We thank the reviewer for her/his comments. Below are our responses in blue. The biggest change is that the update version includes new figures in the appendix showing root mean square (RMS) differences of the parameters studied to get an idea of the day-to-day variability. Brief text explaining these RMS differences was added throughout the manuscript.

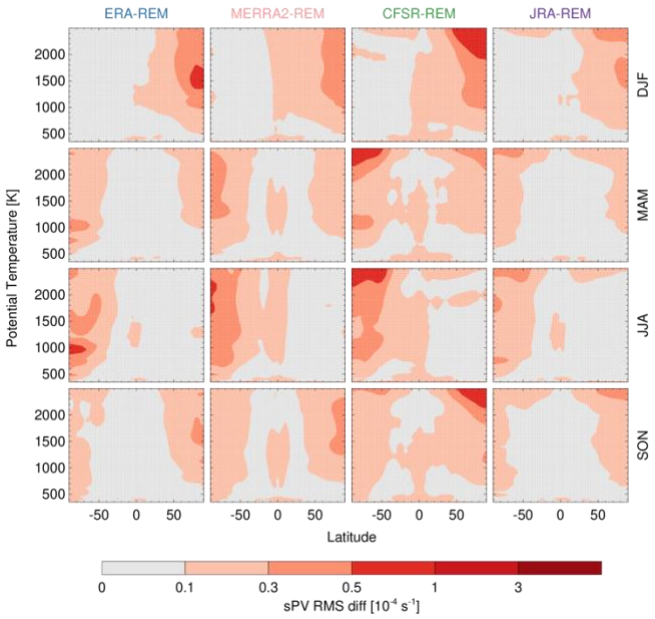
This study, as part of the S-RIP, investigates the agreement of potential vorticity diagnostics among four modern reanalysis datasets. Raw PV, PV-based tropopause height, and PV-based polar vortex shape diagnostics are evaluated. The general conclusion is that we can have confidence in using any of these datasets for most studies of the stratosphere using potential vorticity. Many of the diagnostics presented in this work were demonstrated to be useful in previous literature and are, to my knowledge, assessed and compared among a comprehensive set of modern reanalysis datasets for the first time. This comparison will serve as a useful reference for any study investigating stratospheric physics with the use of PV. I thus believe that it can constitute a valuable contribution to the ACP's S-RIP special issue after some rather minor changes.

General comments:

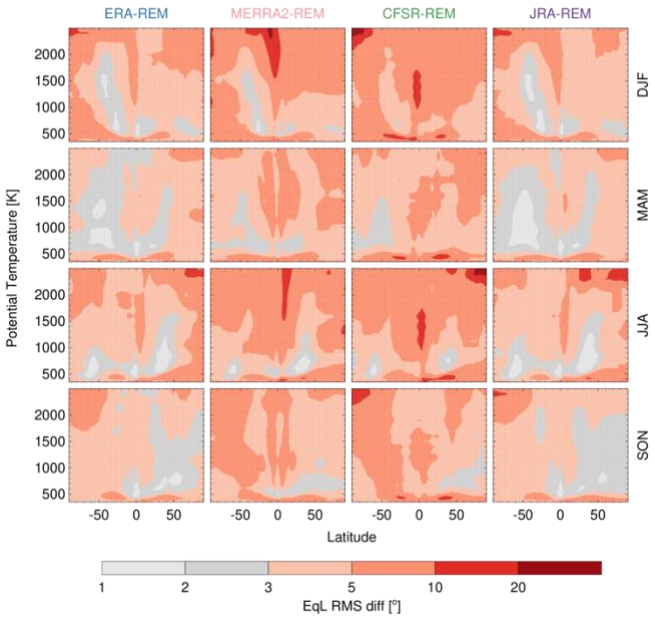
In the discussion associated with Fig. 2, the authors indicate how large the biases are with respect to the climatological PV values. I believe it would be useful to also discuss how large these biases are with respect to interannual or intraseasonal PV variability.

Such diagnostics would be especially useful for those interested in dynamical variability on short time scales such as SSW events. Along the same line of thinking, it would be useful to show the root mean square of the bias (calculated from daily values) to capture biases associated with interannual and intraseasonal variability (which may cancel out when averaged over a long period and give an apparent high skill).

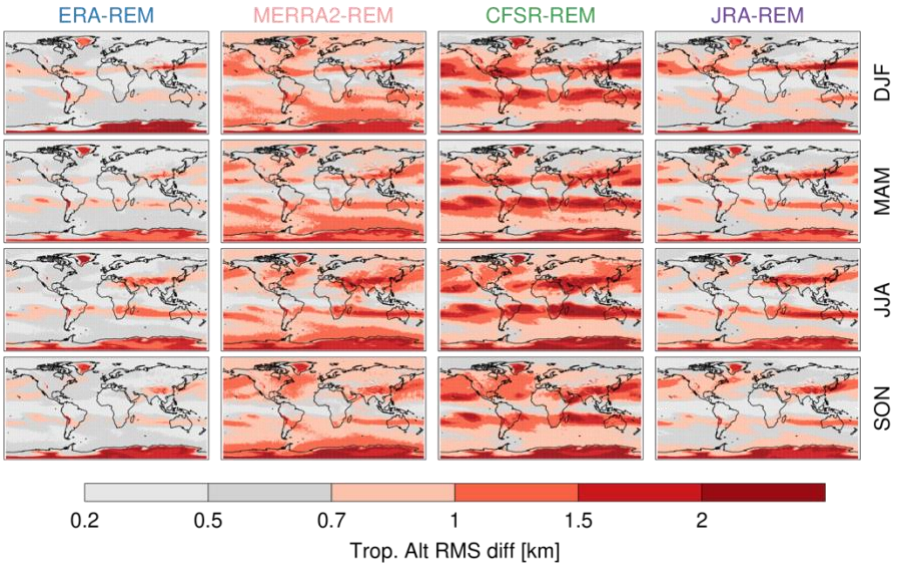
We will add the following figures in an appendix:



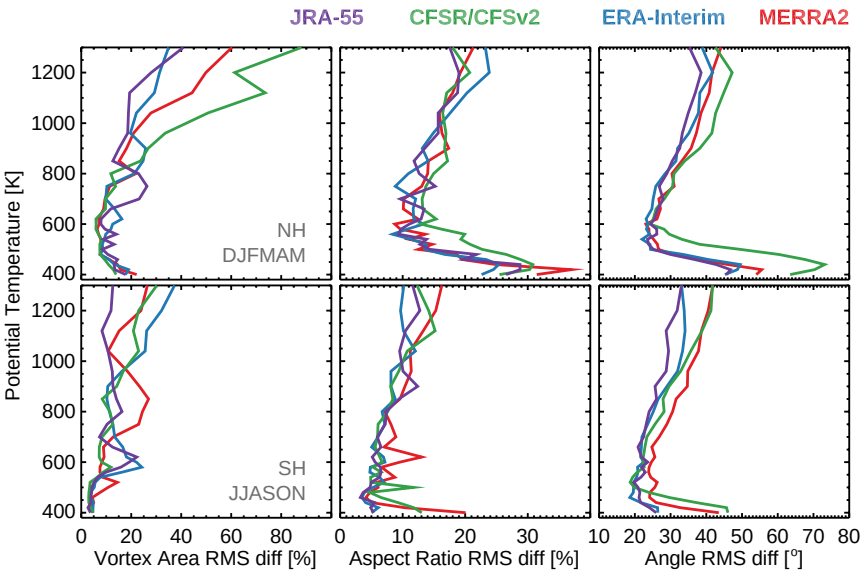
Caption: Seasonal root-mean-square (RMS) daily (1980-2014) sPV differences.



Caption: Seasonal root-mean-square (RMS) daily (1980-2014) EqL differences.



Caption: Seasonal root-mean-square (RMS) daily (1980-2014) 2PVU dynamical tropopause altitude differences.



Caption: Root-mean-square (RMS) daily (1980-2014) differences. (left) RMS vortex area difference, (middle) RMS aspect ratio difference, (right) RMS equivalent ellipse angle difference.

We will add the following text:

In page 5 line 3: “Root mean square (RMS) daily sPV differences (see Figure A1) show agreement better than 0.3*10−4s−1 throughout most of the atmosphere. RMS differences up to 1*10−4s−1 can be found near the poles in the regions of high sPV variability as shown in Figure 3. These RMS differences capture biases that could be encountered in day by day comparisons that may be important for studies using short time scales such as analysis of sudden stratospheric warming (SSW) events.”

In page 7 line 6: “RMS daily EqL differences (see Figure A2) vary from 3 to 10^{o} throughout most of the levels. “

In page 8 line 14: “RMS daily tropopause altitude differences (see Figure A3) are up to 1 km over most of the globe, and greater than 2 km around 30N and 30S, over Greenland and the Andes, and over Antarctica.”

In page 11 line 21: “RMS daily vortex area differences (see Figure A4) can be up to 20% in the Southern hemisphere and vary from 20% to 60% in the Northern hemisphere, with the largest differences at around 1200 K. The exceptions are the RMS differences for CFSR/CFSv2 which can differ up to 80% from the REM at this level. “

In page 11 line 25: “RMS daily aspect ratio differences (see Figure A4) are around 10 to 15% in the southern hemisphere and vary from 10% to 40% in the northern hemisphere, with the largest differences around 400-600 K. “

In page 11 line 32: “RMS daily angle differences (see Figure A4) can be up to 50^{o} in both hemispheres, with the exception of CFSR/CFSv2, which can be up to 70^{o} around 440 K, consistent with the orientation departure shown in Figure 15.”

In the summary, page 13 line 5 we added: “Day to day variations among the reanalysis (quantified through the RMS differences) suggest that caution should be used when using daily fields and that using multiple reanalyses in such studies is desirable.”

Equivalent latitude: It is an important diagnostic evaluated in this paper but is not described in much detail. It could be useful to add an equation describing the relationship between a specific PV contour and its equivalent latitude.

We will add:
“EqL is computed as,
Eql = sin-1 (A/2piR^{2} -1)
where A= A(q) is the area in which PV is less than q on a particular isentropic surface, and R is the radius of the Earth.
EqL is computed using the 0.5 gridded PV fields using a piecewise constant method, where the PV value is assumed constant within each grid cell. **Simply, for each PV value, on a given isentropic surface, we sum the areas for all grid cell with smaller field values**. Further, EqL is only ….”

Also, what is the reference PV value of the equivalent latitudes reported, the zonal mean PV?
That is correct.

Minor comments:

P5 L26 That the -> than the Done

P6 L28 differences Done

P9 L4 That the -> than the Done

P5 L 4 Could you indicate here that the chosen thresholds are taken from Fig. 9. We added in brackets, "as shown in Figure 9. "

P9 L11 These seasonal variations found in the literature, are they found in reanalyses too, or observations? In analysis / reanalysis, we will change the sentence too: "Overall the seasonal variations found in the reanalyses are similar and consistent with seasonal variations found in previous analysis / reanalysis …"

P11 L22 It is recommended that reanalysis centers provide PV on model levels for greater consistency with model physics. Should it be calculated before or after the reanalysis increment? If the latter, is it really more consistent with model physics?

It should be after the increment so that it is consistent with (T, q, U, V, etc), we will change the sentence to: "Although these differences are usually small, we recommend that reanalysis centers provide PV on model levels in future reanalysis products."