Study of Component Aerosol Direct Radiative Effect over the Asian Region

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Abstract
A two-step approach of combing CERES/MODIS shortwave (SW) flux and aerosol optical thickness (AOT) at 0.55μm with the component AOT fractions from a 3-D aerosol model is used to derive top of atmosphere (TOA) component aerosol direct radiative effect (ADRE) over the Asian region for the clear-sky condition. The annual mean values of ADRE for the region are +0.55±0.1W/m² for black carbon (BC); -1.23±0.39W/m² for organic carbon (OC); -3.81±0.71W/m² for sulphate (SU); -3.16±0.45W/m² for dust (DU); -0.64±0.55W/m² for sea salt (SS); -3.98±0.57W/m² for anthropogenic aerosol (AN); -4.37±1.11W/m² for natural aerosol (NA); and -8.37±1.69W/m² for total aerosols (TOT). Both anthropogenic and natural aerosol direct radiative effects in the region are much higher than their global counterparts. Validations have also been performed by comparing our component ADRE computation with the radiative transfer calculations for the AERONET sites and the ACE-Asia field campaign.

Keywords
aerosol direct radiative effect, aerosol optical thickness