Geophysical Research Abstracts
Vol. 18, EGU2016-8921, 2016
EGU General Assembly 2016

Evaluation of a size-resolved aerosol model based on satellite and ground observations and its implication on aerosol forcing

Xiaoyan Ma (1) and Fangqun Yu (2)

(1) Key Laboratory for Aerosol Cloud-Precipitation of China meteorological Administration, Nanjing University of Information Science and Technology, Nanjing, China (xma@nuist.edu.cn), (2) Atmospheric Sciences Research Center, State University of New York, Albany, NY, USA

The latest AeroCom phase II experiments have showed a large diversity in the simulations of aerosol concentrations, size distribution, vertical profile, and optical properties among 16 detailed global aerosol microphysics models, which contribute to the large uncertainty in the predicted aerosol radiative forcing and possibly induce the distinct climate change in the future. In the last few years, we have developed and improved a global size-resolved aerosol model (Yu and Luo, 2009; Ma et al., 2012; Yu et al., 2012), GEOS-Chem-APM, which is a prognostic multi-type, multi-component, size-resolved aerosol microphysics model, including state-of-the-art nucleation schemes and condensation of low volatile secondary organic compounds from successive oxidation aging. The model is one of 16 global models for AeroCom phase II and participated in a couple of model inter-comparison experiments. In this study, we employed multi-year aerosol optical depth (AOD) data from 2004 to 2012 taken from ground-based Aerosol Robotic Network (AERONET) measurements and Moderate Resolution Imaging Spectroradiometer (MODIS), Multiangle Imaging SpectroRadiometer (MISR) and Sea-viewing Wide Field-of-view Sensor (SeaWiFS) satellite retrievals to evaluate the performance of the GEOS-Chem-APM in predicting aerosol optical depth, including spatial distribution, reginal variation and seasonal variabilities. Compared to the observations, the modelled AOD is overall good over land, but quite low over ocean possibly due to low sea salt emission in the model and/or higher AOD in satellite retrievals, specifically MODIS and MISR. We chose 72 AERONET sites having at least 36 months data available and representative of high spatial domain to compare with the model and satellite data. Comparisons in various representative regions show that the model overall agrees well in the major anthropogenic emission regions, such as Europe, East Asia and North America. Relative to the observations, the modelled AOD is systematically lower in biomass burning regions such as South Africa and South America possibly due to uncertainties in emission inventory, but slightly higher in North Africa likely associated with stronger dust emissions in the model. The model is able to capture the realistic seasonal cycle in all regions, including the peak of AOD in major dust events months and biomass burning seasons. The simulated inter-annual variability is overall consistent with the observations, which is distinctly shown in South Africa and South America with strong inter-annual variability compared to other regions. The implication of such evaluation on the predicted aerosol radiative forcing is also investigated.