4.174 Quantitative analysis of the global dust emission using a data assimilation technique.

Presenting Author:
Taichu TANAKA, Meteorological Research Institute, Japan Meteorological Agency, Atmospheric Environment and Applied Meteorology Research Department, Tsukuba, Ibaraki, Japan, yatanaka@mri-jma.go.jp

Co-Authors:
Keiya YUMIMOTO, Research Institute for Applied Mechanics, Kyushu University, Kasuga, Fukuoka, Japan

Abstract:

Mineral dust aerosol plays several important roles in the Earth climate and the environment: it affects the Earth's energy balance directly by scattering and absorbing the radiation, darkening of snow/ice, indirectly by modifying the cloud properties, ocean carbon cycles. It also affects the atmospheric chemical cycles of other aerosols and gases. Numerical dust aerosol models have been developed and used for researches and operational dust weather forecasts with wind-driven dust emission schemes although there is still large uncertainty among models. To improve the dust emission flux calculation, accurate information of the surface erodibility is critical. Current global dust models commonly employ semi-empirical "dust source functions" to express the horizontal variability of surface erodibility to reduce disagreements with observations. Typical dust source function, specifies large dust emission to the topographic depression first proposed by Ginoux et al. (2001). In this study, we take another approach that utilizes a global aerosol model and its data assimilation system to derive empirical dust source functions. We used our global aerosol model called MASINGAR mk-2, which is used for the operational aeolian dust forecast in JMA, and the 2D-Var aerosol data assimilation system using satellite retrieved aerosol optical depth. In this method, calculated dust flux by the global model is inversely corrected by the AOD data assimilation. While the correction at one analysis time is limited over the dust emission area where satellite retrieval is available only, the correction factor map covering the globe can be created from a long-term analysis. We will show the results of the analyzed dust emission and discuss the implication from the empirical dust source function.