Clear Sky Broadband Surface Albedo From CERES and MODIS Instruments on Board Terra Satellite, Direct Comparisons

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Goal: Compare CERES/CRS Ed2b Land Surface Albedo to MODIS MOD43C2 v004 Surface Albedo.

To run a radiation transfer calculation globally we require an estimate of spectral and broadband surface albedo beneath each CERES footprint.

Problem: Validation of surface albedo, derived from TOA observations, is tricky because surface observations are not spatially representative.

Solution: Compare independently derived clear sky broadband surface albedo matched in space and time from CERES and MODIS.

To insure a good match between products, we integrate MODIS 0.05 degree “pixels” within the CERES ∼20km “footprint”.

1. Isolate clear sky CERES footprints within 16 day windows of MODIS BRDF estimation for 4 months (Jan, Apr, Jul, Oct 2001.)

2. Approximate CERES footprint as a circle.

3. Weight MODIS results within CERES footprint with a linear function decreasing w.r.t. geographic center of footprint (to simulate shortwave fluxes at the surface. Results shown here are based on radiation transfer model runs below CERES observations. Broadband albedo is defined as the ratio of upward to downward shortwave fluxes at the surface.

4. To insure a good match between products, we integrate MODIS 0.05 degree “pixels” within the CERES ∼20km “footprint”.

CERES Initial Clear Sky Spectral Surface Albedo (Methodology)

\[\alpha_w = \int \alpha_{MODIS}(x,y)w(d)dx\]

- For clear sky, estimate broadband surface albedo using a LUT
- Estimate spectral albedo based on linking spectral shapes to IGBP types identified within CERES footprint
- Normalize spectral albedo so that integrated value equals clear sky estimate from the LUT.

MODIS BRDF Based Broadband Surface Albedo

- The MODIS land surface group developed an algorithm to input MODIS shortwave radiances to spectral albedos using a sparsely filled estimate of the Bi-directional Reflectance Distribution Function (BRDF) of land surfaces viewed by the MODIS instrument.

Results of Comparisons

Locations Where Data are Compared

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