6.149 Source Apportionment of PM2.5 and Secondary Organic Aerosol Estimation in Pearl River Delta of China.

Early Career Scientist

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Abstract:

$PM_{2.5}$, causing decrease of atmospheric visibility and adverse health effects, becomes the focus of air pollution control in China. Pearl River Delta (PRD) is one of the most economically developed regions in China and ever experienced severe air pollution. However, the air quality in PRD got better and better after strict air pollution control measures applied and successful economic transformation in the recent ten years, with $PM_{2.5}$ finally meeting the national standard in 2015. PRD is now regarded as a model of making a balance between development and environment. In this study, the latest $PM_{2.5}$ source information in PRD was explored, with the three cities around the estuary of PRD, i.e., Dongguan, Shenzhen, and Zhuhai, selected as typical sampling domains. There were five sampling sites setup in each city and all the $PM_{2.5}$ samples were collected in the four seasons from 2014 to 2015. Water-soluble inorganic ions, organic carbon (OC), elemental carbon (EC), and trace elements were detected and quantified for these samples. The positive matrix factorization (PMF) model was applied to the $PM_{2.5}$ dataset in each city to

make source apportionment. The results show that: (1) the mean mass concentration of $PM_{2.5}$ was 41.4 μg/m³ in the three cities, far lower than ten years before; (2) secondary sulfate (21-30%), vehicle emissions (15-27%), and secondary nitrate (10-12%) were the main sources of $PM_{2.5}$. Dust, biomass burning, ships, sea salts, and industrial dust each contributed 1.6-8.2%; (3) the analysis of spatio-temporal variation of main sources of $PM_{2.5}$ indicated that vehicle emissions mainly came from local sources, secondary sulfate mainly came from regional formation, while both local and regional sources contributed significantly to secondary nitrate; (4) secondary organic aerosol (SOA) was also identified and estimated by the PMF model and found to account for 34% of total organic mass on average.