Lake spray aerosol generation: A method for producing representative particles from freshwater wave breaking

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Supplemental Materials

Power law scaling for seawater bubble distributions

Following the maximum in seawater bubble concentration, the number of bubbles at larger radii have been observed to decrease by the following a power law scaling (Deane and Stokes, 2002; Hultin et al., 2010; Leifer and de Leeuw, 2006; Salter et al., 2014):

$$dN / dr = ar^{-b} \quad (3)$$

where r is the bubble radius and a is a scaling term. The b term can be highly variable, ranging from 0.8 to 5, because of its dependence on the evolution of the seawater bubble plume over time (Deane and Stokes, 2002) By fitting the synthetic seawater bubble distribution from 0.3-4 mm using Equation (3), the b term was determined to be 3 for the generated bubble plume. The representative power law fit confirms our plunging jet aerosol generator is capable of producing

bubbles in an analogous fashion to wave breaking in the ocean. The size distribution of bubbles produced in the LSA Generator from synthetic seawater, the synthetic freshwater, and the Lake Michigan freshwater sample all produced a power law scale decrease representative of bubbles produced from ocean wave breaking (Figure 3d).

References

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