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The Cryosphere Discussions

Interactive comment on "Impact of assimilating a merged sea ice thickness from CryoSat-2 and SMOS in the Arctic reanalysis" *by* Jiping Xie et al.

Anonymous Referee #3

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The authors present impacts of assimilating CS2SMOS sea ice data on the TOPAZ4 system. Although the impacts of both CS2SMOS and Cryosat-2 ice thickness on the ice-ocean coupled model have been addressed by Mu et al. (2018), this MS has its new focuses and advances, e.g., extending the study period from one cold season to one full seasonal cycle, and besides the sea ice thickness themselves, also the impacts on sea ice drift fields, SIC, SSH, SST and T-S fields have been examined. It finds that CS2SMOS assimilation partially improves the sea ice drift fields (in the pack ice area) and has not degraded the other ocean fields. The influence of CS2SMOS is also quantified with DFS.

This is a very well written MS. It is may be of interest for a large community of users in the Arctic sea ice numerical modeling, data assimilation and prediction. Results are

clearly presented. The paper has 1 table and 13 figures, which all have appropriate captions and legends.

I recommend this paper for publication after a minor revision, considering the above statement and the comments made below.

Minor comments: 1) For the independent sea ice thickness comparison, the 3 mooring ULS sea ice draft observations in the Beaufort Sea should also be used. The ULS observations can provide the seasonal evolutions of local ice thickness, which are well agreed with the study period. 2) The CS2SMOS is a purely statistics merged product, while data assimilation can blend the SMOS and Cryosat-2 SIT after considering physics (at least partially), and this benefit has been illustrated by Mu et al (2018). The authors are encouraged to assimilate the SMOS and Cryosat-2 data directly in their future research or operational work.

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