Evaluating Surface Flux Results from CERES-FLASHFlux

Anne C. Wilber1, Paul W. Stackhouse, Jr.2, David P. Kratz2, Shashi K. Gupta1, and Parnchak S. Sawaengphokhla1

1Science Systems and Applications, Inc., Hampton, Virginia
2NASA Langley Research Center, Hampton, Virginia

Introduction: The Fast Longwave and Shortwave Radiative Flux (FLASHFlux) data product was developed to provide a rapid release version of the Clouds and Earth’s Radiant Energy System (CERES) results, which could be made available to the research and applications communities within one week of the satellite observations by exchanging some accuracy for speed of processing. Unlike standard CERES products, FLASHFlux does not maintain a long-term consistent record. Therefore the latest algorithm changes and input data can be incorporated into processing. FLASHFlux released Version3A (January 2013) and Version3B (August 2014) which include the latest meteorological product from Global Modeling and Assimilation Office (GMAO), GEOS FP-5 (9.1), the latest spectral response functions and gains for the CERES instruments, and aerosol climatology based on the latest MATCH data. Version 3B included a slightly updated calibration and some changes to the surface albedo over snow/ice. Typically FLASHFlux does not reprocess earlier versions when a new version is released. The combined record of Time Interpolated Space Averaged (TISA) surface flux results from Versions3A and 3B for July 2012 to October 2015 have been compared to the ground-based measurements. The FLASHFlux results are also compared to other CERES gridded products, SYN1deg and EBAF surface fluxes.

CERES SYN1deg: This data product the SYN1deg combines Terra and Aqua CERES and 3-hourly geostationary (GEO) data to produce 3-hourly TOA, in-atmosphere and surface fluxes based on a radiative transfer model. Two of GEO data enable the model to more accurately represent the diurnal variability between the CERES measurement times. For this study the daily averaged surface fluxes were used.

CERES EBAF and Surface-EBAF: The CERES Energy Balanced and Filled (EBAF) product also integrates the GEO observations with CERES and provides Top-of-Atmosphere fluxes. Global net flux is constrained to the ocean heat storage term. EBAF-surface product provides monthly mean LW and SW fluxes that are consistent with the TOA EBAF. For this study, monthly mean FLASHFlux and SYN1deg were compared with the surface measurements. EBAF is currently available through May 2015.

Conclusions:
• FLASHFlux results compare very well to the ground measurement of daily and monthly mean Longwave and Shortwave Surface Fluxes within ± 5 W m⁻² for everywhere except in polar areas.
• FLASHFlux biases and random errors are generally larger than those from climate quality datasets, i.e. SYN1deg and EBAF, but useful for numerous scientific (see A31C-0051, this session), applied science and educational uses.
• Improvements of the FLASHFlux surface models continue to be made. A new cloud transmission algorithm is under development for improved LW flux computation.

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The FLASHFlux data products are available through the “HDF” portion of the CERES ordering page or direct through the FLASHFlux homepage: http://flash.larc.nasa.gov.

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Comparison of Monthly Mean Longwave Fluxes from FLASHFlux, SYN1deg and EBAF

Comparison of Monthly Mean Shortwave Fluxes from FLASHFlux, SYN1deg and EBAF to Ground Measurements

The maps show the variation in the bias of the daily modeled fluxes from the ground measurements at the 51 sites. The comparison of the modeled to measured fluxes at the Gobi Desert and the Manus Island sites shows good correlation to the measurements. Manus represents perhaps the most extreme variability of any site. At this island site the correlation coefficient is only 0.7 and at the Gobi Desert it is 0.9.

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