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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Observed temporal evolution of global mean age of stratospheric air for the 2002 to 2010 period" *by* G. P. Stiller et al.

Anonymous Referee #2

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This paper is an important contribution to the ongoing discussion about large-scale circulation changes under climate change in the stratosphere. There is a lot to like about this paper, and it offers new and previously unavailable information about age variability in the stratosphere. In some areas messages could be clearer, and I am sure many modellers would appreciate a figure showing a simple seasonal climatology of the age in conjunction with all the other 'clever' diagnostics. I am happy for the paper to be published with some revisions (largely concerning clarity), which I have detailed below. The only slightly bigger concern I have is the contradictory message arising from figures 8 and 10 (as mentioned below). But I am sure the authors will be able to clarify this with a better discussion.

P28015, l12: maybe add: in chemistry-climate models prescribing increases in long-

lived greenhouse gases

P28015, l15: suggest instead of indicate

P28016, l4: the tropics

P28016, l12: give time horizon; 10% can be small or big depending on the time required for the change

P28017, l1: please remind the reader which time horizon the Engel et al. study covered

P28017, l17: please untangle this sentence; or just say you provide a climatology and give details later in the section

P28020, l2: maybe it would be good to have statement about the similarity of the systematic biases in the early observational period compared to the later, degraded observational period; looking at Figure 2 one has the impression that the degraded period is systematically lower compared to the early observational period

P28020, l5: calculated instead of presented

P28021, l16: this addresses my comment above (p28020, l2), but I feel this should be mentioned earlier

P28024, l19: please specify which standard deviation you are referring to (all binned profiles?)

P28025, l14: if you so wish introduce AoA early on and use everywhere

P28025, l19: 'and the terms under the sum are' should just read 'and the sum of'

P28026, 17: I do not understand this sentence

P28027, l1: I am not sure what this equation is doing here, without any further explanation – two possibilities: re-write the previous paragraph in a more descriptive way and refer to the relevant literature, or finish of as detailed as you have started explaining equation 5

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P28027: I am not quite sure what you are telling me; you refer to Figure 4 in a very generic way, yet you provide a lot of specific information that is hard to find in the figure – I suggest you re-write this part and guide the reader through Figure 4 (and include only the panels required for the story).

P28027, l14: just 'Recall'

P28028, l1: consider reordering, start with the fact that mesospheric is depleted in SF6 and explain the difference between apparent and real age (this way you would be able to shorten the discussion on the following page, which I would strongly recommend)

P28031, l1: I like this discussion, but it would be nice if in the beginning something as simple as seasonal means of age could have been shown, instead of the large amount of information about the time series analysis

P28033, l8: I am happy to have this discussion in the paper, but it should be made clear that the 'trend' (linear increase) might be significantly influenced by non-periodic, e.g. clustered events, like the number of sudden stratospheric warmings, or ENSO warm events – I doubt these events are correctly removed by the statistical model used – if anything the model might be 'over-fitting' some variability

P28034, l8: I suggest to simplify the phrasing, basically you are looking at different time periods, and as pointed out above (p28033, l8) you cannot remove reliably some long-term variability, or clustered events, which you should discuss earlier

P28034, l17: it is important to discuss the model results, but I would suggest highlighting the observed regional differences more (you have many regions where age decreases, but not necessarily where I would have expected them) – some of the high latitude NH structure might be influenced by the regular major mid-winter warmings of the last few years http://www.geo.fu-berlin.de/met/ag/strat/produkte/northpole/index.html

P28036, l14: I have no clue what the message of this paragraph is – something is corrected and apparently no significant change occurs; if I look at figures 8 (top) and 10

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Interactive Comment

(top) I see many important differences (tropical lower stratosphere, SH high latitudes) and are left with a feeling of confusion – if figure 1o is the better estimate, the discrepancy between modelling and observations is bigger than previously stated; please explain better (and shorter) and provide a stronger link to figure 8

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 28013, 2011.

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