

The manuscript have been improved but there are still some issues that need to be addressed. In the following here are my major points and general concerns:

Major points:

- 1. We are totally agree in the method to proceed to assess the induced differences by different setup. I do also think that analysing the exact causes for the inter-model differences would lengthen the paper considerably. Therefore, I recommend to limit the analysis to these three model LMDz, TM5 and EMAC with their 7 simulations and the value more the utility of the method and its possible application to assess model transport, resolution and convection parameterisation biases. With LMDz simulations, the convection parametrisation issues can be assess as the difference between both runs is the convection scheme. With the three simulation of TM5, the vertical and horizontal resolution bias can be analysed. With EMAC runs, the resolutions issues can be analysed. The ACTM, NIES and TOMCAT differences can not be assessed with these runs and neither understood. Any explanation proposed here about this differences for three models is speculation. I strongly believe the bias in the reanalysis specially JRA-55 might play an important role in addition to the convection parameterisation proposed here. Without an explanation of a further analysis, these model results make the paper a bit incomplete. A second paper can written where the issues concerning these models (ACTM, NIES and TOMCAT) are carefully addressed in term of reanalysis, convection parameterisations, vertical and horizontal resolution issues.***
- 2. The paper still need to be improved in presentation quality. There are several minor issues but important for quality of the paper. For instance, the use of term before defined them, inappropriate use of English lan-***

guage, wrong use of citations (Wofsy, 2011), not homogenized definition (re-analysis, reanalysis, inter-comparison, intercomparison etc...) that should be improved. Some sentences are not formulated in good English. Maybe asking a help to native English speaker would be helpful to overcome these issues.

Minor points:

- 1. Abstract, line 4: ". . . to and in the stratosphere . . ." Please replace this by "into the stratosphere"**
- 2. Abstract, line 8: Remove ". . . as used here, . . ."**
- 3. Abstract, line 9: Remove the second ". . . over . . ."**
- 4. Abstract, line 10: rephrase " We also find . . ."**
- 5. Abstract, line 13-14: Please be consistent with word that are used in the text ". . .northern hemisphere. . ." or Northern Hemisphere. Same for Southern Hemisphere as well. Please check the same issues in the whole manuscript.**
- 6. Page 2, line 5: ". . .mixing ratio distribution of CH₄..." Replace by "... distribution of CH₄ mixing ratio..."**
- 7. Page 2, line 9: Boucher et al., 2009 can be cited here.**
- 8. Page 2, lines 13-14: Remove "It emanates" and rephrase it to one sentence.**
- 9. Page 2, lines 26-27: Please rephrase this sentence "The study concluded that models that show faster IH exchange for SF₆, also exhibit smaller IH gradients in CH₄."**
- 10. Page 2, lines 33: Remove "....between..."**

11. ***Page 3, lines 23: Remove "...just..."***
12. ***Page 2, lines 28: There is no need to define several time "AoA". It has been defined early, just use it all over the text. In addition, the age spectrum is well describe but there is not an explanation about the relation between AoA and age spectrum. In the text, you only use AoA. Therefore, one or two sentences to link the age spectrum to AoA is needed in this paragraph (27-30).***
13. ***Page 4, lines 6-10: There is no description of Table 1 about the different initialization of the tracers neither a clear description of the acronyms (NHSurface, etc...) that are all over the manuscript. Please define these mask terminology and describe the setup here once.***
14. ***Page 7, line 6: It's important to be consistent. It's not "... six CTMs..." but "3CTMs and 3 GCMs".***
15. ***Page 7, lines 8: Replace "... data of a reanalysis (European Centre for Medium-Range Weather Forecasts (ECMWF) ERA-Interim, or JMA)." by ". . . a reanalysis dataset, such as ERA-Interim (Dee et al.,2011) provided by European Centre for Medium-Range weather Forecasts and JRA-25 from Japanese Meteorological Agency (Onogri et al., 2007, Kobayashi et al., 2016)". These defined terminology can be used later in the manuscript without redefined over again.***
16. ***Page 9, line 18: Replace "... while ..." by "... when ..."***
17. ***Page 10, line 7 and line 19: Replace "... Japanese Meteorological Agency ..." by " JRA-25"***
18. ***Page 9, line 32: Replace "... ECMWF meteorological (re)analyses ..." by "... ERA-Interim reanalysis ..."***

19. **Page 11, lines 16-19: Rephrase this sentence "Subsequently, the difference with respect to the South Pole is calculated as an 11-year time series with monthly time resolution. This is done to account for the model-data offset."**
20. **Page 11, lines 26-28: Rephrase this paragraph. Remove "(and pressure field). change this sentence "Monthly mean mixing ratios (and pressure fields) of the participating models have been averaged zonally and over time, and converted to AoA." to "Converted into AoA, the monthly mean mixing ratios of the participating models have been averaged zonally and over time". Remove "contour plots of these" and replace it by "The lat-press cross-section of this AoA is ...". Should also use replace "AoA tracers NHSurface" by "AoA tracer from NHSurface" etc...**
21. **Page 12, line 30: This is wrong "... signalling stratosphere-troposphere exchange (Holton et al., 1995)". This indicate "the upward transport of tropical tropospheric air into the stratosphere". In addition what is called "Deep convective mixing" is just "the tropical ascent" or "Deep convective transport".**
22. **Page 13, line 1: Replace "... vertical mixing ..." by "... vertical transport ..."**
23. **Page 13, line 3: Add "... from ..." after "tracers" and before "NHSurface"**
24. **Page 13, line 20: "... north-east ..."**
25. **Page 14, line 4: "... areas deep inland ..." by "deep inland areas"**
26. **Page 14, line 8: Not define "... BL ..." but later in page 20. To what "This" belong? Rephrase it.**
27. **Page 14, line 13: Rephrase this sentence "In Figure 5 the stratospheric AoA is plotted for all models from 100 hPa to the top of the atmosphere, averaged**

over the period 2000-2010 (11 years). As expected, oldest AoA is found at the high-altitude poles". Start "Figure 5 shows the stratos...."

28. ***Page 15, line 6: "... Wofsy, 2011" Wrong citation***
29. ***Page 15, line 9: "The lower panel..." of which figure?***
30. ***Page 19, line 12: remove "...high level..."***
31. ***Page 20, line 11: To what belong "...,this...". Rephrase.***
32. ***Page 21, line 8-9: This is wrong "...and may become more apparent on the smaller spatial and temporal scales that are not part of this first analysis". This reanalysis bias are intrinsic to the scales.***
33. ***Figure 2 and 5: Please remove the pressure levels overplots.***

References

1. Eluszkiewicz, J., R.S. Hemler, J.D. Mahlman, L. Bruhwiler, and L.L. Takacs, 2000: Sensitivity of Age-of-Air Calculations to the Choice of Advection Scheme. *J. Atmos. Sci.*, 57, 3185-3201, [https://doi.org/10.1175/1520-0469\(2000\)057;3185:SOAOAC;2.0.CO;2](https://doi.org/10.1175/1520-0469(2000)057;3185:SOAOAC;2.0.CO;2)
2. Boucher, O., Friedlingstein, P., Collins, B., and Keith P Shine, K. P.: The indirect global warming potential and global temperature change potential due to methane oxidation, *Environ. Res. Lett.*, 4, 044007, doi:10.1088/1748-9326/4/4/044007, 2009.
3. Kobayashi, C., and T. Iwasaki (2016), Brewer-Dobson circulation diagnosed from JRA-55, *J. Geophys. Res. Atmos.*, 121, 14931510, doi:10.1002/2015JD023476.