

Interactive comment on “Multi-decadal Records of Stratospheric Composition and their Relationship to Stratospheric Circulation Change” by Anne R. Douglass et al.

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This paper uses long-term satellite measurements of trace gases in the stratosphere, ground based column measurements from two sites, and model output from both free-running and specified dynamics runs to evaluate how well the specified stratospheric circulation variability matches that implied from the observed trace gas variability. This is an important exercise to help us understand how well the reanalysis products can provide estimates of long-term changes in the stratosphere. As the authors state, we can't expect the reanalysis output to be perfect since the measurements that go into the various reanalysis models vary over time. However, since reanalysis products are

C1

heavily used as our best estimate of the stratospheric circulation we need to know on a quantitative level how well they represent the real atmosphere, how the agreement or disagreement varies over time, and how to continue to improve them in the future.

The paper is clearly written, the conclusions are well supported and I have no major comments. The topic is appropriate for ACP and I would suggest publication with consideration of the minor comments below.

Specific comments:

Pg. 1, line 17: The beginning of the AURA data record is stated as 2015 but I think you mean 2005.

Pg. 4, line 1: extra “the”

Pg. 5, line 9: remove “data” before “column”, “from” is misspelled

Pg. 15, line 30: remove one “consistent” from the sentence

Pg. 22, line 4: should be “red dashed”

Figures 3 and 4: It took me a while to figure out why the mean ages between these figures look different. You should mention somewhere in the text and in the figure caption that the time interval of the plots is different and why.

Just as a side note, I saw better agreement between the NH average mean ages from the tropical pipe model driven by observations vs. MERRA only after 2000 compared to before 2000, as shown in Figure 7 of the Ray et al., 2014 JGR paper. It's nice to see consistency in that result to what is shown in this paper.

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C2