Atmospheric Chemistry
Observations & Modeling

ACOM Seminar

Exploring Korean air quality using chemical transport models and multiplatform observations

Si-Wan Kim
Yonsei University

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ABSTRACT

South Korea has been facing severe air quality challenges, particularly concerning surface ozone and particulate matter (PM). The complexity of air quality problems in Korea arises from the influence of emissions from China, regional chemistry, atmospheric transport, and local processes. This study investigates the current status and trends of surface ozone in Korea. Most monitoring sites have reported an annual increase of 1-2 ppb in daily maximum 8-hour average ozone concentrations, with levels exceeding 70 ppb since the early 2010s. The reasons behind these increases remain unclear. The chemical transport model may serve as a useful tool to address this issue. The global model CAM-Chem (Community Atmosphere Model with Chemistry) is effective for understanding seasonal changes and long-term variability in tropospheric ozone. Using extensive observations from the 2016 KORUS-AQ field campaign and surface data from China and Korea, we analyze and present the capabilities of the regional model WRF-Chem (Weather Research and Forecasting model coupled with Chemistry) for simulating ozone, formaldehyde, and their precursors, identifying areas for improvement. Comparisons of model results with satellite retrievals of NO_2 and formaldehyde highlight regions where NO_x and volatile organic compound (VOC) emissions are highly uncertain. The study found overestimations of NO_x emissions over Chinese megacities and biogenic VOCs in southern China. Satellite data, along with aircraft observations from KORUS-AQ, also help refine PM simulations. This presentation will conclude by introducing exciting opportunities to study emissions and chemistry over Asia using geostationary data from GEMS (Geostationary Environment Monitoring Spectrometer).

For more information, please contact Qing Ye (qingye@ucar.edu) or Kyle Zarzana (kzarzana@ucar.edu).
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