Geophysical Research Abstracts
Vol. 14, EGU2012-10370, 2012
EGU General Assembly 2012

Estimation of the direct aerosol radiative effect over China based on satellite remote sensing measurements

A.-M. Sundström (1), J. Huttunen (2), A. Arola (2), P. Kolmonen (3), L. Sogacheva (3), G. de Leeuw (1,3,4)

(1) Department of Physics, University of Helsinki, Helsinki, Finland (anu-maija.sundstrom@helsinki.fi), (2) Finnish Meteorological Institute, Kuopio, Finland, (3) Finnish Meteorological Institute, Helsinki, Finland, (4) TNO, Utrecht, The Netherlands

Aerosols influence the radiative budget of the Earth-atmosphere system directly by scattering and absorbing solar and thermal infrared radiation, and indirectly by modifying the microphysical, and hence the radiative properties and lifetimes of clouds. However, the quantification of aerosol radiative effects is complex and large uncertainties still exist, mainly due to the high spatial and temporal variation of the aerosol concentration and mass, as well as their relatively short lifetime in the atmosphere. The clear-sky direct aerosol radiative effect at the top of the atmosphere (TOA) is defined as the difference between the net solar flux ΔF_{TOA} (difference between downward and upward fluxes) defined with (F) and without (F_0) aerosols. The negative values of ΔF_{TOA} correspond to planetary cooling, whereas positive values correspond to increased atmospheric warming.

Satellites offer an opportunity to observe the spatial distribution of aerosol properties with adequate resolution and coverage from regional to global scales. In this work multisensor satellite observations are used to estimate the direct aerosol radiative effect at the top of the atmosphere over China within the shortwave (SW, 0.3-5 microns) region. The Moderate Imaging Spectroradiometer onboard (MODIS) NASA's Terra and Aqua platforms offer global observations of aerosol and cloud optical properties nearly on a daily basis, whereas the Clouds and the Earth's Radian Energy System (CERES) instruments measure simultaneously TOA broadband fluxes e.g. in the shortwave region. Hence, the instantaneous aerosol direct radiative effect for a month at TOA can be estimated using the MODIS aerosol optical depth (AOD) and coincident broadband flux from the CERES instrument. The values for F and F_0 are obtained by performing a linear regression between MODIS AOD at 0.55 microns wavelength and CERES SW flux. The instantaneous values are converted to monthly means by using a radiative transfer code. Preliminary results of the aerosol direct effect over China between 2004 and 2009 will be introduced. In addition, the results are compared with radiative transfer calculations and AERONET sunphotometer inversions.