In situ detection of the chemistry of individual fog droplet residues in the Pearl River Delta region, China

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Abstract

Here we use a single particle aerosol mass spectrometer (SPAMS) coupled with a ground-based counterflow virtual impactor (GCVI) to directly measure the chemistry of individual fog droplet residues in submicron size. This is the first report providing single-particle dual-polarity mass spectrometry measurements of fog droplet residual particles in China. We show that most of the fog droplet residues are comprised of elemental carbon (EC) (67.7%), followed by K-rich (19.2%) and mineral dust (12.3%). Our previous measurement demonstrated enhanced gas-to-particle partition of trimethylamine (TMA) and hydroxymethanesulfonate (HMS) by fog processing. Here, we present direct observational evidence that TMA and HMS are not found within fog droplet residues. Additionally, metals showed a ability to play an important role in fog events, while higher fractions of [SiO3]- were observed in fog droplet residues than in ambient and interstitial particles. The results highlights the importance of interplay between anthropogenic emissions and regional climate system

Keywords: fog, mixing state, chemical composition, GCVI, single particle, PRD

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