

## Analysis of chemical composition and size distribution of urban aerosol under three temperature conditions

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Atmospheric aerosol components evaporate or condense as a result of the changes in air temperature. The volatility is an important property for the atmospheric lifetime of aerosol components because it could influence on the rate of chemical reactions and the removal by deposition. Recently, Huffman et al. (2009) reported atmospheric aerosol measurement using a high-resolution time-of-flight aerosol mass spectrometer (HR-ToF-AMS) coupled to a thermodenuder. Based on the measurements, they discussed the volatility of positive matrix factorization (PMF) components, i.e., hydrocarbon-like organic aerosol (HOA), semi-volatile oxygenated organic aerosol (SV-OOA), and low-volatility oxygenated organic aerosol (LV-OOA). Our knowledge on the volatility of PMF components including the relation to the size distribution is, however, still limited. In this study, we investigated the composition and size distribution of urban aerosols and assessed the differences under different temperature conditions.

The atmospheric observation was performed in Nagoya in August 2010. The chemical composition of aerosols was obtained by introducing them to HR-ToF-AMS after they passed through a PM1 cyclone, two diffusion dryers filled silica gel, and one of two heated pipes (100 and 300 degC) or a bypass tubing. We changed the temperature conditions that particles experienced to room temperature (RT), 100 degC, and 300 degC every 30 min. The data for the period from 16 to 25 August was analyzed.

In the first three days of the studied period, the concentrations of organics and inorganics were high. In the second three days, the concentration of nitrate was high in the morning on 21, whereas the concentrations of other components were low. In the last three days, the concentrations of organics and nitrate were low. Conversely, the concentrations of sulfate and ammonium were the highest in the morning of 23. The concentrations of chemical components at 100 and 300 degC were compared with those at RT. The mean concentrations of organics, nitrate, sulfate, and ammonium at 100 degC (or 300 degC) were, respectively, 73% (9%), 71% (18%), 94% (5%), and 91% (1%) of those at RT. While the concentrations of all these components decreased by the heating to 100 degC, the differences in the shape of the size distributions at different temperatures (RT and 100 degC) were not clear. We calculated the size distributions of PMF components at RT and 100 degC based on (1) a method using the intensities of three peaks in the mass spectra ( $m/z$  43, 44, and 57) and (2) a method using the signals in 187 different  $m/z$  in each diameters. The sum of the size distributions of the PMF components calculated using these two methods agreed well with the size distributions of total organics. The centroid diameters (in the log scale) of the size distributions of the PMF components averaged for one day (from 06 to 06 LT) at RT and 100 degC were calculated. The averages (and ranges) for HOA, SV-OOA, and LV-OOA at RT were, respectively, 365 nm (325-403 nm), 362 nm (267-436 nm), and 502 nm (433-546 nm), and those at 100 degC were, respectively, 353 nm (314-454 nm), 336 nm (212-404 nm), and 497 nm (459-544 nm). Whereas the mean centroid diameter of LV-OOA was larger than the mean centroid diameters of HOA and SV-OOA, the mean centroid diameters of HOA and SV-OOA were similar regardless of the temperature conditions.

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