

Estimation of surface shortwave radiation budget from MODIS data

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Remote sensing application to surface radiation budget (2nd from the bottom)

The surface shortwave radiation budget is a key factor responsible for the redistribution of the available energy in Earth-atmosphere system and its spatial and temporal variation can be estimated from the satellite data. Two components of the surface shortwave radiation balance are considered in the present study: surface shortwave downward radiation (SSDR) and surface shortwave net radiation (SSNR), which are derived from MODIS data using a radiative transfer model.

Accurate and updated calibration of instrument and the calibration of the radiation models with high-quality standard radiative transfer calculation have been issues in shortwave radiation budget estimation from satellite data (Schmetz, 1989; Noia et al., 1993; Pinker et al., 1995). In addition, under- or overestimation of surface albedo in declouding process and narrowband to broadband corrections in atmospheric anisotropy were pointed out as error sources in retrieval techniques (Schmetz, 1989; Noia et al., 1993; Pinker et al., 1995; Perez et al., 2001). In present study, both downward flux (SSDR) and net flux (SSNR) are estimated from top of atmosphere (TOA) reflectance using linear regressions for each solar zenith angle, viewing zenith angle, and relative azimuth angle that are developed from extensive radiative transfer simulations. The presented method uses MODIS TOA reflectance and surface reflectance data which have 1-km spatial resolution at nadir and does not need the declouding process or surface albedo in estimation, therefore we expect to estimate surface radiation budget with finer resolution compared to previous studies, irrespective of those error sources. The methodology, comparisons with other algorithms, and validation results will be presented.