

## ***Interactive comment on “Comparison of mean age of air in five reanalyses using the BASCOE transport model” by Simon Chabrillat et al.***

### **Anonymous Referee #1**

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The paper presents a comparison of mean age of air (AoA) diagnostics in five modern reanalyses (ERA-Interim, MERRA, MERRA-2 and JRA-55). The AoA is obtained from the kinematic transport model BASCOE. The results reveal large discrepancies in the magnitude and even larger in the trends, which show different sign and spatial structure. The paper is well timed and will make a very useful contribution to the S-RIP Special Issue. It is well written, the methodology is accurately described and the results are clearly presented. I only have the following minor suggestions.

- It is stated that the model input is wind and surface pressure. Is the latter used to convert from model levels to pressure levels? Perhaps this could be said directly at some point.

- Is the sentence in L15-16 (P1) of the abstract needed? It seems redundant.

C1

- L4 P2: “considerably depending on the considered period”: consider changing one of the two to avoid repetition.

- L30 P3: explain how these. . .

- L32 P3: each tailored for a different reanalysis dataset.

- L14-15 P4: It could be mentioned why it is chosen not to use the vertical wind component directly.

- L31 P4: “idealized tracer which increases linearly at the surface”: throughout the surface or just in the tropics?

- L31-32 P6: “the AoA at the equatorial tropopause has been subtracted from the fields...”: did you use the climatological or time-dependent tropopause altitude?

- L9 P8: GCCM: this has not been introduced before, do you mean CCM?

- L14-15 P8: “different latitude gradients between the tropics and ...”

- L14 P9: remove “globally”, it is not global but midlatitude average.

- L30 and 31 P9: “different with” should be “different from”

- L11 P10: “not significant”: in ERA-Interim or in observations?

- L12 P10: “ERA-I does not show any overall trend after 2000...”. Why do you point out these trends after 2000 in ERA-I specifically? Same thing on P16 L22-23.

- L23 P12: standard error for which confidence level?

- L1 P13: remove “unexpected”.

- L2 P13: remove “much”

- L7 P13: “Diallo et al. (2012)...” Ploeger et al. (2015a) show AoA trends for the total and later periods.

C2

- L10 P13: “using only wind fields”: do you mean not using heating rates? Perhaps this should be explicit.
- L26-27 P14: “While this may be a coincidence...”: but having more wave drag would imply a faster BDC, so I do not see the point of this sentence.
- L34 P14: “Miyazaki et al. (2016) Fig. 11”: The trends in annual mean tropical upwelling for these reanalyses are shown in Abalos et al. (2015) Fig. 11.
- L18 P15: Another difference with CLaMS is that it includes a mixing parameterization.
- Figure 7 caption: “No impact...” This sentence does not belong to the caption but to the main text.

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