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The phase state of urban aerosols in the atmosphere of Beijing, China

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The phase state of aerosols particles plays a key role in the absorption, diffusion, and chemical reactions of active trace gases at the surface and in the bulk of atmospheric aerosols (Virtanen et al., 2010; Koop et al., 2011). Up to now, little information is available on the phase state of ambient particles, especially in the urban environments. In the present study, we operated a three-arm impactor apparatus (Bateman et al., 2014) to measure the bouncing factors of the ambient atmospheric aerosols in the Beijing, China, where is frequently experiencing heavy haze episodes. Simultaneously, the particle chemical composition and particle hygroscopic growth factor were measured using an Aerodyne HR-Tof-AMS and a Hygroscopicity Tandem Differential Mobility Analyzer (H-TDMA), respectively. On a basis of these data, the particle phase state and its link to particle hygroscopicity and chemical composition will be investigated. Our preliminary results showed that the bouncing factors decreased smoothly with the increasing ambient relative humidity (RH). The bouncing factors were below 0.2 above RH=50%, indicating that particles were liquid phase above this RH. The observations showed that the heavy pollution periods with an extremely high PM2.5 mass concentration (>150 ug/m3) typically associated with a high ambient RH (>50%). This means that the particles were liquid phase when the heavy pollution occurred. It implies that the particles with a liquid phase could be efficient reaction vessels in which atmospherically multiphase chemical and physical processes can occur.

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