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Long-term aerosol number size distributions down to 1 nm in urban Beijing

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To reveal the characteristics of aerosols in polluted environments, we measured aerosol number size distributions in the size range of ~1 nm – 10 μ m during 2018- 2020 in urban Beijing. As a vital process influencing the aerosol size distributions, new particle formation (NPF) events were frequently observed in urban Beijing. We classified NPF days into typical NPF days with a burst of sub-3 nm particles and those with few sub-3 nm particles. We examined their characteristics and possible reasons. The mean aerosol number size distributions were clearly different and the peak particle diameter was ~1.5 nm and 12 nm, respectively. For those with a burst of sub-3 nm particles, however, the peak diameter shifts from small diameter to larger particle diameters as the aerosol size distribution evolves during the NPF process and then becomes similar to those with few sub-3 nm particles. Meteorological analysis indicates that air mass movement may account for these observations. Despite these differences, similar diurnal patterns were observed on most days in urban Beijing, i.e., drastic change in aerosol size distributions happens around 4:00 a.m. and 4:00 p.m.