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Chemical Characterization and Mixing Sate of Ambient PM in Xi'an Winter

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Particulate Matter influences visibility, human health (Anderson and Atkinson, 2007), and climate. The difference of mixing state of chemical species in PM affects the physical properties of PM such as hygroscopic growth (Hersey et al., 2011), Cloud Condensation Nuclei(Stocker et al., 2013) and light properties(Huang et al., 2013).

Chongqing is one of the four direct-controlled municipalities in China. The whole Chongqing city is on the edge of Sichuan basin, surrounded by mountains, with the crossing of Yangtze River. As a part of Sichuan basin, Chongqing is currently suffering the heavy air pollution from both gaseous and particulate pollutants(Yang et al., 2011). The study of ambient PM chemical characterization is insufficient. Thus in this study, the study of PM using online aerosol mass spectrometer is reported.

The Single Particle Aerosol Mass Spectrometer was deployed in the Atmospheric Monitoring Supersite in the south of the city. During the thirty-day campaign, a total of approx. 1 million particle were collected with valid mass spectra. After the ART-2a clustering analysis, the whole dataset were catalogued into 8 groups: EC-traffic, ECOC-coal burning, ECOC-Biomass burning, Aged Biomass burning, OC-combustion, Ca-dust, Si-Dust, Al-Dust and B-dust groups. Among them, the major clusters are from Biomass Burning, Coal burning, traffic, and dust.

The secondary species, such as sulfate and nitrate were found internally mixed with above 90% of total collected particles. The secondary organic species, marked by CH_3COO and COOH, were observed mainly mixed with combustion and traffic emitted particles.

The diurnal analysis of the mainly group suggests that all the primary emitted particles decrease in the afternoon excluded the influence of planetary boundary layer expansion. The aging process was significant in the afternoon due to high temperature and high relative humidity, as well as the strong solar radiation.

This study is helpful for understanding the chemical composition and mixing state of ambient PM in summer of Chongqing, and to provide scientific suggestion for policy makers for PM abatement.

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