Interactive comment on "Data assimilation using adaptive, non-conservative, moving mesh models" *by* Ali Aydoğdu et al.

Anonymous Referee #1

This paper studied the data assimilation using adaptive, non-conservative, moving mesh models. The authors proposed a novel methodology to perform EnKF method with models that use non-conservative adaptive moving mesh. To deal with the challenge that the dimension of the state space changes in time and differs across ensemble members, they use a mapping strategy that adds one forward and one backward mapping step before and after the analysis stage respectively. That implies they are doing data assimilation on the fixed reference mesh rather than on moving mesh which differs across ensemble members. The manuscript is clearly written and reasonably organized, and also contains some interesting findings and insights. I am in support of the publication of the current work, after some minor revisions. The followings are some questions and comments:

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1. The authors repeatedly mentioned the Lagrangian sea-ice model neXtSIM. I understand that the current work is motivated by a long range research effort aimed at developing suitable EnKF strategies for the neXtSIM. The neXtSIM model is solved on a 2-dimensional unstructured triangular adaptive moving mesh. But the current work only proposed the 1D remeshing procedure and 1D mapping method to the fixed reference mesh, and tested with 1D models. I can't understand why the authors gave such detailed introductions on the neXtSIM model and the remeshing on the triangular elements in section 1.3. As far as I understood, it seems that no substantial progress has been made to the data assimilation with 2D models using non-conservative adaptive moving mesh. If neither the method nor the experiment involves the neXtSIM model, it looks strange to describe it in the introduction.

2. Page 4, Line 20. It seems that Du et al.(2016) have already interpolated each ensemble member onto a fixed reference mesh, and carried out analysis on that fixed reference mesh. Did they develop the method on a 2D mesh? What is the difference between this work and their work?

3. Eq. (4) gives the condition for the validity of 1D mesh, and the remeshing procedure is introduced in section 3.2. The author indicates that the 1D mesh and remeshing retains the key features of the neXtSIM's 2D mesh. Is that means the neXtSIM model itself has conditions for the validity of 2D mesh and the remeshing procedure? What is the condition for the validity of 2D mesh?

4. In section 5.2 and 5.5, the authors introduced the mapping strategy to interpolate each ensemble member onto a fixed reference mesh. Eq. (12), (14) implies that the interpolation is done by taking average of adjacent points with no weights. It looks different from the traditional interpolation method. Why not use the weights relate to the distance?

5. Page 15, Line 14. The authors mentioned that localization is not used in this work. Please explain the reason. It is generally acknowledged that localization takes more

obvious effects on data assimilation than inflation.