Geophysical Research Abstracts
Vol. 20, EGU2018-10951, 2018
EGU General Assembly 2018

Data assimilation of GOCI AOD and surface PM observations on aerosol modeling over the Korean Peninsula during KORUS-AQ campaign

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Particle matter(PM) has played a significantly deleterious role in affecting human health and climate. Recently, continuous high concentrations of PM in Korea attracted public attention to this critical issue, and the Korea-United States Air Quality Study(KORUS-AQ) campaign in 2016 was conducted to investigate the causes. For this study, we adjusted the initial conditions in the chemical transport model(CTM) to improve its performance over Korean Peninsula during KORUS-AQ period, using the campaign data to evaluate our model performance. We used the Optimal Interpolation(OI) approach and used hourly surface air quality measurement data from the Air Quality Monitoring Station(AQMS) by NIER and the aerosol optical depth(AOD) measured by a GOCI sensor from the geostationary orbit onboard the Communication Ocean and Meteorological Satellite(COMS). The AOD at 550nm has a 6km spatial resolution and broad coverage over East Asia. After assimilating the surface air quality observation data, the model accuracy significantly improved compared to base model result (without assimilation). It reported very high correlation value (0.98) and considerably decreased mean bias. Especially, it well captured some high peaks which were underpredicted by the base model. To assimilate satellite data, we applied AOD scaling factors to quantify each species contribution to total PM concentration and find-mode fraction(FMF) to define vertical distribution. Finally, the improvement showed fairly good agreement.