CERES TRMM Edition2C FSW Data Quality Summary

Investigation:	**CERES**
Data Product:	**Monthly Gridded Radiative Fluxes and Clouds (FSW)**
Data Set:	**TRMM (Instruments: CERES-PFM, VIRS)**
Data Set Version:	**Edition2C**

The purpose of this document is to inform users of the accuracy of this data product as determined by the CERES Science Team. This document briefly summarizes key validation results, provides cautions where users might easily misinterpret the data, provides links to further information about the data product, algorithms, and accuracy, and gives information about planned data improvements. This document also automates registration in order to keep users informed of new validation results, cautions, or improved data sets as they become available.

This document is a high-level summary and represents the minimum necessary information for scientific users of this data product.

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Nature of the FSW Product

The Monthly Gridded Radiative Fluxes and Clouds (FSW) archival data product contains hourly single scanner flux and cloud parameters averaged over 1.0-degree regions. Input to the FSW Subsystem is the Clouds and Radiation Swath (CRS) archival data product. Each FSW covers a single month of data from a single CERES instrument mounted on one satellite.

Instantaneous CERES footprint data are sorted by region and time. Gridded means of CRS data are calculated in hourly Greenwich Mean Time (GMT) time increments for each region with at least one CERES observation. These region/time increments are centered on the local half-hour and are referred to as "hourboxes." The major categories of data output on the FSW are as follows:

- Region-specific data such as surface properties and elevation
- Time and viewing geometry data
- Total-sky, clear-sky, and no-aerosol radiative fluxes at the top of the atmosphere (TOA), surface, and at three pressure levels: 70, 200, and 500 hPa.
- Layer mean cloud properties for 4 pressure layers

All CERES footprints with a non-default value of either Shortwave (SW) or Longwave (LW) flux are used in the FSW product. CERES data collected during the Rotating Azimuth Plane (RAP), crosstrack, and the alongtrack scan modes are used.

A full list of parameters on the FSW is contained in the CERES Data Product Catalog (PDF) and a full definition of each parameter will be contained in the FSW Collection Guide.

When referring to a CERES data set, please include the satellite name and/or the CERES instrument name, the data set version, and the data product. Multiple files which are identical in all aspects of the filename except for the 6 digit configuration code (see Collection Guide) differ little, if any, scientifically. Users may, therefore, analyze data from the same satellite/instrument, data set version, and data product without regard to configuration code. This data set may be referred to as "CERES TRMM Edition2C FSW."

Cautions and Helpful Hints

There are several cautions the CERES Science Team notes regarding the use of CERES-TRMM FSW data:

- SW fluxes are corrected to a common solar zenith angle (SZA) before averaging. This requires two corrections: 1) the modification of the solar insolation from the SZA of the observation to the SZA of the key footprint, and 2) the correction of the observed albedo to the SZA of the central time using directional models of albedo as a function of SZA and scene type. For surface SW fluxes, only the correction based on the change in solar insolation is applied. There is no correction for the change of albedo with SZA. For the FSW, the SZ correction is minor since. Generally, the time difference between any footprint and the key footprint (the footprint closest to the

center of the region) is at most a few seconds.
- The definition of "clear-sky" used to calculate the mean clear-sky flux for each hourbox is now consistent with the definition used for the selection of ADMs. Edition2C FSW defines footprints with cloud amounts less than 0.1% as clear.
- The Edition2C product contains data collected from rotating azimuth (RAP), alongtrack, and crosstrack scanning operating modes. Hours that include RAP data can be identified by checking the viewing zenith angle and relative azimuth angles for default values. These parameters cannot be defined for RAP data.
- Users should be careful about comparisons of FSW CERES TOA fluxes with ERBE or ERBE-like fluxes. The geographic location of a CERES flux estimate is at the surface geodetic latitude and longitude of the CERES footprint centroid. On ERBE, all fluxes are located at a geocentric latitude and longitude corresponding to the 30-km level. Other differences are expected due to:
    1. The viewing zenith angle cut-off for ERBE-like footprints is 70°. For the FSW, it is limited to 48° in crosstrack mode.
    2. ERBE-like fluxes were derived using angular distribution models (ADM) developed from ERBE and NIMBUS-7 data. The FSW fluxes were derived using the new CERES ADM.

  An overview of flux ERBE-like/CERES flux differences can be found in the CERES SSF TOA flux Data Quality Summary.
- All CERES footprints with a non-default value of either SW or LW flux have been used as input to the FSW.
- The FSW data product includes averages of the VIRS imager radiances for all 5 VIRS channels. A processing error resulted in mean radiances being calculated only for the 0.65 and 10.8 μm channels on the SFC product. This has been corrected on the FSW.
- The FSW contains gridded means of all data currently available on the SSF product. Users should consult the CERES SSF TRMM Edition2B Data Quality Summary for information concerning the availability and accuracy of individual parameters. For instance, Shortwave Model A surface fluxes are limited to clear-sky footprints. Longwave Model A surface fluxes are also limited to clear-sky footprints. Shortwave Model B and Longwave Model B surface fluxes, however, are available for all-sky.

Accuracy and Validation

The User should consult the SSF and CRS Data Quality Summaries for information on the accuracy of the data used as input to the FSW. There are no known issues with the accuracy of the sorting and gridding of the data to produce the FSW.

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.

Expected Reprocessing

At this time, there are no scheduled revisions of the **CERES TRMM Edition2C FSW** data. The CERES Team will continue detailed examination and documentation of the ground calibration and characterization data, as well as the in-flight calibration opportunities. Notification of any changes will be sent to registered users.

Attribution

The CERES Team has gone to considerable trouble to remove major errors and to verify the quality and accuracy of this data. **Please provide a reference to the following paper when you publish scientific results with the CERES TRMM Edition2C FSW data:**

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

When Langley ASDC data are used in a publication, **we request the following acknowledgment be included**: "These data were obtained from the NASA Langley Research Center EOSDIS Distributed Active Archive Center."

The Langley ASDC requests two reprints of any published papers or reports which cite the use of data that we have distributed. This will help us determine the use of data that we distribute, which is helpful in optimizing product development. It also helps us to keep our product related references current.

Feedback and Questions

For questions or comments on the CERES Quality Summary, contact the User and Data Services staff at the Atmospheric Science Data Center.

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