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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Attribution of recent ozone changes in the Southern Hemisphere mid-latitudes using statistical analysis and chemistry-climate model simulations" *by* Guang Zeng et al.

Anonymous Referee #2

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Review of Zeng et al. Attribution of recent ozone changes in the Southern Hemisphere mid-latitudes using statistical analysis and chemistry-climate model simulations

This study uses statistical analysis to understand recent changes in ozone up to 25 km at Lauder, NZ and relate them to changes over similar and longer time periods in chemistry-climate model simulations. Overall the manuscript is clearly written and analysis explained well and I think it would be of interest to the ACP community and would recommend its publication after the authors take some mostly minor comments into consideration.

General comments:

I have concerns about using a chemical measure (O3) for tropopause height to evaluate the O3 field itself. Can you demonstrate that this measure is the same as a PV or temperature based tropopause height over varying timescales?

I can understand on shorter timescales how the level of o3 of 150 ppb would reflect dynamical variability in tropopause height (although one could argue that a different concentration ∼100 ppb might be a better choice) but on longer timescales it seems like the chemical changes (through ODS changes) would also be reflected in this quantity. Can you quantify and separate and include some discussion in the text of this issue?

What does chemical O3 tropopause changes look like over the full ref-C2 run can you see the impact of ODS changes causing o3 loss and recovery reflected in this quantity? If you can't see this impact it would be a good demonstration that it is essentially a dynamics only representation over both short and long time-scales. If you do it can be quantified and related to the smaller change in ODSs over the Lauder record

I understand that the Lauder record 1987-2014 includes only a modest change in ODSs peaking in the 1990s with little net change so a linear trend might be expected to be flat but it doesn't rule out a some ozone loss in the early period and gain in the later period.

Can you explain why the variables in Table 3 are in some cases different than those shown in Figure 3 like surface Temperature which seems to be highly correlated to lower troposphere ozone is not shown in figure 3.

p5 line 17-18 it seems a bit circular argument if you are using o3 to define the tropopause height.

p10 line1-3 Can you make the same claim for ODS changes over this time refC1 time period (difference between RefC1 and fODS).

p10 line 34 p11 line 1-2 it is not obvious why this should be the case, can you do any

additional analysis to explain possible mechanisms.

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