

Geosci. Model Dev. Discuss., referee comment RC2
<https://doi.org/10.5194/gmd-2022-269-RC2>, 2023
© Author(s) 2023. This work is distributed under
the Creative Commons Attribution 4.0 License.

Comment on gmd-2022-269

Anonymous Referee #2

Referee comment on "Experiments with the modified Rotating Shallow Water model (modRSW, v.1.0): assessing the relevance for convective-scale data assimilation research" by Thomas Kent et al., Geosci. Model Dev. Discuss.,
<https://doi.org/10.5194/gmd-2022-269-RC2>, 2023

The authors aim to show the relevance of using the modRSW model as a tool for mimicking key aspects of convective scale data assimilation in order to justify the transfer of knowledge from a simplified and cheaper setup to an operational configuration. In my opinion, this is a very important and complicated topic which is often overlooked, because it is not straightforward how to tackle it. I think the authors made a good attempt and I encourage the publication of this article, after the authors have considered the following points.

General comments:

1) The topic of this article is very tricky, since much of the relevance of the setup with the modRSW will depend on the purpose of the research. I think the authors should put more focus on the type of research that would be and would not be appropriate with the modRSW. For example, the authors note based on the snapshots that DA can recover the location of convection but struggles with the intensity. We know that operational convective scale DA does have problems with location errors. So for research that seeks to deal with location errors the modRSW may not be suitable. Another important topic among toy model users is non-Gaussianity and positivity constraints on hydrometeors. Is the non-Gaussianity and non-linearity in the modRSW comparable to an operational model? Does the rain get negative values and does it influence the DA results in a similar way as in an operational setup? I encourage the authors to discuss what type of research would be and would not be appropriate with the modRSW.

2) Comparing this modRSW setup to an operational setup skips the natural step of comparing to an idealised setup with operational model. I think it would be helpful to design a similar idealised setup with an operational model to compare to the modRSW setup, to distinguish between model-caused differences and any other errors sources that come with the use of real observations. After all, in this work we are interested in the

relevance of the modRSW, so we want to isolate its role in the DA experiments. Could the authors provide some thoughts on this matter?

Specific comments:

L365: Observations \square members , right?

L370: By discarding negative observations, one creates a positive bias. Is this bias comparable to operational convective scale DA? As mentioned in general comment 1), non-Gaussianity and non-negativity is a popular topic among toy-model users, so I think this point should be explored more elaborately.

L412: the OID of 0.18, is for real observation experiments I assume. Would we expect a lower value for an idealised setup with operational model? As mentioned in general comment 2) shouldn't that be the value to compare the modRSW setup to?

L421: I don't fully understand how the thresholds of 20 and 40% are chosen, given the numbers mentioned in the previous paragraph.