



## Number Size distribution of Atmospheric Submicron Aerosols in Thirteen Sites across China

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Number concentration and size distribution (15-600nm) of atmospheric submicron aerosols have been measured in thirteen sites across China during several campaigns from 2006 to 2011. All the sampling sites are categorized into four types, including five urban sites, four suburban sites, three regional sites and two cruise measurements along the eastern coast of China. Spatial and temporal variation of aerosols in nucleation mode (with particle diameter between 15 and 25 nm), Aitken mode (with particle diameter between 25 and 90 nm) as well as accumulation mode (with particle diameter between 90 and 600 nm) in all sites are investigated. Particle number concentration in urban and suburban sites are 2-5 times higher than in regional and sites and cruise measurements. Higher concentration of nucleation mode particles as well as more new particle formation events are found in urban and suburban sites than in regional sites and cruise measurements, indicating high formation rates in the urban sites due to anthropogenic emission of new particles formation precursors. Aitken mode particles are abundant in both urban sites and suburban sites, with larger variation in urban sites than in suburban sites. Accumulation mode particles present higher concentration in winter than in summer. Diurnal trend of both Aitken and accumulation mode shows a bimodal pattern, while the pattern of Aitken mode particles is much more obvious in urban sites but can be barely found in cruise measurements. Particle concentration in accumulation mode and Aitken mode have a weak correlation, with aerosols in different sites occupying different Aitken/Accumulation region. Log-normal modal fitting treatment are also used on particle size distribution data to provide the modal pattern as well as the aging information. Particle size distribution shows bimodal or trimodal patterns in most cases in urban sites. However, in regional sites and cruise measurements, the unimodal fit can always do a good job. The median accumulation mode (with median diameter larger than 70nm) diameters in suburban sites are often larger than those in urban sites, suggesting the growth of particles owing to the aging processes during the transportation. Rapid growth of median mode diameters are also found in urban sites during certain pollution processes. Slight differences on particle size distribution and diurnal variations among Beijing region, the Yangzi River Delta region and the Pearl River Delta region are found and the correlative reasons are discussed.