IRS2012-226
International Radiation Symposium 2012
Dahlem Cube, Berlin, Germany, 06 – 10 August 2012

Correction for 3D Radiative Effects on Clear Sky Reflectance and Aerosol Optical Thickness Retrieval in Broken Cloud Field – Case Studies

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The retrieval of aerosols near clouds from reflected sunlight is rather challenging. Sunlight reflected from clouds can effectively enhance the reflectance of clear region nearby. Ignoring cloud 3D radiative adjacency effects can lead to large biased error in aerosol retrieval, thus to incorrect interpretation of satellite observations for aerosol-cloud interaction. We have developed a simple model to compute cloud-induced radiance enhancement due to radiative interaction between boundary layer cloud and molecular layer above. Here we apply this method to broken cloud images acquired from MODIS. We use CERES observations combined with radiative transfer models to derive visible narrowband radiative flux for estimating the radiance enhancement. With the corrected spectral radiances as input to the MODIS aerosol retrieval algorithm, we compute aerosol optical thicknesses (AOT). We compare the corrected AOT with the original AOT to assess the performance of our approach. We further discuss issues in the current correction method and plans to validate the scheme.