Detailed Contributions of Foreign and Domestic Emissions to Particulate Matter over South Korea Forecasted with WRF and UM models

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Introduction

- South Korea is under the influence of very high (> 100 ug/m3 as daily average) particulate matters (PM) episodes.
- It is critical to examine the effects of meteorological inputs to a chemical transport model (CTM) on the estimation of PM contribution.
- We compare meteorological inputs to two CTMs; Unified Model (UM) and Weather Research and Forecasting model (WRF), and analyse the impact on the predicted PM concentrations and contributions with CMAQ.
- To estimate contributions of major emission sectors to South Korea PM, we apply brute force method with perturbed emissions on industrial, residential, power plant, and transportation source sectors in foreign countries and South Korea.

Methodology **Model Setup** Air Quality System Set-up **Brute Force Method (BFM)**



























Conclusions

- 10-m wind speed simulated with WRF is higher than that simulated with UM during the period in 2014.
- For primary PM emissions, residential emissions (~54%) are prevailing in January while industrial emissions are dominant in April, July and October by up to 66% over China. CMAQ w/ UM simulated higher PM10 concentrations than CMAQ w/ WRF over South Korea in general.
- PM10 contributions from foreign emissions are around 42% for WRF-CMAQ and 46% for UM-CMAQ respectively in July 2014.
- For July 2014, PM10 contribution of Chinese Industrial emissions to South Korea PM estimated with WRF-simulated meteorology was around 27% while that with UM-simulated meteorology was around 30% for the month.