A Modeling Study of Emission Control Strategies in Urban Cities in the Yangtze River Delta, China

*Jingyi Li[1], Nan Li[1], Yuhao Mao[1], Zhenxin Liu[1], Jianlin Hu[1], Hong Liao[1], Hao Fang[1]

1. Nanjing University of Information Science & Technology

With fast advances in economy, most eastern Chinese cities are experiencing severe air pollution and in an urgent demand of stringent emission control strategies. The Community Multi-scale Air Quality model (CMAQ) and the Weather Research & Forecasting model (WRF) were applied to study the air quality and emission control strategies in two urban cities, i.e. Shanghai and Nanjing in the Yangtze River Delta (YRD), China. Multi-resolution Emission Inventory for China (MEIC) and the Model of Emissions of Gases and Aerosols from Nature (MEGAN) were used for anthropogenic and biogenic emissions, respectively. We evaluated model's performances against seasonal observations of O_3, NO_x, SO_2, $PM_{2.5}$ and PM_{10} at 10 monitoring sites in Shanghai and 11 monitoring sites in Nanjing during 2015. We further compared detailed $PM_{2.5}$ composition from the model and measured data at an urban monitoring site as an additional constraint. The model can well reproduce the spatial and temporal distribution of these chemical compounds. We then designed emission control strategies for $PM_{2.5}$ in Shanghai and Nanjing based on the modeling results. Sensitivity tests showed that long-range transport is mainly responsible for $PM_{2.5}$ pollution in both cities. Therefore, a collaborative emission control strategy in Nanjing/Shanghai and their surrounding regions is needed to effectively improve air quality. We also performed several sensitivity tests to study the response of $PM_{2.5}$ to different total controlled emission reductions as well as major primary emitted $PM_{2.5}$ precursors. This information is very useful for the government in policy making in the future.

Keywords: Emission control, CMAQ, WRF, China

