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# Analytical Formulation of Ocean Sea Spray Production, Aerosol Deposition, and Concentration Profiles

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The fundamental parameter required for representing the ocean as a direct source of aerosol particles is the size dependent *source function*, $S_n(r)$, or number of droplets of a given size produced at the sea surface per unit surface area per unit time as a function of the surface forcing (wind speed, wave breaking, surface stress, etc). Because the source function is difficult to measure directly at the interface, it is typically estimated from the height-dependent number-size distribution of droplets, $n(r, z)$, and/or the covariance of particle concentration with vertical velocity (turbulent particle flux). Current specifications of the source strength are based on laboratory studies, scaling arguments, and a few field measurements. In recent years, parameterizations in terms of the physical processes of sea spray production have been sought, but it has proven difficult to clearly relate the source function to observations. In this paper we discuss the formulation of the aerosol source function problem in terms of turbulent, molecular, and inertial processes within two layers over the ocean: layer *one* is below an effective source height and layer *two* is above that height. We show that the aerosol deposition velocity can be defined in an unambiguous manner that permits straightforward interpretation of the effective source strength (derived from measurements) in aerosol budget equations used for numerical models of aerosol dynamics.