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Improvement of PM concentration predictability using WRF-CMAQ-DLM coupled system and its applications

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Air quality due to increasing Particulate Matter(PM) in Korea in Asia is getting worse. At present, the PM forecast is announced based on the PM concentration predicted from the air quality prediction numerical model. However, forecast accuracy is not as high as expected due to various uncertainties for PM physical and chemical characteristics. The purpose of this study was to develop a numerical-statistically ensemble models to improve the accuracy of prediction of PM10 concentration. Numerical models used in this study are the three dimensional atmospheric model Weather Research and Forecasting(WRF) and the community multiscale air quality model (CMAQ).
The target areas for the PM forecast are Seoul, Busan, Daegu, and Daejeon metropolitan areas in Korea. The data used in the model development are PM concentration and CMAQ predictions and the data period is 3 months (March 1 - May 31, 2014). The dynamic-statistical technics for reducing the systematic error of the CMAQ predictions was applied to the dynamic linear model(DLM) based on the Baysian Kalman filter technic. As a result of applying the metrics generated from the dynamic linear model to the forecasting of PM concentrations accuracy was improved. Especially, at the high PM concentration where the damage is relatively large, excellent improvement results are shown.