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Interactive comment on “Age of stratospheric air in the ERA-Interim” by M. Diallo et al.

Anonymous Referee #1

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Diallo et al. present a clear and detailed analysis of the stratospheric age spectrum diagnosed from trajectories calculated with ERA-Interim reanalysis winds and heating rates to contribute to the large array of literature on this topic. The study is novel in that it uses the full 32-years of the ERA-Interim reanalysis data set (as opposed to some previous studies which uses perpetual runs of a single year) to calculate a 22-year time-series of global stratospheric age of air, which enables the study interannual variability and trends. An obvious issue with this approach is that over this period the observations assimilated by the reanalysis have undergone continuous changes (e.g. assimilation of COSMIC temperatures in 2006), the effect of which are fed back into the winds and heating rate fields used in this study to calculate the trajectories and age of air, and will affect the results obtained. Unless these effects can be quantified, the trends calculated should be thought of as belonging to an "ECMWF world", and the utility of which is in doubt. While the authors mention this at the very end of the paper,

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this is an important issue that should be at least acknowledged in the section on trends before proceeding with the analysis and comparison with MIPAS.

The paper as a whole is well written, and I recommend it for publication in ACP with some corrections. In particular, there are a number of spelling and grammatical mistakes that should be checked.

Specific comments:

1. Page 17095 - Description of the method. Line 25, not sure how $F(\tau)$ is estimated - since it is the probability density function, are the authors calculating the cumulative distribution function as in Scheele (2005) for the trajectories, rather than actually estimating the pdf? And also, should the definition of mean age not be $\int_0^\infty F(\tau)\tau d\tau$?
2. P 17097: Section 3.1 The method of calculating the std. dev. after accounting for the time correlation of monthly ages is interesting and not altogether completely well-known. Perhaps this could be included as an appendix/in text.
2. Figure 1: The x-axis label says 'Mean age' (same goes for the y-axis labels of Figure 7) - this got me quite confused, since Mean age in the text means the 'stratospheric mean age of air', but here it seems to actually mean the length of the trajectories. Could this be cleared up? The labels in the graphs should read "tau" rather than 't'.
3. Figure 2. - the text on P 17097 says standard deviation, but the figure label says 'variance', which is it?
4. P17109 - line 10 - could the authors just clarify in the text what the "strong hypothesis is"?
5. Figure 6. I'm just wondering if the labels of the plots are mixed up - e.g. 6(a) in the text it says that the variation between JJA and DJF is smaller in SH, but it seems to be the opposite in the plot.
6. P 17111 line 16 - reference needed regarding to ERA-Interim/other reanalysis com-

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