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Interactive comment on “Inter-comparison of stratospheric mean-meridional circulation and eddy mixing among six reanalysis datasets” by K. Miyazaki et al.

Anonymous Referee #1

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The authors compare the mean meridional circulation and the eddy mixing in six reanalyses, including which three present-generation and their corresponding previous-generation datasets. The Brewer-Dobson circulation is computed based on the mass-weighted isentropic zonal means, and the eddy mixing is estimated as the isentropic diffusion coefficient using the PV flux-gradient relation.

The topic is well timed as it contributes to the ongoing effort to compare and improve reanalysis datasets and it addresses the issue of trends in stratospheric global transport. Nevertheless, I have major concerns with the interpretation and presentation of the results, as outlined below.

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Major comments

- I am not sure how to interpret the Kyy results. The authors argue that the Kyy mixing estimate agrees with the results of Haynes and Shuckburgh (2000), but this does not seem right to me. In particular the strongest mixing in Figure 6 of the present manuscript is found just in the region of strongest zonal winds within the polar vortices, and not in the surf zone. This result is also at odds with theoretical expectations. The authors should be aware of this discrepancy and clarify what information does the Kyy diagnostic provide. These concerns regarding the mixing diagnostic make me skeptical about the interpretation of the results in the following Sections.

- The authors should discuss the statistical significance of the linear trends and correlations throughout the manuscript. Significance information is only found in some tables but not mentioned in the text or shown in the figures.

- Some of the results in the present manuscript are already shown in the recent publication Abalos, M., B. Legras, F. Ploeger, and W. J. Randel (2015), Evaluating the advective Brewer-Dobson circulation in three reanalyses for the period 1979–2012. *J. Geophys. Res. Atmos.*, 120, 7534–7554. doi: 10.1002/2015JD023182. The authors should discuss their results in light of published work.

Minor comments

- L16 P27750: showed → show

- L12 P27755: w^* → w

- L1-5 P27755: Mention if the absolute value change to follow the argumentation.

- L11 P27756: Is there a reason why w^* is estimated from w but v^* from the stream-function?

- L 11-12 P27757: The mentioned paper does not estimate Kyy as done in the present manuscript.

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- Table 1. The value for JRA-55 at 560 K is highlighted as significant but it is not.
- L22-24 P27763: Could you explain how “decadal scale changes in the mixing trends seem to be consistent with those in the tropical upward mass flux”?
- L14 P27765: Relative importance of mean and eddy transport -> ... meridional eddy transport
- L11 P27772: strictly -> accurately
- L13-16 P27775: Which unrealistic variations and discontinuities have been found?

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 27749, 2015.

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