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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Reanalysis intercomparison of potential vorticity and potential-vorticity-based diagnostics" *by* Luis F. Millan et al.

Anonymous Referee #1

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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).

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

Minor comments:

P5 L26 That the -> than the

P6 L28 differences

P9 L4 That the -> than the

P5 L 4 Could you indicate here that the chosen thresholds are taken from Fig. 9.

P9 L11 These seasonal variations found in the literature, are they found in reanalyses too, or observations?

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?

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