CERES Terra Edition1A SSF TOA Fluxes - Accuracy and Validation

CERES shortwave (SW), longwave (LW) and window (WN) channel radiative fluxes are derived from empirical Angular Distribution Models (ADMs) that convert a measured radiance in a given Sun-Earth-satellite viewing configuration to a top-of-atmosphere (TOA) radiative flux. Recently, a new set of ADMs were developed from 9 months of CERES-TRMM SSF measurements over the Tropics (Loeb et al., 2002). These ADMs were used to generate TOA fluxes on the CERES-TRMM Edition2B SSF product. A brief description of the Edition2B_TRMM ADMs is provided in TRMM ADM Attachment (PDF), and a detailed description of TOA flux validation results is available from the TRMM Edition2B SSF Quality Summary. Currently, a new set of ADMs is under development for determining TOA fluxes from CERES-Terra measurements. The new CERES-Terra ADMs will be based on two years global SSF Edition 1A CERES-Terra radiances and cloud properties. Once the CERES-Terra ADMs are available, they will be used to generate CERES-Terra SSF TOA fluxes, which will be released on Edition2A of the CERES-Terra SSF product.

In the interim, TOA fluxes on the current CERES-Terra Edition1A SSF product are determined by applying CERES Edition2B_TRMM ADMs to CERES-Terra radiances. Since the CERES-TRMM orbit is restricted to the tropics, larger TOA flux errors are anticipated at middle and upper latitudes, particularly over snow and sea ice, where there wasn't sufficient data sampling from CERES-TRMM to derive empirical ADMs. Since the CERES-TRMM ADMs were developed using scene identification from 2-km VIRS measurements, whereas CERES-Terra uses on 1-km MODIS measurements, there may be differences in cloud parameter retrieval accuracy from the two instruments, which will introduce errors in TOA fluxes. Similarly, differences in footprint size between CERES-TRMM (10-km equivalent diameter at nadir) and CERES-Terra (20-km equivalent diameter at nadir) will likely also affect the TOA flux estimates on the current SSF. In Terra Edition1A Regional Mean TOA Flux Uncertainties Attachment (PDF), validation results obtained by applying the CERES Edition2B_TRMM ADMs to four months (November-December, 2000; April-May, 2001) CERES-Terra radiances are provided. The main points to note from those figures are as follows:

- When comparing regional mean SW TOA fluxes on the SSF with TOA fluxes determined by direct integration (DI) of all-sky measured SW radiances, the SSF TOA fluxes are generally within 0.5 W m-2 of DI fluxes, except poleward of 45 latitude, where TOA flux errors are larger partly because measurements on Terra are recorded at larger solar zenith angles, and partly because these latitudes are not represented in the CERES Edition2B_TRMM ADMs.

- Regional mean SW TOA flux accuracy based on CERES-Terra Edition1 SSF instantaneous TOA fluxes is improved by a factor of 1.5-2.0 compared to TOA fluxes based on the CERES ERBE-Like product.

- In regions covered by snow and sea ice, CERES-Terra Edition1A SSF LW TOA fluxes are generally too large by up to 2.5 W m-2. This error is due to the lack of snow and sea ice LW ADMs. These errors will be drastically reduced in the CERES-Terra Edition2A SSF.

Return to Quality Summary for: SSF Terra Edition1A