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Intra-community spatial variability of particulate matter size distributions in Southern California/Los Angeles

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Abstract. Ultrafine particle (UFP) number concentrations vary significantly on small spatial and temporal scales due to their short atmospheric lifetimes and multiplicity of sources. To determine UFP exposure gradients within a community, simultaneous particle number concentration measurements at a network of sites are necessary. Concurrent particle number size distribution measurements aid in identifying UFP sources, while providing data to investigate local scale effects of both photochemical and physical processes on UFP. From April to December 2007, we monitored particle number size distributions at 13 sites within 350 m–11 km of each other in the vicinity of the Ports of Los Angeles and Long Beach using Scanning Mobility Particle Sizers (SMPS). Typically, three SMPS units were simultaneously deployed and rotated among sites at 1–2 week intervals. Total particle number concentration measurements were conducted continuously at all sites. Seasonal and diurnal number size distribution patterns are complex, highly dependent on local meteorology, nearby PM sources, and times of day, and cannot be generalized over the study area nor inferred from one or two sampling locations. Spatial variation in particle number size distributions was assessed by calculating the coefficient of divergence (COD) and correlation coefficients (*r*) between site pairs. Results show an overall inverse relationship between particle size and CODs, implying that number concentrations of smaller particles (<40 nm) differ from site to site, whereas larger particles tend to have similar concentrations at various sampling locations. In addition, variations in r values as a function of particle size are not necessarily consistent with corresponding COD values, indicating that using results from correlation analysis alone may not accurately assess spatial variability.

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