

Author's Response to Editor Decision: PVG Tropopause (egosphere-2024-471)

We thank the Editor for the careful reading of the manuscript and the helpful comments! In the following, we address all comments and questions raised (Editor's comments in italics) and state all changes in the manuscript. Line numbers refer to the *latexdiff* file.

1 Overall comment

Editor: *The authors have made a great effort to address the reviewers' comments on their manuscript, and have added a good deal of new analysis, which demonstrates that simplified versions of their methodology may be appropriate for some uses. I have just a few remaining minor comments.*

Authors: Thank you for this positive evaluation of the manuscript!

2 Specific comments and questions

Editor: *Both reviewers asked why ERA5 was so different to the other reanalyses. You have speculated that this could be a reflection of the much higher resolution in ERA5. I understand that you don't want to speculate in the text. However, I wonder if your methodology contributes to this. All reanalyses are interpolated onto isentropic levels, with 10K spacing, except for ERA5, which is interpolated onto 5K levels. Do you still see marked differences between ERA5 and the other reanalyses if you also interpolate ERA5 onto 10K levels?*

Authors: Thank you for the interesting question! We discussed whether interpolation of ERA5 data from native model levels onto isentropic levels with a coarser spacing of 10 K instead of 5 K would mitigate the differences in PV observed between ERA5 and the other reanalyses. We came to the conclusion that this interpolation would not affect the PV values on each isentropic level and does therefore not explain the PV differences between reanalyses. We assume that the steeper PV gradient in ERA5 is an internal property of the reanalysis and maybe due to the higher native grid resolution, but we can not pinpoint this to any specific cause yet.

Editor: *Reviewer 1 asked why you chose 1980-2017 as your analysis period. I recommend adding your reasoning (that this is the period with the largest overlap between reanalysis datasets) to Section 2.1.*

Authors: Thank you for the suggestion! We reworked lines 153–154 and added the following sentence at the end of Section 2.1, lines 193–194:

"We consider the period from 1980 to 2017, as it provides the largest overlap of available post-processed reanalysis datasets at the time of this study."

Editor: *Reviewer 2 asked you to remove a 'ca.', which you changed to 'up to 360K'. Just checking that you didn't mean to change this to "~360K", which would be closer to your original meaning.*

Authors: Thanks for the idea! We changed this to "up to ~360K" in line 353.

Editor: *L283, please add here that the choice of 30 and 50hPa to capture the QBO follows Stiller et al., 2012*

Authors: Thanks! Added "following Stiller et al., 2012" to line 274.

Editor: *L506: Additionally → However*

Authors: Thanks, done, line 495.

Editor: *L540: There appears to be only half a sentence here. Please check.*

Authors: Thank you for the note! This is most likely due to the LaTeX diff file being broken. However, the sentence is complete in the submitted manuscript, see also line 528 in the new latexdiff file.

Editor: L671: *'due to the wavy pattern of PV contours' isn't really an explanation of this behaviour. Can you link it better to other features of the atmospheric circulation, such as the jets, or the monsoon high?*

Authors: Indeed, thank you for the suggestion! We elaborated on the zonal variations of the tropopause as follows, lines 654–657:

“These global fields reveal noticeable zonal variations in tropopause height and latitude, which can be attributed to undulations of the subtropical jet streams caused by Rossby waves, as well as baroclinic instability forming high- and low-pressure areas, leading to zonal variability in the PV field.”

Editor: L734: *During* → *during*

Authors: Thank you! Fixed, line 717.

Editor: L785: *three reviewers* → *two reviewers*

Authors: Thanks, reworked the sentence accordingly in lines 767–769:

“Last but not least, we greatly appreciate the careful reading of the manuscript and helpful feedback by the editor Laura Wilcox, two anonymous reviewers, as well as Tim Blazytko, Jan Conrads and Y. C..”