Comments on the Revised version of the manuscript
'Inter-comparison of stratospheric mean-meridional circulation and eddy mixing among six reanalysis datasets' by K. Miyazaki et al.

One of my two major points has not been satisfactorily addressed by the authors.

In my first review I argued that the eddy mixing climatology (shown in Figure 1 of the revised version) does not represent global mixing properties correctly. The authors have added a paragraph arguing that the Kyy estimate cannot be expected to be as accurate as the effective diffusivity, which uses equivalent latitude. While I agree with this general statement, I am still not convinced by the eddy mixing results shown in the paper.

Previous works have shown that Eulerian calculations of Kyy are indeed able to capture the main features such as the mixing barriers at the polar jets (e.g. Randel and Garcia 1994, Bartels et al. 1998, Nakamura 2008). The maximum mixing in these works is located in the surf zone, at the edge of the polar jets, and very weak mixing is found in the regions of strongest winds. In contrast, in Figure 1 of the revised paper there are maxima in Kyy located at the polar jets (where the zonal winds are strongest) in both DJF and JJA. This implies a fundamental difference with respect to all previous results and theoretical expectations. However, in the description of the results the authors state that Figure 1 shows maximum mixing in the surf zone (P10 L20-21). This is an unfaithful interpretation of the results.

Figure 1R shows calculations of Kyy from the PV flux-gradient relationship on isentropic coordinates performed by the reviewer from reanalysis data. The figure shows stronger values in the surf zone (i.e. at the edges of the polar jets) than at the jet core for both seasons, in contrast with the results in Fig. 1 of the submitted manuscript. Although this is not exactly the same metric used in the submitted manuscript, it provides evidence of the ability of the PV-based flux-gradient relationship to capture the surf-zone and the polar jet barrier in winter for both hemispheres.

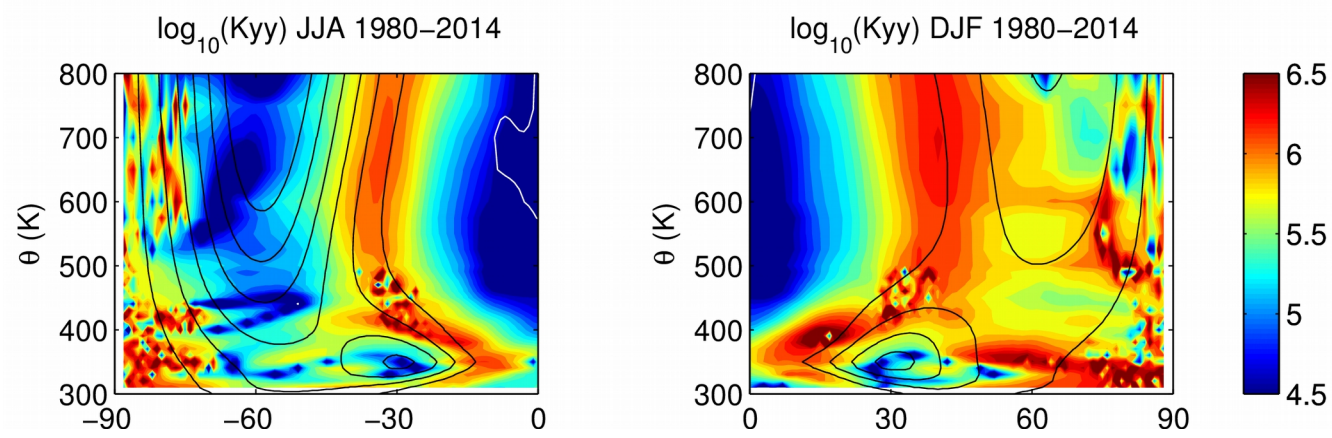

Figure 1R. Calculation of Kyy ~ - [v'q'] / [q]_y on isentropic coordinates from ERA-Interim data for 1980-2014. The calculations are done after averaging the flux and the gradient over the season for each year. The eddy flux is based on daily-mean data. The zonal wind climatology is shown in contours with 10 m/s spacing.

Given the disagreement with previous published results and with Fig. 1R, I recommend the authors to double-check their Kyy calculations. If they are correct (the MIM framework is not used in the mentioned results), then it should be concluded that the chosen metric is not valid to correctly identify the eddy transport barriers and describe the overall structure of mixing. Consequently, its ability to

provide reliable information on the long-term variability in eddy mixing is questioned, and the fundamental differences with other diagnostics should be thoroughly discussed in the paper.

Because the Kyy results constitute a central part of the article, I cannot recommend publication in ACP in its current form. Nevertheless, I consider that there is interesting and novel material in the paper, and I encourage the authors to resubmit the manuscript after solving this major issue.