



Investigation of Nucleation Events in Wintertime Beijing, China

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Nucleation processes contribute substantial secondary aerosols in the atmosphere, which often lead to severe air pollution episodes in China, especially in heavily populated urban area. In this work, we conducted field observations of nucleation events in a rural site of Beijing, from January to March 2016. Nucleation events were frequently observed during the measurement period. The nucleation rates of 1.0 nm diameter aerosol (J1) were determined from direct measurements of particle size distribution of 1.4 - 3.0 nm by a particle size magnifier (PSM) with a value up to a few hundreds particles $\text{cm}^{-3} \text{s}^{-1}$, significantly higher than what we observed during CAREBeijing 2008. Meanwhile, gaseous sulfuric acid (H_2SO_4) was measured with an atmospheric pressure ionization high-resolution time-of-flight chemical ionization mass spectrometer (API-HR-ToF-CIMS). H_2SO_4 dimers and sub-3 nm aerosols showed excellent correlations during the nucleation events. NH_3 was also observed by another chemical ionization mass spectrometer with a value ranging from a few ppbv up to ~ 20 ppbv. Cold ambient temperature (less than -10°C) and high NH_3 concentration may explain the unusually high nucleation rates, which could contribute to the winter haze formation in the urban area of Beijing and should be investigated in more details.