

Interactive comment on “Lake spray aerosol generation: A method for producing representative particles from freshwater wave breaking” by Nathaniel W. May et al.

Anonymous Referee #1

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Referee comments on "Lake spray aerosol generation..." by May et al.

General comments: This is an interesting and valuable study of aerosol production from bursting bubbles in freshwater, a potentially important subject that has been little studied. The authors made a thorough preliminary study of bubble and aerosol size distributions from lake water, synthetic freshwater, and synthetic seawater. I state "preliminary" not with any pejorative or diminutive implication, but merely that one could envision continued similar studies with different (and known) organic content, and especially different temperatures. Overall the manuscript is solid and I recommend publication. Before publication, however, there are a few minor topics listed below that should be addressed.

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Specific comments: Concentrations should be denoted in units grams/kg of water or grams/kg of solution (which, for seawater, is salinity), rather than in grams/L. To the number of significant digits given, the numerical values are probably the same, but stating values in grams/L (presumably L refers to water and not the solution) requires specification of temperature and (to a much lesser degree) pressure.

Abstract and throughout manuscript: Describing size distributions as having "a peak near 300 micrometer" is ambiguous in two ways: whether the size refers to radius or diameter is not specified (and for particles the RH to which this radius or diameter refers must be specified as well), and the peak is meaningful only if the representation of the size distribution is specified, i.e., whether the representation is in the form dN/dD or $dN/d\log D$.

The statement at the end of p. 4 that bubble coalescence is inhibited in seawater due to increased surface tension caused by higher ion concentrations is not correct. Yes, higher ion concentrations lead to inhibition of bubble concentrations, and higher ion concentrations lead to slightly higher surface tension, but attributing the cause of the increased bubble inhibition to higher surface tension is incorrect.

On line 10 on p. 5, the authors seem to stress that the bubble size distribution is the dominant factor controlling the resultant drop size distribution, but the concentration of species that could remain after water evaporation is perhaps a more important factor. Were freshwater to have the same bubble size distribution as seawater and drop production mechanisms were the same, the resultant drop size distribution would still differ considerably as the amount of material in the ejected drops that can remain to form the dry particles differs considerably between the two media.

Toward the bottom of p. 7, the authors state that the depth (5 cm) is sufficient that it does "not affect the bubble plume or limit bubble lifetime," but this is not supported by any reference, and it would seem that breaking waves would entrain bubbles to more than 5 cm.

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On p. 9 toward the bottom, the authors state that electrical mobility diameters and aerodynamic diameters "were converted to physical (geometric) diameters" but did not give any details as to how these conversions were done, the assumptions made, etc. This is important information that should be included.

On p. 17 the relation between solution concentration and bubble density was discussed, and different behaviors were seen for different ranges; thus why in Figure 7 was a linear fit assumed between these two quantities?

Similarly, on p. 19 the nonlinear relationship between total aerosol concentration and solution concentration is discussed, but a linear fit is presented in Figure. 8.

On p. 20 the authors conclude that low ionic concentration freshwater samples produce fewer particles than high ion concentration seawater samples, but the phrasing suggests that the ionic composition is somehow important rather than merely the greater solute concentration. To draw such a conclusion, it would seem that both ionic and nonionic solutions should be investigated. In contrast, on p. 21 they state that the low concentration of salts in freshwater is the reason.

In Figure 4, it is not clear if the dotted lines are lognormal distributions; this should be explicitly discussed. Additionally, it would aid the reader if a dotted line representing the sum of the two modes for the blue and red graphs were shown.

In Figure 7, why are bubble size distributions displayed as dN/dD rather than $dN/d\log D$, similar to the representation used for aerosol size distributions? This would allow a more facile comparison between bubble production and drop production.

In Figure 7, the labels differ from the caption (e.g., NaCl is shown in B).

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