

Turbulent Flux Measurements of the Residual Layer Nucleation Particles

The main objective of the proposed ARM Field Campaign is to examine the feasibility to use the eddy-covariance particle flux measurement of 2-10 nm particles to help distinguish between ground-level and elevated new particle formation events. The campaign is motivated by the recent study of Meskhidze et al. (2019) that suggests that a large number of the new particle formation events could be initiated in the residual layer where the temperature is colder, relative humidity is larger, and radiation is more intense compared to the surface. The campaign will involve the deployment of a self-contained trailer with a telescoping tower at the ARM SGP site to carry out particle turbulent flux measurements through Eddy Covariance (EC) and Relaxed Eddy Accumulation (REA) techniques. Specifically, we aim to:

- Quantify how eddy covariance vertical turbulent fluxes of particles can be used to separate ground-level and elevated sources of new particle formation events
- Evaluate if the residual layer new particle formation events can be unambiguously linked to observed Case B nucleation events detected at the surface
- Provide integrated data sets of ≥ 2.5 nm and ≥ 10 nm sized particle fluxes, particle size- and hygroscopicity-resolved fluxes, particle number distribution in 180 nm to 3 μ m range at 1 Hz frequency, and the size-selected particle number concentration measurements between ~5 to 80 nm.

Reference:

Meskhidze, N., Jaimes-Correa, J. C., Petters, M. D., Royalty, T. M., Phillips, B. N., Zimmerman, A., & Reed, R. (2019). Possible Wintertime Sources of Fine Particles in an Urban Environment. *Journal of Geophysical Research: Atmospheres*, 124(23), 13055–13070. <https://doi.org/10.1029/2019JD031367>





