

Clouds and the Earth's Radiant Energy System (CERES) SYN1deg Data Set Abstract



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Data Set Description:

The Synoptic Radiative Fluxes and Clouds (SYN1deg-1Hour) product contains a day of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) geostationary (GEO) enhanced temporally interpolated data. The 1-degree regional fluxes are averaged at 1-hour GMT-based intervals. This data set starts with Edition4A.

The Synoptic Radiative Fluxes and Clouds (SYN1deg-3Hour) product contains a day of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) geostationary (GEO) enhanced temporally interpolated data. The 1-degree regional fluxes are averaged at 3-hour GMT-based intervals.

The Synoptic Radiative Fluxes and Clouds (SYN1deg-Day) product contains a day of space and time averaged Clouds and the Earth's Radiant Energy System (CERES) geostationary (GEO) enhanced temporally interpolated data. The 1-degree regional fluxes are daily averages of the Synoptic Radiative Fluxes and Clouds (SYN1deg-1Hour) product.

The Monthly Radiative Fluxes and Clouds (SYN1deg-Month) product contains regional, zonal and global monthly averages of the Synoptic Radiative Fluxes and Clouds (SYN1deg-1Hour) product.

The Monthly 3-Hour Radiative Fluxes and Clouds (SYN1deg-M3Hour) product contains regional, zonal and global averages of all days during the month for each of the eight 3-hourly GMT time increments. This data set is not available after Edition3A.

The SYN1deg-3Hour, SYN1deg-Month and SYN1deg-M3Hour are archival products produced by Subsystem 8. The Edition3A has combined the Terra and Aqua CERES observed fluxes and cloud retrievals starting July 1, 2002. The SYN1deg-M3Hour is discontinued in Edition4A, but an SYN1deg-1Hour and SYN1deg-Day data set is added. This product is written in HDF-EOS format and contains metadata as well as gridded science data. The science data are SDSs with multiple records. Each record contains spatially averaged data for an individual region, zone or globe.

The SYN1deg-1Hour, SYN1deg-3Hour, SYN1deg-Day, SYN1deg-Month and SYN1deg-M3Hour products includes:

- Regional data (SYN1deg-1Hour, SYN1deg-3Hour, SYN1deg-Month and SYN1deg-M3Hour)
- Zonal and global data (SYN1deg-Month and SYN1deg-M3Hour)
- 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
- Constrained (tuned) vertical flux profiles for both clear-sky and total-sky conditions evaluated at the TOA, 70mb, 200mb, 500mb, and surface
- The constrained (tuned) and initial (untuned) TOA and surface fluxes for the pristine (clear-sky no-aerosol), clear-sky, total-sky-no-aerosol, and total-sky conditions
- The adjusted radiative transfer model input parameters
- The direct and diffuse SW surface fluxes for total-sky, clear-sky, pristine and actinic conditions
- The surface UVA and UVB direct and diffuse fluxes for total-sky, clear-sky, pristine, and total-sky-no-aerosol conditions
- The SW and LW entropy at TOA and surface (added in Edition4A)

Additional information about the format and content of the SYN1deg-3Hour, SYN1deg-Month and SYN1deg-M3Hour can be found in the [CERES Data Products Catalog](#): [SYN1deg-1Hour](#), [SYN1deg-3Hour](#), [SYN1deg-M3Hour](#), [SYN1deg-Day](#), and [SYN1deg-Month](#) (PDFs).

Additional information about the Quality of the content of the SYN1deg-1Hour, SYN1deg-3Hour, SYN1deg-Day, SYN1deg-Month and SYN1deg-M3Hour can be found in the [Data Quality Summary](#) (PDF).

Summary of Changes:

The CERES Data Management Team and the Langley Atmospheric Science Data Center (ASDC) use a Sampling Strategy, a Production Strategy, and a Configuration Code (CCode) to track versions of CERES primary data products. In general, minor reprocessing changes are tracked by increasing the Configuration Code while major reprocessing changes result in a new Production Strategy. The Sampling Strategy identifies the satellite and instruments which acquired the data in the product.

A summary of changes made to the CERES SYN1deg-1Hour, SYN1deg-3Hour, SYN1deg-Month and SYN1deg-M3Hour product is shown in the following table.

Modification History of the CERES SYN1deg-1Hour, 3Hour, Day, Month, M3Hour Terra-Aqua Products (formerly SYN/AVG/ZAVG)

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on Terra + Aqua SYN1deg Products
Terra-MODIS_Edition4A ⁽³⁾ Terra-Aqua-MODIS_Edition4A ⁽³⁾	400403		<ul style="list-style-type: none"> Added a one-hour and daily data product. Dropped the monthly 3-hour average. Reworked the data structure to add additional clouds variables and remove others. Improved computation of the solar zenith angle and fluxes. Updated algorithm to calculate SW and LW flux from narrowband radiances. Interpolation when needed is performed in GMT. Used Fu-Liou hybrid shortwave solver (4-stream) and 18 shortwave band radiative transfer code. Included random cloud overlap in radiative transfer model calculation. Used Edition4 hourly MATCH aerosol data. Troposphere and stratospheric SO₄, stratospheric Ammonium sulfate and volcanic ash added. Updated surface albedo spectral shape from MODIS MCD43C over land and snow. Included solar angle dependent Look-up Table for surface albedo. Zonal scene (cloudy and clear) and surface type (land and ocean) dependent tuning. Added entropy calculations.
Terra-MODIS_Edition3A ⁽⁴⁾ Terra-Aqua-MODIS_Edition3A ⁽⁴⁾	300301, 301301, 302301, 303301, 303302, 303303, 303304, 303306, 303307	Aug 2012	<ul style="list-style-type: none"> The products have been renamed from SYN/AVG/ZAVG to SYN1deg. The product has been reorganized into 3 files based on temporal averaging. Previously, they were organized by spatial resolution. For data after June 2002 the Edition3a has combined the Terra and Aqua CERES observed fluxes and cloud retrieval. Some code fixes have corrected output for the following parameters: Untuned Clear-Sky Longwave Up, Untuned Clear-Sky Window Up, mean visible optical depth-adjusted, mean cloud fractional area-adjusted, mean cloud effective temperature-adjusted.

**Modification History of the CERES SYN1deg-1Hour, 3Hour, Day, Month, M3Hour Terra-Aqua Products
(formerly SYN/AVG/ZAVG)**

Sampling Strategy and Production Strategy	CCode	Available at ASDC	Impact on Terra + Aqua SYN1deg Products
Terra-FM1-MODIS_Beta3 ⁽⁴⁾ Terra-FM2-MODIS_Beta3 ⁽⁴⁾	005003	Apr 2007	<ul style="list-style-type: none"> • These products are referred to as SYN/AVG/ZAVG. • The 3-hourly and the monthly 3-hourly average code are updated and modified. Cloud properties are averaged with cloud fractions for weighting. • MODIS aerosol optical depths are included. • TOA flux errors are included. • TSI inputs with "NaN" or "Inf" are replaced with defaults. • Linear interpolation is added for hours with missing data in SYNI. • Untuned fluxes are computed from tuned and adjusted fluxes. • Direct and diffuse fluxes are computed from the total fluxes and the direct diffuse ratios. The direct and the diffuse fluxes are computed the surface fluxes and the direct diffuse ratios. • Number of hourboxes for observed, untuned and tuned SW and LW fluxes are added. • Number of observations in AVG/ZAVG are removed. • SYN/AVG/ZAVG structures are re-organized for clearness. • The HDF file compression is included to reduce the file size.
Availability: (1) not available;(2) restricted to CERES analysts; (3) restricted to CERES Science Team and analysts; (4) public			

References:

An overview of the temporal interpolation and spatial averaging algorithms used for CERES can be found in the following reference:

Young, D. F., P. Minnis, D. R. Doelling, G. G. Gibson, and T. Wong, 1998: Temporal Interpolation Methods for the Clouds and Earth's Radiant Energy System (CERES) Experiment. *J. Appl. Meteorol.*, **37**, 572-590

Contact Information:

Investigator(s) Name and Title	Technical Contact(s)	Data Center
Norman G. Loeb CERES Interdisciplinary Principal Investigator E-mail: norman.g.loeb@nasa.gov Telephone: (757) 864-5688	David R. Doelling E-mail: david.r.doelling@nasa.gov Telephone: (757) 864-2155 Atmospheric Science Research Mail Stop 420 NASA Langley Research Center Hampton, Virginia 23681-2199 USA FAX: (757) 864-7996	User and Data Services Office Atmospheric Science Data Center NASA Langley Research Center Mail Stop 157D Hampton, Virginia 23681-2199 USA Telephone: (757) 864-8656 FAX: (757) 864-8807 E-mail: support@eosweb.larc.nasa.gov asdc@earthdata.nasa.gov URL: http://eosweb.larc.nasa.gov

Acknowledgement:

The requested form of acknowledgment for any publication in which these data are used is:

"These data were obtained from the NASA Langley Research Center Atmospheric Science Data Center."

The Langley Data Center requests a reprint of any published papers or reports or a brief description of other uses (e.g., posters, oral presentations, etc.) of data that we have distributed. This will help the Data Center determine the use of data distributed, which is helpful in optimizing product development. It also helps us to keep our product related references current.

Reference:

The CERES Team has gone to considerable trouble to remove major errors and to verify the quality and accuracy of these data. Please provide a reference to the following paper when you publish scientific results with the CERES data:

Wielicki, B. A., B. R. Barkstrom, E. F. Harrison, R. B. Lee III, G. L. Smith, and J. E. Cooper, "Clouds and the Earth's Radiant Energy System (CERES): An Earth Observing System Experiment," *Bull. Amer. Meteor. Soc.*, **77**, 853-868, 1996

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Author: User and Data Services, Langley ASDC

ASDC Help Desk: Phone (757) 864-8656; E-mail support-asdc@earthdata.nasa.gov