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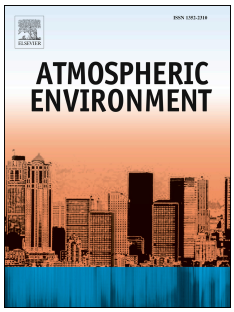

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Influence of chemical size distribution on optical properties for ambient submicron particles during severe haze events

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Abstract Despite of extensive efforts on investigation into characteristics of severe haze pollution in megacities of China, the accurate relationships among the aerosol composition, mass-size distribution and optical properties during pollution episodes remain poorly understood. Here, we conducted in situ measurements of the mass size distribution of submicron aerosol (PM_1) species by using a High-Resolution Time-of-Flight Aerosol Mass Spectrometer (HR-ToF-AMS), particle light scattering by a Cavity Attenuated Phase Shift ALBedo monitor (CAPS-ALB) and a Photoacoustic Extinctionmeter (PAX) during the winter of 2017 in Shanghai, China. The average PM_1 concentration was 85.9±14.7 μg/m^3 during the haze episodes, of which was ~7 times higher than that of clean period (12.1±3.1 μg/m^3). Organic aerosol (OA) and inorganic species (SO_4^{2-} + NO_3^- + NH_4^+) contributed 39.9% and 51.2% of the total mass of PM_1 during the haze episodes, respectively. OA exhibited a single or bimodal distribution during the haze episodes with the peak concentration of 51.8 μg/m^3. There were no obvious differences between ammonium nitrate (NH_4NO_3) and ammonium sulfate ($(NH_4)_2SO_4$) during the haze episodes, which exhibited single

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