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The CERES geostationary enhanced temporally averaged flux product

D. Doelling (1), M. Nordeen (2), C. Nguyen (2), M. Sun (2), and N. Loeb (1)

(1) NASA-Langley, Climate Science Branch, hampton, United States (david.r.doelling@nasa.gov), (2) SSAI, Hampton, Virginia, United States

To date, the CERES project has provided the climate community with over a decade (March 2000 –June 2011) of level-3 gridded daily and monthly mean reflected solar (SW) and emitted longwave (LW) radiative fluxes at the top-of-atmosphere (TOA) and surface. CERES instruments are in sun-synchronous orbits onboard the Terra and Aqua satellites, which have local equator crossing times of 10:30AM and 1:30PM, respectively. In order to determine daily and monthly mean fluxes, time interpolation is required in order to account for changes in the radiation fields between CERES observation times. CERES uses two temporal averaging techniques to derive the daily mean TOA fluxes from CERES measurements. The CERES-only (CO) temporal interpolation method assumes constant cloud conditions between CERES measurements. In the SW, scene-dependent diurnal albedo models are used to estimate how TOA albedo (and therefore flux) changes with solar zenith angle for each local time. In the LW, the CO method employs linear interpolation of the LW flux between measurements over ocean, whereas a half-sine model is used to infer TOA flux over land. The second approach more explicitly accounts for temporal variations in clouds and their impact on the diurnal cycle of radiative fluxes by supplementing CERES observations with those from visible and infrared instruments on geostationary satellites. The CERES geostationary (CG) temporal interpolation method utilizes 3-hourly geostationary measurements to infer broadband fluxes between CERES measurements. To ensure the GEO-based fluxes are consistent with CERES calibration, the GEO fluxes are normalized to CERES using spatially (5x5 regional) and temporally (+/-1.5 h) matched GEO and CERES data.
We show that monthly mean regional SW TOA flux differences between these two methods of time interpolation are greater than 30 Wm-2 in regions with a strong diurnal cycles, such as maritime stratus and land afternoon convective regions. The two methods are compared against 15-minute GERB TOA fluxes, which covers the Meteosat domain. Consistency between CERES and GERB daily SW and LW TOA fluxes are significantly improved (by 33% or more) when CERES measurements are supplemented by GEO data. We will also show preliminary results using 1-hourly GEO data for possible application into CERES flux products.