

Chemical characteristics of the three-stage fog water in the winter of Nanjing

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In order to understand the chemical characteristics of fog water in Nanjing, three-stage Caltech Active Strand Cloud Collector (CASCC) was used to collect fog droplets in three separate droplet size ranges (from December 7th to December 9th, 2013). Fifty percent droplet size cuts of 22, 16, and 4 μm diameter are featured in stages one, two and three, respectively. Twenty-three fog samples were collected in two fog events and divided into eight periods. Concentrations of cations and anions in each sample were detected by ion chromatography. Composition of the fog water, chemical composition distribution characteristics of fog water in each stage, the correlation of ions in each stages and the relationship between ion concentrations and gaseous pollutants or microphysics were considered together during the analysis. The results showed the pH mostly resided in acidic range. The electrical conductivity and the changing trends of total ion concentration (TIC) of the fog water on the outskirts of Nanjing are consistency. The conductivity of the first stage fog water is markedly lower than the third stage, but during the second, forth and the fifth sample period, we found that the conductivity with the distribution of particle diameter, present a "U" type distribution. The three-stage CASCC data showed significant size-dependence for all reported species. The small drop fraction had significantly high concentrations of the major ions (NH_4^+ , NO_3^- , SO_4^{2-}), lower pH values and higher EC values than the large drop fraction. Also the data showed concentrations of the species was higher at night. Due to the differences in contribution from regional pollutant sources, soluble components varied greatly in different fog events. Also the ionic composition had a significant relationship with microphysical properties and pollutant gases.