

Review of manuscript acp-2017-1157 (revision)

Multiple symptoms of total ozone recovery inside the Antarctic vortex during Austral spring.

Pazmino et al., 2018.

Review

The changes and modifications that have been made to this paper have very much improved the paper, and I thank the authors for putting in considerable effort for making improvements. I am quite pleased with the paper as it is right now: it is more consistent and more complete, and provides a solid contribution to the ongoing debate on ozone recovery in the Antarctic ozone hole.

There are two minor issues left, as well as some typos and grammar that need to be addressed, see below.

Minor issues

[1] Conclusions: I would invite the authors to spend a few sentences on what their take is on the attribution question, i.e. how much of the increase in Antarctic ozone can be attributed to changes in ODSs and how certain are they. The authors are free to provide their views, but the reason to ask is that the debate about Antarctic ozone recovery has changed from the question whether recovery is observed (which is now well established) to how much of the observed increase in Antarctic ozone can be attributed to the decrease in ODSs. All of it, all of it but uncertainties cannot exclude the possibility that part of it is not related to ODSs, only part of it, etc. That way the paper contributes to this discussion, which no doubt will take some time to settle.

[2] Page 12, last paragraph. It is argued that the observed 2001-2017 reductions in OMD (53% and 35%) are too large compared to the decrease in ODS during the same time period. However, this is an incorrect interpretation.

The change in OMD is relative to the arbitrary 220 DU level. The 220 DU OMD only starts to deviate from zero around 1980 (ozone columns smaller than 220 DU did not systematically occur before that time). So, the change in fraction change in OMD should be compared to the fraction change in ODSs between 2001 and 2017 RELATIVE to the 1980 ODS levels.

According to figure S1-1 of the 2010 Ozone Assessment, 1980 ODS levels were 50% of what they were in 2000. The corresponding change in OMD 2000-1980 has been approximately 20-25 Mt. Between 2001 and 2017, ODSs have decreased by 15-20%, which is 30-40% of the change in ODS since 1980, and thus as 30-40% change in OMD since 1980. Which is consistent with the numbers reported (53% and 35%).

ODSs were not zero in 1980, and as others have shown, ozone depletion really started already after 1960 [Langematz et al., 2016; <https://doi.org/10.5194/acp-16-15619-2016>].

Please modify this paragraph accordingly.

Typos, grammar

General: make sure to replace “higher” with “larger” throughout the paper where applicable. I know it is acceptable to talk about for example “higher values”, but in the context of the atmosphere and especially in a paper where heights play a role, I strongly prefer the use of “larger” over “higher”, as the use of “higher” can be confusing.

Page 2, line 1. Replace “deeply” with “strongly”

Page 2, line 23. “evaluated ozone trends using” (plural trends)

Page 2, line 23. Specific which ozone trends Solomon et al. [2016] have evaluated (both total ozone and ozone profiles/height resolved ozone)

Page 2, line 24. Replace “The authors have shown a significant” with “They found a significant”

Page 2, line 30. Replace “remains thus an open question” with “remains open to debate”

Page 4, line 39 (+ line 1 page 5). “The white dot marks in figure 1” (remove “the”)

Page 5, line 1. A dot is missing after “classification”.

Page 5, line 4. Delete “isentropic levels” (is already mentioned before in the same sentence)

Page 7, line 33. Delete “of”

Page 7, line 34. Change to “... September, with very low values observed mostly during the last week.”

Page 7, line 35; Page 8, line 3. Suggest to replace “works” with “publications”

Page 8, line 2. “In this paper, ...”

Page 8, line 29. Replace “only” with “alone”

Page 9, line 14. Replace “more” with “better”

Page 9, line 15. Delete “thus for the first time”. This is not true, in our 2017 paper we already discuss trend significances for a whole range of time periods, and we did find a significant trend also for the period 15 Sep – 15 Oct albeit less significant than periods including early September.