

Response to Editor's Comments

Dear authors,

Please, check the comments from the reviewer. A few minor corrections are necessary before your paper is accepted for publication.

*Our response is given below; the requested corrections have been made in the new version of the manuscript. **Changes to the manuscript are in red.***

Also, please, pay attention to the data accessibility section:

1. Include the DOI in the section, not simply a citation to Hitchcock (2022).

We have added a DOI as requested.

2. Given the amount of data currently declared (in the order of hundreds of GB), please, consider publishing it in Zenodo.

CEDA offers a level of support more appropriate to the size and use case expected for the data generated by this protocol.

3. We can not accept restricted access to the data through registration or similar. Therefore, you must release the data under the "Publically available data" mechanism that CEDA provides, not the "Registered user accessible data".

Thank you for catching this - there was an unintended permissions issue affecting the reference dataset that has now been corrected. It is now accessible as 'publically available data' without the need for registration.

4. I have tried to download the data using my CEDA account. When I try to download a file, I get an HTTP ERROR 403, access forbidden. Please, as said before, recheck accessibility and make all the data available without any restriction, request for registration, etc.

We have confirmed that the data is available without restrictions.

Response to Anonymous Referee #2's Comments

General comments

While my recommendation to reorganize the priority of scientific purposes is not reflected, I think the authors have answered and addressed my comments in their revised manuscript as possible. I thank the authors for adding preliminary output from CESM2 (Figures 3 and 4) and discussing the benefits and drawbacks of zonally-symmetric and full-field nudgings (section 3.3). Although I still think the settings of the full-field nudging and its tropical part can be sophisticated if we deprioritize the fourth purpose, I agree that this is the matter that should be

tried anyway rather than disputed at this stage. I wish these aspects are reappraised after the success of inter-model comparisons participated by as many models as possible. Good luck with the project!

Thanks again to the reviewer for their helpful comments on this paper - we have corrected the technical issues raised below; please see our point by point responses for details. Our responses are in italics, comments corresponding to changes to the text or a figure are in red.

Minor comments

Figure 3: Please change the labels of vertical axes to the correct ones (T --> U).

Thank you for catching this - they are now correct.

Figure 4 caption: It is better to declare the contour intervals of the ensemble means. The same thing can be said of the contour intervals of the reanalysis in Figures 6, 8, and 10.

We have now specified contour intervals in the captions for Figs. 4 and 6; the intervals are the same in Figs. 8 and 10 as they are in Fig. 6.

Figure 4: It is better to arrange the units ([m/s], [K m/s]) same as other figures.

We have made the unit formatting more consistent.

I.295-: How many ensemble members are used to make Figures 3 and 4? Is it a 21-member ensemble (like a real-time forecast described in Richter et al.)? or over 50 members as requested in this protocol?

50 ensemble members are used; this is now stated in the text.

I.306-310: I think what should be argued in Figure 4 is how the ensemble spread in the tropospheric zonal-mean zonal wind varies among the experiments. The spread below the middle troposphere is not so different between the free and nudged (& control) runs, although there are some shrinks in the nudged (& control) run above 300 hPa.

The intent of this figure is to show that the nudging is working as intended: that is, that the zonal mean state of the stratosphere has been strongly constrained while the wave field is allowed to evolve freely. How this affects the tropospheric forecast is a central question to be addressed in the analysis of the output.