Ocean Science Discussions

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Comment on os-2021-104

Anonymous Referee #2

Referee comment on "Ocean bubbles under high wind conditions – Part 2: Bubble size distributions and implications for models of bubble dynamics" by Helen Czerski et al., Ocean Sci. Discuss., https://doi.org/10.5194/os-2021-104-RC2, 2022

Review of os-2021-104

Ocean bubbles under high wind conditions. Part 2: Bubble size distributions and implications for models of bubble dynamics.

Helen Czerski, Ian M. Brooks, Steve Gunn, Robin Pascal, Adrian Matei, Byron Blomquist

The manuscript reports on a large data set of bubble size distributions at 2m and 4m depth, and in various wind and wave conditions. The data set is extensive and is undoubtedly of interest to the community. The paper merits being published after revisions.

General comments:

I appreciate the difficulty of making such measurements and the dataset is certainly impressive. While I appreciate the honesty of the authors in clearly stating the limitation of the data set, I find the analysis somewhat speculative and lacking, particularly in the use of the ancillary data available from these measurements campaigns.

It would be interesting to see void fraction and the peaks of the moments of the bubble size distribution, as a function of wind speed, and wave related parameters such as significant wave height, wave age, significant wave slope, and breaking probability (white

cap coverage and the like). The data is sufficiently wide that decencies on the sea state are likely to emerge.

Minor comments:

Line 68, you mentioned that current numerical models cannot yet reproduce the complexity of breaking and air-entrainment events. I think they are getting pretty close and that's worth mentioning. See Deike et al, JFM 2016 for example. Although it is acknowledged that these numerical models do suffer from the same scale limitations as laboratory experiments do.

If understand correctly, figure 1a shows the probability of measuring a bubble of a given radius for different wind speeds; and figure 1c shows the radii in the very tail of these distributions in the 90^{th} percentile and up. Does this mean that figure 1c shows bubble sizes that are essentially unlikely to be present in the data (90% of the time)?

For clarity, please use the same labels for the normalized size distributions of figures 2b, 3, and 4. Also, it is important to note that the normalization does not render the data dimensionless.

Please, rephrase line 275 “At 2 m, the peak volume has a limited relationship with the void fraction, and does not show a large decrease immediately after a peak.”

I believe the authors meant to say something akin to “At 2 m, the radius of peak volume has a weak relationship with the void fraction, and does not show a large decrease immediately after a large void fraction events”