

Interactive comment on “How robust are stratospheric age of air trends from different reanalyses?” by Felix Ploeger et al.

Anonymous Referee #3

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The paper presents an intercomparison of mean stratospheric age of air and age spectrum for three modern reanalyses using the diabatic model CLaMS. The climatology, seasonality and long-term trends are evaluated, and the results are compared to observations and a previous reanalysis study based on a kinematic model. A large spread in the climatological values is pointed out, which is however comparable to the range of uncertainty in observations. The seasonality is similar in all reanalyses. The long-term trends are qualitatively consistent over 1989-2015 but less so over shorter (decadal) periods. Overall, the results confirm a long-term acceleration of the BDC consistent with model predictions in response to increasing greenhouse gases.

The topic is of high interest, the paper is timely, comprehensive and very well written, and the results are clearly presented. I recommend publication. The only comments I

C1

have, listed below, are mostly technical.

- P7 L1: Perhaps you could briefly comment the impacts of choosing a given spin-up year.
- P9 L28: remove ‘complete’
- P11 L1-2 and P12 L13-14: Could you be more specific on what is meant by ‘the tropics-extratropics transition is more dilute’? Do you mean the smoother mean age latitudinal gradients or less contrast tropics/extratropics in the age spectrum amplitude values?
- P13 L2: Remove ‘further’
- P14 L1: Fig. 7 a-c (add a-c)
- Fig. 8 caption: add ‘annual mean’, otherwise one is tempted to compare with Fig. 3.
- P17 L5: ‘chemical and radiative’: Abalos et al. (2019) JGR (<https://doi.org/10.1029/2018JD029301>) show that the negative mean age trends in the SH are attributed to the ozone hole.
- P19 7-9: This sentence is confusing, it would be better to compare different reanalyses over the same period, not two reanalyses over two different periods.
- P20 L17: no conclusion is possible with regards to which reanalysis ...
- P22 L3: the qualitative agreement
- P24 L4-5: Unclear sentence: are differences in vertical winds consistent with differences in heating rates (among reanalyses)?
- P24 L24: The year of the second reference should be 2016
- P25 L12: robustness in the representation of ...
- P25 L15: than considering mean age alone.

C2

