Geophysical Research Abstracts
Vol. 12, EGU2010-14240, 2010
EGU General Assembly 2010

Examining the impact of wildfire smoke aerosol on clouds, precipitation and energy balance in high latitudes using a regional model WRF-Chem-SMOKE and satellite data

Zheng Lu and Irina N. Sokolik
Georgia Institute of Technonology, Earth and Atmospheric Sciences, Atlanta, United States (isokolik@eas.gatech.edu)

Smoke aerosols from wildfires in northern latitudes can cause various diverse impacts on the Earth climate system, including changes in the clouds, hydrological cycle and energy balance. In this study, we examine the smoke aerosol-cloud-precipitation linkages using a modified version of the WRF-Chem model which includes a module SMOKE to treat smoke aerosol in cloud microphysics and radiative transfer processes. The model was configured to simulate boreal forest wildfire events in northern latitudes in the summer of 2007. The satellite data were used to constrain the total burned area as well as to validate the modeled 3D smoke fields.

The SMOKE module treats the size-resolved composition of smoke particles that are linked to cloud processes through modeled smoke CCN and IN. The injection plume height was modeled following the parameterization of Freitas et al. (2007, 2009) that is incorporated in WRF-Chem. We examine the evolution of smoke fields and associated changes in cloud properties and precipitation caused by smoke aerosol by considering different fire regimes, different emission scenarios depending on burning vegetation types, and different initial aerosol size distribution assumptions. The range of considered impacts and relative importance of involved factors will be presented based on WRF-Chem-SMOKE results and satellite data from CloudSat, CALIPSO, MODIS, and OMI.