Geophysical Research Abstracts
Vol. 19, EGU2017-2831, 2017
EGU General Assembly 2017

4DVar Data Assimilation for Dust Emission Parameter Estimation over East Asia Area

Jianbing Jin (1), Hai Xiang Lin (1), Arnold Heemink (1), and Arjo Segers (2)

(1) Delft Institute of Applied Mathematics, Delft University of Technology, Netherlands (j.jin-2@tudelft.nl), (2) TNO, Dept.of Climate, Air and Sustainability, Utrecht, the Netherlands (arjo.segers@tno.nl)

The Severe Dust Storms (SDS) have long played a wide and negative impact on the atmospheric environment and climate system. To reduce the social and economic influences caused by the SDS, various model-based dust forecasting and early warning systems have been developed. However, the simulated dust concentrations by those existing models sometimes show a discrepancy of more than two orders of magnitudes from the observations. The most important reason for such large differences is the difficulty in accurately identifying the dust emission source region and emission rate.

In our study, the LOTOS-EUROS/Dust is used to simulate the SDS over East Asia areas. A geographic dependent friction velocity threshold (FVT), instead of a spatially constant one, is introduced in the dust emission equation. A trajectory-based 4DVar data assimilation scheme is designed to estimate the spatially different FVTs. By using the trajectories (the ensemble model realization perturbations with the Monte Carlo sampled FVTs), an accurate approximation of the expected FVTs with high efficiency can be obtained.

Twin experiments have been implemented, where the 2D Aerosol Optical Depth (AOD) observations transformed from the expected model realization are assimilated, both the estimated FVTs and the forecast dust concentrations are evaluated. Besides, the improved FVTs (for trajectories) sampling scheme and model-based FVTs reduction are also implemented, which can further improve the forecast accuracy without increasing the number of trajectories.