW Surface Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt
SYN-127	Untuned Clear-Sky LW Surface Down	32-bit real	W m^{-2}	0 .. 700	Nlon*Nlat*Ngmt
SYN-128	Untuned Clear-Sky LW TOA Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt
SYN-129	Untuned Clear-Sky WN Surface Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt
SYN-130	Untuned Clear-Sky WN Surface Down	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt
SYN-131	Untuned Clear-Sky WN TOA Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt

Table 2.10-16. Untuned TotalSky-NoAerosol Fluxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-132	Untuned Total-Sky SW Surface Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-133	Untuned Total-Sky SW Surface Down	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-134	Untuned Total-Sky SW TOA Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-135	Untuned Total-Sky LW Surface Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt
SYN-136	Untuned Total-Sky LW Surface Down	32-bit real	W m^{-2}	0 .. 700	Nlon*Nlat*Ngmt
SYN-137	Untuned Total-Sky LW TOA Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt
SYN-138	Untuned Total-Sky WN Surface Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt
SYN-139	Untuned Total-Sky WN Surface Down	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt
SYN-140	Untuned Total-Sky WN TOA Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt

Table 2.10-17. Untuned TotalSky Fluxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-141	Untuned Total-Sky SW Surface Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-142	Untuned Total-Sky SW Surface Down	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-143	Untuned Total-Sky SW TOA Up	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-144	Untuned Total-Sky LW Surface Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt
SYN-145	Untuned Total-Sky LW Surface Down	32-bit real	W m^{-2}	0 .. 700	Nlon*Nlat*Ngmt
SYN-146	Untuned Total-Sky LW TOA Up	32-bit real	W m^{-2}	0 .. 850	Nlon*Nlat*Ngmt
SYN-147	Untuned Total-Sky WN Surface Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt
SYN-148	Untuned Total-Sky WN Surface Down	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt
SYN-149	Untuned Total-Sky WN TOA Up	32-bit real	W m^{-2}	0 .. 370	Nlon*Nlat*Ngmt

Table 2.10-18. Satellite Emulated WN TOA Fluxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-150	Untuned Satellite Emulated WN TOA	32-bit real	W m^{-2}	50 .. 400	Nlon*Nlat*Ngmt
SYN-151	Tuned Satellite Emulated WN TOA	32-bit real	W m^{-2}	50 .. 400	Nlon*Nlat*Ngmt

Table 2.10-19. TOA Flux Error

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-152	Tuned Minus Observed SW TOA	32-bit real	W m^{-2}	-1400 .. 1400	Nlon*Nlat*Ngmt
SYN-153	Untuned Minus Observed SW TOA	32-bit real	W m^{-2}	-1400 .. 1400	Nlon*Nlat*Ngmt
SYN-154	Tuned Minus Observed LW TOA	32-bit real	W m^{-2}	-600 .. 600	Nlon*Nlat*Ngmt
SYN-155	Untuned Minus Observed LW TOA	32-bit real	W m^{-2}	-600 .. 600	Nlon*Nlat*Ngmt

Table 2.10-20. Number of Hourboxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-156	Number of Observed SW	32-bit real	N/A	1 .. 744	Nlon*Nlat*Ngmt
SYN-157	Number of Untuned SW	32-bit real	N/A	1 .. 744	Nlon*Nlat*Ngmt
SYN-158	Number of Tuned SW	32-bit real	N/A	1 .. 744	Nlon*Nlat*Ngmt
SYN-159	Number of Observed LW	32-bit real	N/A	1 .. 744	Nlon*Nlat*Ngmt
SYN-160	Number of Untuned LW	32-bit real	N/A	1 .. 744	Nlon*Nlat*Ngmt
SYN-161	Number of Tuned LW	32-bit real	N/A	1 .. 744	Nlon*Nlat*Ngmt

Table 2.10-21. Constrainment Adjustments, Table 2.10-4(c) defines Nlev

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-162	Total column precipitable water - initial	32-bit real	cm	0 .. 10	Nlon*Nlat*Ngmt
SYN-163	Total column precipitable water - adjusted	32-bit real	cm	-10 .. 10	Nlon*Nlat*Ngmt
SYN-164	Upper tropospheric precipitable water - initial	32-bit real	cm	0 .. 10	Nlon*Nlat*Ngmt
SYN-165	Upper tropospheric precipitable water - adjusted	32-bit real	cm	0 .. 10	Nlon*Nlat*Ngmt
SYN-166	Upper tropospheric humidity - initial	32-bit real	N/A	0.0 .. 100.0	Nlon*Nlat*Ngmt
SYN-167	Upper tropospheric humidity - adjusted	32-bit real	N/A	0.0 .. 100.0	Nlon*Nlat*Ngmt
SYN-168	Corrected initial broadband surface albedo	32-bit real	N/A	0.0 .. 1.0	Nlon*Nlat*Ngmt
SYN-169	Surface albedo - adjusted	32-bit real	N/A	0 .. 1	Nlon*Nlat*Ngmt
SYN-170	Aerosol optical depth - initial	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-171	Aerosol optical depth - adjusted	32-bit real	N/A	0 .. 5	Nlon*Nlat*Ngmt
SYN-172	Skin temperature - initial	32-bit real	K	175 .. 375	Nlon*Nlat*Ngmt
SYN-173	Skin temperature - adjusted	32-bit real	K	175 .. 375	Nlon*Nlat*Ngmt
SYN-174	Surface pressure	32-bit real	hPa	0 .. 800	Nlon*Nlat*Ngmt
SYN-175	Column ozone - initial	32-bit real	du	0 .. 800	Nlon*Nlat*Ngmt
SYN-176	Column ozone - Flag source	32-bit integer	N/A	0 .. 3	Nlon*Nlat*Ngmt
SYN-177	Mean visible optical depth- adjusted	32-bit real	N/A	0 .. 400	Nlon*Nlat*Ngmt*Nlev
SYN-178	Mean cloud fractional area - adjusted	32-bit real	%	0 .. 1	Nlon*Nlat*Ngmt*Nlev
SYN-179	Mean cloud effective temperature - adjusted	32-bit real	K	175 .. 375	Nlon*Nlat*Ngmt*Nlev

Table 2.10-22. Surface SW Direct/Diffuse Fluxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-180	Total-Sky SW flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-181	Clear-sky SW flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-182	Pristine-Sky SW flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-183	Actinic-Sky SW flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-184	Total-Sky SW flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-185	Clear-sky SW flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-186	Pristine-Sky SW flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-187	Actinic-Sky SW flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt

Table 2.10-23. UVA – UVB Fluxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-188	TOA Downwelling UVB Flux	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-189	TOA Downwelling UVA Flux	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-190	Pristine UVB Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-191	Pristine UVB Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-192	Pristine UVA Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-193	Pristine UVA Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-194	Clear-Sky UVB Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-195	Clear-Sky UVB Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-196	Clear-Sky UVA Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-197	Clear-Sky UVA Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-198	Total-Sky-NoAerosol UVB Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-199	Total-Sky-NoAerosol UVB Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-200	Total-Sky-NoAerosol UVA Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-201	Total-Sky-NoAerosol UVA Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-202	Total-Sky UVB Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-203	Total-Sky UVB Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-204	Total-Sky UVA Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-205	Total-Sky UVA Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-206	Total-Sky Surface UV Index	32-bit real	N/A	0 .. 30	Nlon*Nlat*Ngmt
SYN-207	Clear-Sky Surface UV Index	32-bit real	N/A	0 .. 30	Nlon*Nlat*Ngmt
SYN-208	Pristine Surface UV Index	32-bit real	N/A	0 .. 30	Nlon*Nlat*Ngmt
SYN-209	Total-Sky-NoAerosol Surface UV Index	32-bit real	N/A	0 .. 30	Nlon*Nlat*Ngmt
SYN-210	Total-Sky UVB Surface Up	32-bit real	W m^{-2}	0 .. 5	Nlon*Nlat*Ngmt
SYN-211	Snow Grain Size	32-bit real	μm	50 .. 2000	Nlon*Nlat*Ngmt
SYN-212	Match Total Aerosol Optical Depth at 0.55 μm	32-bit real	N/A	0 .. 10	Nlon*Nlat*Ngmt

Table 2.10-24. PAR Fluxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-213	TOA Downwelling PAR Flux	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-214	Total-Sky PAR Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-215	Total-Sky PAR Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-216	Total-Sky PAR PURV Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-217	Total-Sky PAR PURV Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-218	Total-Sky PAR ChlorA Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-219	Total-Sky PAR ChlorA Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt

Table 2.10-24. PAR Fluxes

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-220	Clear-Sky PAR Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-221	Clear-Sky PAR Surface Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-222	Pristine PAR Surface flux - Direct	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt
SYN-223	Pristine PAR Surface flux - Diffuse	32-bit real	W m^{-2}	0 .. 1400	Nlon*Nlat*Ngmt

Table 2.10-25. Pristine-Sky SW MultiStream Correction

SDS Index	SDS Name	DataType	Units	Range	No of Elements
SYN-224	SW TOA Flux - Up - Pristine-Sky - Corrected	32-bit real	W m^{-2}	0 .. 1000	Nlon*Nlat*Ngmt
SYN-225	SW Surface Flux - Down- Pristine-Sky - Corrected	32-bit real	W m^{-2}	0 .. 1000	Nlon*Nlat*Ngmt

Table 2.10-26. 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	• Updated format to comply with standards.	All
11/15/06	R3V2	639	• 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
02/08/08	R3V3	667	• Updated to add three parameters and changed the SDS Index tables. (08/20/2008) • 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	• 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) • Reorganized tables for clarity. (02/07/2009)	Sec. 2.10 Sec. 2.10 Sec. 2.10 Sec. 2.10 All