4.015 Global aerosol climatology with 14km grid spacing using a non-hydrostatic icosahedral atmospheric transport model.

Presenting Author:
Daisuke Goto, National Institute for Environmental Studies (NIES), Tsukuba, Japan, goto.daisuke@nies.go.jp

Co-Authors:
Yousuke Sato, Department of Applied Energy, Graduate School of Engineering, Nagoya University, Nagoya, Japan
Hisashi Yashiro, RIKEN/AICS, Kobe, Japan
Kentaroh Suzuki, Atmosphere and Ocean Research Institute, Univerity of the Tokyo, Kashiwa, Japan
Teruyuki Nakajima, Earth Observation Research Center (EORC), Japan Aerospace Exploration Agency (JAXA), Tsukuba, Japan

Abstract:

A high-performance computing resource allows us to conduct numerical simulations with a horizontal grid spacing that is high enough to resolve cloud systems. The cutting-edge computational capability, provided by K computer at RIKEN in Japan, enables the authors to perform more than 1-year, global simulations of air pollutions and clouds with unprecedentedly high horizontal resolutions. In this study, we have developed a next generation model that is capable of simulating global air pollutions with O(10km) grid spacing by coupling an atmospheric chemistry model to Non-hydrostatic Icosahedral Atmospheric Model (NICAM; Tomita and Satoh, 2004; Satoh et al., 2008; 2014). The atmospheric aerosol-chemistry model is called NICAM-Chem (Suzuki et al., 2008; Goto, 2014; Goto et al., 2015, 2016, 2017). We have performed 3-year integrations with 14 km grid spacing on K computer (proposal numbers in 140046, 150156, 160004, 170017, and 180012). The simulated results of the basic meteorological fields, clouds, precipitation, aerosols and radiation fluxes are compared with various measurements including reanalysis data, in-situ measurements and satellite observations. Their global distributions of simulated parameters are generally agreement in the measurements and better performances compared to the other simulations with lower-resolved horizontal grid sizes. Around the polar areas, for example, the aerosol distributions with the higher-resolved horizontal grid spacing are much closer to the measurements than those with lower-resolution, as shown by Sato et al. (2016). The further model evaluation will be presented.