The Impact of Fog/Cloud Processes on The Formation of Secondary Organic Aerosols and The Physicochemical Properties of Atmospheric Particles

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Abstract

Fog/Cloud provides a rich liquid-phase environment for atmospheric chemical reactions, making significant contributions to the formation of secondary inorganic and organic aerosol components. After the evaporation of droplets, the physicochemical characteristics of aerosols may undergo significant changes, affecting their atmospheric chemical processes as well as their environmental and climate effects. However, most existing studies have focused on the analysis of chemical components in cloud and fog water, and it remains unclear to what extent the fog/cloud processes affect the formation of secondary organic aerosols and the physicochemical properties of particles. This study conducted a series of observations at the Mt. Tianjing in Southern China. Based on the analysis of the chemical components of fog/cloud water, we introduced single-particle mass spectrometry and transmission electron microscopy to systematically compare and analyze the physicochemical properties (mass spectrometry characteristics, morphology, elemental composition, and mixed structure) of ambient particles during non-cloud periods and cloud droplet residual particles during cloud processes. We studied the contribution of fog/cloud liquid-phase processes to the formation of secondary organic aerosols, in particular the nitrogen-containing organics, as well as the impact of secondary organic aerosol formation on the microphysical properties of black carbon particles. Additionally, we used the discrete dipole approximation algorithm to calculate the light absorption cross-section of black carbon particles and assessed the impact of fog/cloud processes on their light absorption effects. The results of this study can provide a reference for future accurate simulations of fog/cloud processes and their environmental and climate effects.

Early Career Scientist

NO, I am not an early career scientist.

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