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SIZE DISTRIBUTION OF SEA SPRAY FROM INDIVIDUAL BREAKING WAVES

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ABSTRACT

Knowledge of the magnitude and shape (i.e., dependence on particle size) of the production flux of sea spray aerosol is necessary for understanding the budget of cloud condensation nuclei in the marine atmosphere, modeling aerosol optical depth, and similar topics. Magnitudes of production fluxes determined from laboratory experiments with simulated breaking waves using artificial or actual seawater vary by as much as two orders of magnitude, and size distributions vary greatly, but the pertinence of these experiments to particle production in actual oceanic breaking waves is questionable (de Leeuw et al., 2011). In principle these concerns might be overcome by determination of the size distribution of oceanic breaking waves, but this approach is of limited utility because the magnitudes of the production flux from individual waves may differ substantially and because the fraction of production that is sampled depends strongly on the location of the sampler relative to the breaking wave and time after breaking. Consequently simultaneous measurement of the size distribution of primary particles in air directly impacted by individual breaking waves is necessary. The Ultra-High Sensitivity Aerosol Spectrometer (UHSAS) allow simultaneous determination of the particle number concentration over the diameter range 60-1000 nm, allowing examination of the variability of the shape of the sea spray production size distribution for individual waves and the dependence of this size distribution on temperature, biological activity, sea state, and other controlling factors. Results from preliminary experiments demonstrating proof of principle will be presented.

de Leeuw, G., E. L Andreas, M. D. Anguelova, C. W. Fairall, E. R. Lewis, C. O'Dowd, M. Schulz, & S. E. Schwartz, "Production flux of sea-spray aerosol," Rev. Geophys., 49, RG2001, 2011. doi:10.1029/2010RG000349