

Aerosol characteristics and sources in Yangzhou, China resolved by offline aerosol mass spectrometry and other techniques

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Characterization of fine aerosol characteristics and sources is essential in reducing the air pollution in the densely populated areas, such as the Yangtze River Delta region in China. This study performed a half-year long PM_{2.5} sample collection in Yangzhou and analyzed the chemical components using various techniques, in particular, an Aerodyne soot particle aerosol mass spectrometry (SP-AMS). The measured species were able to reconstruct the majority of PM_{2.5} mass (on average, 91.2%). Source analyses of inorganic species found that secondary nitrate, sulfate and chloride were the major species, and also qualitatively inferred primary sources including biomass burning, coal combustion, traffic, industry and re-suspended dust due to nearby demolition activities. EC-tracer method derived that the organic matter (OM) was composed of 65.4% secondary OM (SOM) and 34.6% of primary OM (POM). SP-AMS determined that the water-soluble OM (WSOM) occupied 60.3% of OM, close to the fraction of SOM to OM, and correlation analyses showed that WSOM might enrich SOM, while water-insoluble OM (WIOM) was likely abundant in POM. Further positive matrix factorization (PMF) analyses on WSOM identified three primary sources including traffic, cooking and biomass burning, and two secondary factors. Indeed, we found the secondary factors dominated WSOM mass (68.1%), and their contributions increased with the increase of WSOM concentrations. The relatively small contribution of primary sources in WSOM was likely due to the low water solubility of these primary OM factors. This study improves understanding of the complex aerosol sources and chemistry in this region.