

Geosci. Model Dev. Discuss., referee comment RC2
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Comment on gmd-2020-381

Anonymous Referee #2

Referee comment on "An update on the 4D-LETKF data assimilation system for the whole neutral atmosphere" by Dai Koshin et al., Geosci. Model Dev. Discuss.,
<https://doi.org/10.5194/gmd-2020-381-RC2>, 2021

In this work, the authors implement the IAU method to improve the DA scheme of a previous work: KSMW20. The effects of this improvement are particularly noticeable in the mesosphere and lower thermosphere, which is a typically neglected area.

This is, by construction, an incremental work. However, I think it is well constructed and it is detailed. Therefore I am pleased to recommend it for publication after some minor requests.

23. 'The' does it refer to one GCM in particular? Or to all in general?

26. Last sentence in line is grammatically incorrect.

30. The first sentence in this paragraph is quite long. Consider splitting in 2 shorter sentences.

48. Maybe a reference for these GCMs would be useful

85. The explanation about the generation of spurious waves by large analysis increments can benefit by using a figure, or referring to one in some of the existing papers dealing with this topic.

200. To refer sometimes to KSMW20 and sometimes to KSMW (without the year) can be confusing. I get that sometimes you refer the paper itself, and sometimes the actual system and analysis, but I think readers will find this cumbersome.

210. It may be worth to show the anomaly coming solely from the background so that one can notice the effect of the observations.

220. It is quite interesting to note that the amplitude of small waves is larger in high latitudes. Can this be related to any other known facts of the MLT region. You mention a bias of the model, maybe you can provide a reference about these previously observed facts.

227. Here again, I feel like the use of KSMW20 and the KSMW analysis is redundant. It can just be 'their' analysis.

280. New analysis does not say much. I would recommend something that indicates an incremental analysis update has been used.