



EGUsphere, referee comment RC1
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Comment on egusphere-2022-660

Anonymous Referee #1

Referee comment on "Assimilation of sea surface salinities from SMOS in an Arctic coupled ocean and sea ice reanalysis" by Jiping Xie et al., EGU sphere,
<https://doi.org/10.5194/egusphere-2022-660-RC1>, 2022

The paper "Assimilation of sea surface salinities from SMOS in an Arctic

coupled ocean and sea ice reanalysis" looks at the effect of assimilating the latest version (V3.1) of SMOS surface salinity data into the Arctic region. It does this by comparing the results to model runs which either did not assimilate SMOS data, or used an earlier version (V2.0) of the data. Validation was done against a variety of in-situ sources. The broad conclusion is that the V3.1 data does bring some benefits.

My comments, both minor and major, on the manuscript can be found in the accompanying PDF

The results in the manuscript will clearly be of interest to readers of EGU sphere. I also cannot see any major errors with the approach taken and how the results were obtained. That being said, and to be blunt, the paper is currently in a very poor state and needs to be considerably improved before publication.

Some, but not all, of my major issues are:

- The English is very poor, and nearly indecipherable in places. Most of my 230+ comments relate to the English. I appreciate that the authors are not native English speakers and that writing in English may be difficult. However, I recommend getting a native English speaker to proofread any future version before resubmitting.
- There is a lack of care with the mathematics; three of the six equations in the paper look to be wrong.
- The authors claim to use the DEnKF assimilation system, but their description, and

mathematics, more closely relate to the EnKF – which is not the same.

- The authors do much of their analysis on absolute fields, which all look very similar to each other. This makes it hard to believe their conclusions. It would be much more informative to look at the difference fields.
- The authors need to give correlation coefficients between the model results and the in-situ observations. Regardless of the data being assimilated, some of the plots in figures 4, 6 and 7 make it look like the model is doing very poorly at representing salinity changes. It would be useful to see this quantified.

Given these points, and my comments in the attached PDF, I am recommending that the paper is accepted, but only after major, and extensive, revision.

Please also note the supplement to this comment:

<https://egusphere.copernicus.org/preprints/2022/egusphere-2022-660/egusphere-2022-660-RC1-supplement.pdf>