

3.5 Synoptic Radiative Fluxes and Clouds Intermediate (SYNI)

The Synoptic Radiative Fluxes and Clouds Intermediate (SYNI) product contains a month of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) data for a single broadband scanner instrument; it also incorporates 3-hourly narrowband data from several geostationary satellites. Flux data from the TSIB product, along with MOA data, are used to calculate radiate flux profiles, cloud conditions, and aerosol optical depths using the same models as the Instantaneous SARB subsystem. There are data for every hour of the month for each 1-degree region. These data are organized into 180 zonal files, each of which contains nested regions depending on the colatitude.

The SYNI 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 SYNI 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 SYNI. 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

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The SYNI contains the direct and diffuse shortwave surface fluxes for total-sky, clear-sky, pristine and actinic conditions. The SYNI 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: 1/Month

Portion of Atmosphere Covered: Surface, Internal and TOA

Time Interval Covered:

File: Monthly

Record: Hourly

Portion of Globe Covered:

File: 1 colatitude zone

Record: 1 degree equal angle region

Product Version:

TRMM: N/A

Terra: Beta3, Edition2C, Edition3A

Aqua: Beta4, Edition2B, Edition3A

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SYNI Data Fields

The SYNI contains 162 data fields which are parameter collections of one-degree regional data where multiple dimensions refer to pressure levels, cloud conditions, or bandwidths. Product sizing information is given in [Table 3.5-1](#).

Table 3.5-1. Product Sizing Information

Name	Units	Range	Dim	Data Type
Photosynthetically active radiation over surface	W m ⁻²	0 .. 780	1	32 bit-real
Direct/diffuse surface ratio	N/A	0 .. 30	1	32 bit-real
Corrected initial broadband surface albedo	N/A	0 .. 1	1	32 bit-real
Number of atmospheric levels	N/A	0 .. 5	1	32 bit integer
Pressure levels	hPa	0 .. 1100	5	32 bit-real
SW flux - upward – pristine	W m ⁻²	0 .. 1400	2	32 bit-real
SW flux - downward – pristine	W m ⁻²	0 .. 1400	2	32 bit-real
LW flux - upward – pristine	W m ⁻²	0 .. 850	2	32 bit-real
LW flux - downward – pristine	W m ⁻²	0 .. 700	2	32 bit-real
WN flux - upward – pristine	W m ⁻²	0 .. 370	2	32 bit-real
WN flux - downward – pristine	W m ⁻²	0 .. 370	2	32 bit-real
SW flux - upward for clear-sky	W m ⁻²	0 .. 1400	5	32 bit-real
SW flux - downward for clear-sky	W m ⁻²	0 .. 1400	5	32 bit-real
LW flux - upward for clear-sky	W m ⁻²	0 .. 850	5	32 bit-real
LW flux - downward for clear-sky	W m ⁻²	0 .. 700	5	32 bit-real
WN flux - upward for clear-sky	W m ⁻²	0 .. 370	5	32 bit-real
WN flux - downward for clear-sky	W m ⁻²	0 .. 370	5	32 bit-real
SW flux - upward for total-sky	W m ⁻²	0 .. 1400	5	32 bit-real
SW flux - downward for total-sky	W m ⁻²	0 .. 1400	5	32 bit-real
LW flux - upward for total-sky	W m ⁻²	0 .. 850	5	32 bit-real
LW flux - downward for total-sky	W m ⁻²	0 .. 700	5	32 bit-real
WN flux - upward for total-sky	W m ⁻²	0 .. 370	5	32 bit-real
WN flux - downward for total-sky	W m ⁻²	0 .. 370	5	32 bit-real
SW flux adjustment at surface - upward - pristine	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at TOA - upward – pristine	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at surface - downward - pristine	W m ⁻²	-1400 .. 1400	1	32 bit-real
LW flux adjustment at surface - upward - pristine	W m ⁻²	-600 .. 600	1	32 bit-real
LW flux adjustment at surface - downward - pristine	W m ⁻²	-700 .. 700	1	32 bit-real
LW flux adjustment at TOA - upward – pristine	W m ⁻²	-700 .. 700	1	32 bit-real
WN flux adjustment at surface - upward - pristine	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at surface - downward - pristine	W m ⁻²	-50 .. 50	1	32 bit-real

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Table 3.5-1. Product Sizing Information

Name	Units	Range	Dim	Data Type
WN flux adjustment at TOA - upward – pristine	W m ⁻²	-50 .. 50	1	32 bit-real
SW flux adjustment at surface - upward for clear-sky	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at TOA - upward for clear-sky	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at surface - downward for clear-sky	W m ⁻²	-1400 .. 1400	1	32 bit-real
LW flux adjustment at surface - upward for clear-sky	W m ⁻²	-600 .. 600	1	32 bit-real
LW flux adjustment at surface - downward for clear-sky	W m ⁻²	-700 .. 700	1	32 bit-real
LW flux adjustment at TOA - upward for clear-sky	W m ⁻²	-700 .. 700	1	32 bit-real
WN flux adjustment at surface - upward for clear-sky	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at surface - downward for clear-sky	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at TOA - upward for clear-sky	W m ⁻²	-50 .. 50	1	32 bit-real
SW flux adjustment at surface - upward for total-sky	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at TOA - upward for total-sky	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at surface - downward for total-sky	W m ⁻²	-1400 .. 1400	1	32 bit-real
LW flux adjustment at surface - upward for total-sky	W m ⁻²	-600 .. 600	1	32 bit-real
LW flux adjustment at surface - downward for total-sky	W m ⁻²	-700 .. 700	1	32 bit-real
LW flux adjustment at TOA - upward for total-sky	W m ⁻²	-700 .. 700	1	32 bit-real
WN flux adjustment at surface - upward for total-sky	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at surface - downward for total-sky	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at TOA - upward for total-sky	W m ⁻²	-50 .. 50	1	32 bit-real
WN filtered radiance -satellite emulated	W m ⁻² sr ⁻¹	0 .. 50	1	32 bit-real
WN filtered radiance adjustment-satellite emulated	W m ⁻² sr ⁻¹	0 .. 50	1	32 bit-real
WN flux - satellite emulated – TOA	W m ⁻²	2 .. 50	1	32 bit-real
WN flux adjustment - satellite emulated – TOA	W m ⁻²	2 .. 50	1	32 bit-real
Total LW unfiltered radiance - satellite emulated	W m ⁻² sr ⁻¹	0 .. 200	1	32 bit-real
Total LW unfiltered radiance adjustment - satellite emulated	W m ⁻² sr ⁻¹	0 .. 200	1	32 bit-real
Total column precipitable water – initial	cm	0 .. 10	1	32 bit-real
Total column precipitable water – adjustment	cm	-10 .. 10	1	32 bit-real
Upper tropospheric precipitable water – initial	cm	0 .. 10	1	32 bit-real
Upper tropospheric precipitable water - adjustment	cm	-10 .. 10	1	32 bit-real
Upper tropospheric humidity – initial	N/A	0.0 .. 100.0	1	32 bit-real

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Table 3.5-1. Product Sizing Information

Name	Units	Range	Dim	Data Type
Upper tropospheric humidity – adjustment	N/A	0.0 .. 100.0	1	32 bit-real
Surface albedo – adjustment	N/A	-1 ..1	1	32 bit-real
Aerosol optical depth – initial	N/A	0 .. 2	1	32 bit-real
Aerosol optical depth – adjustment	N/A	-2 .. 2	1	32 bit-real
Skin temperature – initial	K	175 .. 375	1	32 bit-real
Skin temperature – adjustment	K	-50 .. 50	1	32 bit-real
Column ozone – initial	DU	0 .. 1000	1	32 bit-real
Column ozone source flag	N/A	0 .. 3	1	32 bit integer
Aerosol constituency flags	N/A	01000000 .. 18999999	7	32 bit integer
Aerosol and Surface Albedo Sources Flag	N/A	0 .. 900	1	32 bit integer
Mean visible optical depth- adjustment	N/A	-400 .. 400	4	32 bit-real
Mean cloud fractional area – adjustment	N/A	-1 .. 1	4	32 bit-real
Mean cloud effective temperature - adjustment	K	-50 .. 50	4	32 bit-real
Number of tuning iterations	N/A	0 .. 1	1	32 bit integer
Constraint status flag	N/A	0 .. 600	1	32 bit integer
FuLiou model error code	N/A	1 .. 3500	1	32 bit integer
TOA downwelling UVB	W m ⁻²	0 .. 100	1	32 bit-real
TOA downwelling UVA	W m ⁻²	0 .. 100	1	32 bit-real
TOA downwelling PAR	W m ⁻²	0 .. 600	1	32 bit-real
Downward UVB at surface for total-sky	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVB at surface for total-sky	W m ⁻²	0 .. 100	1	32 bit-real
Downward UVA at surface for total-sky	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVA at surface for total-sky	W m ⁻²	0 .. 100	1	32 bit-real
MATCH aerosol optical depth	N/A	0 .. 2	1	32 bit-real
Downward UVB at surface for clear-sky	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVB at surface for clear-sky	W m ⁻²	0 .. 100	1	32 bit-real
Downward UVA at surface for clear-sky	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVA at surface for clear-sky	W m ⁻²	0 .. 100	1	32 bit-real
Broadband surface albedo	N/A	0 .. 1	1	32 bit-real
Downward UVB at surface for pristine-sky	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVB at surface for pristine-sky	W m ⁻²	0 .. 100	1	32 bit-real
Downward UVA at surface for pristine-sky	W m ⁻²	0 .. 100	1	32 bit-real



Table 3.5-1. Product Sizing Information

Name	Units	Range	Dim	Data Type
Direct Diffuse UVA at surface for pristine-sky	W m ⁻²	0 .. 100	1	32 bit-real
Snow grain radius using broadband retrieval	um	0 .. 2000	1	32 bit-real
Downward UVB at surface for cloudy-sky with no aerosol	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVB at surface for cloudy-sky with no aerosol	W m ⁻²	0 .. 100	1	32 bit-real
Downward UVA at surface for cloudy-sky with no aerosol	W m ⁻²	0 .. 100	1	32 bit-real
Direct Diffuse UVA at surface for cloudy-sky with no aerosol	W m ⁻²	0 .. 100	1	32 bit-real
Upward UVB at surface for total sky	W m-2	0 .. 100	1	32 bit-real
Surface total-sky UV-Index	N/A	0 .. 30	1	32 bit-real
Surface clear-sky UV-Index	N/A	0 .. 30	1	32 bit-real
Surface pristine-sky UV-Index	N/A	0 .. 30	1	32 bit-real
Surface cloudy-sky with no aerosol UV-Index	N/A	0 .. 30	1	32 bit-real
PAR at surface for total-sky	W m-2	0 .. 700	1	32 bit-real
Direct Diffuse PAR at surface for total-sky	W m-2	0 .. 700	1	32 bit-real
PAR Purv for total sky	W m-2	0 .. 700	1	32 bit-real
Direct Diffuse PAR Purv for total sky	W m-2	0 .. 700	1	32 bit-real
PAR ChlorA for total sky	W m-2	0 .. 700	1	32 bit-real
Direct Diffuse PAR ChlorA for total sky	W m-2	0 .. 700	1	32 bit-real
PAR at surface for clear-sky	W m-2	0 .. 700	1	32 bit-real
Direct Diffuse PAR at surface for clear-sky	W m-2	0 .. 700	1	32 bit-real
PAR at surface for pristine-sky	W m-2	0 .. 700	1	32 bit-real
Direct Diffuse PAR at surface for pristine-sky	W m-2	0 .. 700	1	32 bit-real
Upwards SW TOA pristine-sky correction	W m-2	0 .. 1500	1	32 bit-real
Downwards SW surface pristine-sky correction	W m-2	0 .. 1500	1	32 bit-real
SW flux - upward for cloudy-sky with no aerosol	W m ⁻²	0 .. 1400	2	32 bit-real
SW flux - downward for cloudy-sky with no aerosol	W m ⁻²	0 .. 1400	2	32 bit-real
LW flux - upward for cloudy-sky with no aerosol	W m ⁻²	0 .. 850	2	32 bit-real
LW flux - downward for cloudy-sky with no aerosol	W m ⁻²	0 .. 700	2	32 bit-real
WN flux - upward for cloudy-sky with no aerosol	W m ⁻²	0 .. 370	2	32 bit-real
WN flux - downward for cloudy-sky with no aerosol	W m ⁻²	0 .. 370	2	32 bit-real
SW flux adjustment at surface - upward for cloudy-sky with no aerosol	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at TOA - upward for cloudy-sky with no aerosol	W m ⁻²	-1400 .. 1400	1	32 bit-real
SW flux adjustment at surface - downward for cloudy sky with no aerosol	W m ⁻²	-1400 .. 1400	1	32 bit-real

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Table 3.5-1. Product Sizing Information

Name	Units	Range	Dim	Data Type
LW flux adjustment at surface - upward for cloudy sky with no aerosol	W m ⁻²	-600 .. 600	1	32 bit-real
LW flux adjustment at surface - downward for cloudy-sky with no aerosol	W m ⁻²	-700 .. 700	1	32 bit-real
LW flux adjustment at TOA - upward for cloudy sky with no aerosol	W m ⁻²	-700 .. 700	1	32 bit-real
WN flux adjustment at surface - upward for cloudy-sky with no aerosol	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at surface - downward for cloudy-sky with no aerosol	W m ⁻²	-50 .. 50	1	32 bit-real
WN flux adjustment at TOA - upward for cloudy-sky with no aerosol	W m ⁻²	-50 .. 50	1	32 bit-real
Spectral interval – SW	TBD	TBD	15	32 bit-real
Diffuse SW broadband for total sky	W m ⁻²	0 .. 1450	1	32 bit-real
Diffuse SW broadband for clear sky	W m ⁻²	0 .. 1450	1	32 bit-real
Diffuse SW broadband for pristine sky	W m ⁻²	0 .. 1450	1	32 bit-real
Diffuse SW broadband for cloudy-sky with no aerosol	W m ⁻²	0 .. 1450	1	32 bit-real
Direct SW broadband for total sky	W m ⁻²	0 .. 1450	1	32 bit-real
Direct SW broadband for clear sky	W m ⁻²	0 .. 1450	1	32 bit-real
Direct SW broadband for pristine sky	W m ⁻²	0 .. 1450	1	32 bit-real
Direct SW broadband for cloudy-sky with no aerosol	W m ⁻²	0 .. 1450	1	32 bit-real
Hour of month	N/A	0 .. 744	1	32 bit integer
Region number	N/A	0 .. 64800	1	32 bit integer

Table 3.5-2. Sizing Information

Data Quantity	Size (GB)
Zonal SYNI Size	0.23
Monthly TOTAL SYNI Size	42.40

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SYNI 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.

SYNI Revision Record

SCCR Approval Date	Release/Version Number	SCCR Number	Description of Revision	Section(s) Affected
N/A	R4V1	N/A	<ul style="list-style-type: none"> • New Data Products Catalog section. (6/24/2008) • Clarified wording in the first paragraph. (10/02/2009) • The ASDC footer was added to the bottom of the document. (06/06/2013) 	All Sec. 3.5 All
N/A	R5V1	N/A	<ul style="list-style-type: none"> • Updated Product Version information for Edition2 and Edition3 products. 	Sec. 3.5

