



EGUsphere, referee comment RC2  
<https://doi.org/10.5194/egusphere-2022-957-RC2>, 2022  
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## Comment on egusphere-2022-957

Anonymous Referee #2

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Referee comment on "Improving sea surface temperature in a regional ocean model through refined sea surface temperature assimilation" by Silje Christine Iversen et al., EGUsphere, <https://doi.org/10.5194/egusphere-2022-957-RC2>, 2022

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The paper "Improving the SST in a regional ocean model through refined SST

"Assimilation" describes a new system to assimilate passive microwave data into a regional model near Norway. The bias correction system for these data and a new observation operator (the supermod operator) are described. The authors claim improved results from these new systems giving statistics from a run covering April-June 2018. A spectral analysis is also presented.

A full list of my comments can be seen in the attached marked up PDF

In general I found the paper to be well written and the figures to be of good quality. Aside from some missing references, I am also happy with what is presented on the bias correction.

However, I found the supermod part of the paper to be much less convincing and I think this needs considerable work. I have a number of problems with this work:

- The authors have reduced the observation error variance when supermodding by a factor of more than six. While some change in observation error would be expected, no proper argument is given for the values chosen. From their results I think it is possible that this was too large a reduction and the authors are overfitting the data. Also, I would have expected to see an additional experimental run where the observation errors have not been changed so the effect of the supermod operator could have been seen in isolation.
- The results shown indicate an increase in power in the high wavenumbers in the model.

However, I don't understand this as the increments are visually smoother (figure 7). This needs to be properly explained. Also, the power spectrum of the increments, not just the model, should be given.

- The supermoded observations resulted in significantly degraded statistics. I found the authors assertion that this was due to a "double penalty" issue to be unconvincing. This is because neither the resolution of the model nor the verification data has changed. It's also because the increments look smoother to me (see above bullet point). I think it is more likely that they are overfitting the data and putting noise into the model. The authors either need to provide much better evidence to support their beliefs and refute mine, or they need to recalibrate the assimilation to reduce overfitting.

These are major issues with the manuscript and will require work to resolve. However, I believe the paper is of interest and that the problems can be addressed. Therefore I am recommending the manuscript for major revision.

Please also note the supplement to this comment:

<https://egusphere.copernicus.org/preprints/2022/egusphere-2022-957/egusphere-2022-957-RC2-supplement.pdf>