

“The CERES geostationary calibration methodology with emphasis on the desert calibration”

R. Bhatt², D. Doelling¹, D. Morstad², A. Gopalan²
(1) NASA-Langley, (2) SSAI

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ABSTRACT

The Clouds and the Earth's Radiant Energy System (CERES) project provides the community a quality climate TOA and surface fluxes and cloud properties and are key elements in evaluating the ability of climate models to predict both past and future climate states. One important aspect of successful climate monitoring is satellite calibration. The CERES instantaneous broadband calibration radiance stability is 0.1% per year, whereas the accuracy of the longwave (LW) and shortwave (SW) is better than 0.5% and 1% respectively. CERES uses the 3-hourly GEO fluxes and clouds to provide diurnally averaged daily and monthly TOA flux means from the CERES measurements onboard the Terra (10:30 AM local equator crossing time) and Aqua (13:30PM) sun-synchronous satellites. The GEO radiances are calibrated against MODIS as a reference to provide consistent GEO retrieved cloud properties and derived broadband fluxes. These fluxes are then carefully normalized against the well-calibrated CERES fluxes to ensure climate quality fluxes, free of GEO artifacts. With the upcoming release of Edition3 products, CERES has just recalibrated all the CERES instruments to ensure that both Terra and Aqua fluxes are on the same radiometric scale and the removal of all known instrument trends. CERES will also recalibrate all GEO satellites using the entire GEO time record.

CERES employs collocated, coincident ray-matched GEO/MODIS radiances as its primary technique, calibrating GEO radiances beginning in the year 2000. The advantage of the ray-matching technique is that it provides a full dynamic range of radiances to check the linearity of the GEO visible instrument. CERES uses deep convective clouds and invariant desert sites to validate the primary technique. All three methods can assess the stability of the GEO visible instrument. Examples of the CERES GEO calibration techniques and validation efforts will be shown at the conference. Special emphasis will be given to the newly incorporated desert site methodology.