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Nonlinear Processes in Geophysics
Discussions

Interactive comment on "The Impact of Entrained Air on Wave Dissipation" *by* Juan M. Restrepo et al.

Anonymous Referee #1

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My major remarks concern: 1) the counter-intuitive results derived 2) the readability of the paper

For the first one (results), it is not at all obvious that the intrusion of air bubbles in the water would produce an overall increase of viscosity. I would think the opposite. Is there other research (theoretical or experimental) consistent with these results? If so, it would be highly advisable to include more references to such (previous) studies (to eventually cushion the reader intuition, as it is my case). If not, pls. provide an explanation of how this effect is physically possible. The authors seem to take for granted this fact, but Fig. 1 (for instance) is shocking and struggling at first sight. Then I keep wondering, but not convinced.

For the second (readability): a) Although the compact vectorial math notation in section

2 may be elegant, it is not very friendly (physically), specially considering that the subject is new and the results are not evident. Pls. explain what is the physical meaning of each term in these equations (see annotations).

b) Each section has a different writing style, in which explanations go from too general and sometimes speculative to too specific. In this flow, it is very difficult to grasp the actual implications of the case studied. The article starts talking about wave (energy) dissipation, so the reader is invited to think about the main (mainly breaking) process, in which viscosity should play a marginal role. Then somewhere out of the blue, there is a hint to the scale to capillary waves. Indeed for large scale the assumption of (bubbles) homogeneity seems a questionable one, I believe you would need a two-layer model. If the scale is at the capillary level, I agree that homogeneity is a valid (first) possible approach. However all this is not mentioned clearly (should be stated upfront). Only in later stages it is indicated that a good rain is necessary to generate the correct bubbles, and that the scale of impact is in the capillary waves, so the actual effect on dissipation may be negligible. However the effect in surface roughness may be interesting. Pls. consider explaining better this in the discussion section, and preferably also give explicitly all the scales involved (wave length range).

c) Given the previous remark I wonder: Is your title fair? probably a better title may avoid the reader predisposition to think on large scale dissipation. If you stick to it, pls. consider including the word "energy".

d) I've noted in paper some other remarks to the text, where I've scrapped parts that contribute only to speculation and confusion. Consider removing those and excuse the rudeness.

Please also note the supplement to this comment:
https://npg.copernicus.org/preprints/npg-2020-22/npg-2020-22-RC1-supplement.pdf