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Atmospheric Chemistry and Physics Discussions

# *Interactive comment on* "Measuring the Antarctic ozone hole with the new Ozone Mapping and Profiler Suite (OMPS)" *by* N. A. Kramarova et al.

**Anonymous Referee #2**

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This manuscript (Measuring the Antarctic ozone hole with the new Ozone Mapping and Profiler Suite (OMPS) by N. Kramarova et al.) describes early results from the ozone total column and profile measurements from the Ozone Mapping and Profiler Suite (OMPS) on the Suomi NPP satellite, with a focus on the Antarctic region. Some validation is provided versus SBUV/2, OMI, and Aura MLS data, and the agreement is generally quite good. Measurements of the 2012 Antarctic ozone hole are described, with estimates of its area and comparisons to previous years' ozone hole characteristics; this is the 2nd smallest ozone hole on record since 1988. A fairly typical rate of increase in ozone hole area is observed for 2012, with a faster than average decrease after the late September peak; wave activity appears to have played a major part in the hole's fairly rapid disappearance in 2012.



General comments

The data descriptions provided in this manuscript are generally clear and to the point. It is good to see such a first look at the data from this new satellite mission, and to read a fairly clear discussion of what look like high quality data. This looks like a promising start and one will expect to see a good continuation of the global ozone records (total column and profiles) from OMPS in the future, although more detailed validation studies will be needed on a more global scale, and are no doubt forthcoming in the years to come. However, some statements are made in a manner that is too qualitative and would need more description of analyses and results, in addition to error bars, to pass as robust conclusions. Without serious consideration of such issues (see primarily items (4) and (5) below), I could not recommend this manuscript for publication as is, or with only minor changes. The changes can be fairly minor if some of the conclusions (regarding correlation between ODSs and the ozone measurements over Antarctica) are changed and not overstated. The alternative is for the authors to try to stick to the (currently qualitative) conclusions, but a lot more analyses and error bar calculations would be required to make those points clear or believable. ACP is a somewhat better choice of journal than AMT, it would seem, although this could have probably gone to either journal; the more robust statements currently deal more with data comparisons than ozone hole "trend" issues.

Specific comments

1. Comparisons were provided versus SBUV/2, sondes, and Aura MLS profiles. Total column comparisons were shown versus OMI. But why not also show more of the comparisons versus SBUV/2 columns? This is only mentioned briefly before Section 4. Is this because a separate set of studies are forthcoming with more details, or some other reason? Some clarification would be useful, even if a lot more details regarding such comparisons are not provided.

2. Figure 2 shows that some variability is clearly seen from both satellite profiler data

(OMPS LP and Aura MLS) near 17.5 km altitude; the sondes do not appear to capture this. Is there a possible reason for such a difference (where it looks like the sonde data do not match up with the satellites)? Apart from sampling issues, it is hard to see what might have caused this specific difference.

3. There is almost sufficient material for this "first look" paper to not mention a lot more details (see above). However, some mention of possible reasons for some differences should probably be provided. In particular, Figure 3 shows some interesting patterns in the 10-15% levels of disagreement between OMPS and OMI columns (panel c). Are there any likely or potential explanations at this stage?

4. There is some discussion relating to Fig. 4 that I find too speculative and marginal – see line 26 at bottom of page 7. The authors state that there may be a slight downward trend over the 1995-2012 time period for the ozone hole size (area with column amounts less than 220 DU). The words used by the authors are "visually suggesting" (in reference to a potential decrease in ozone hole area). But this is not clearly obvious to this reviewer, and it would only be a rigorous conclusion if error bars were taken into account after regression analyses of some sort; the peer-reviewed work by Salby et al. seems to have followed this more rigorous path. But "visually", even the last 10 years do not "show" something that could be called an obvious trend. However, I would say that a flattening after 1995 would be a clear enough statement for a majority of readers, even if this is also qualitative in nature.

5. The potential implications of Fig. 5 also seem to be significantly exaggerated. Page 9 (lines 20-28) mentions that the rate of increase in ozone hole area is similar ("at the same rate") as in previous years. There is a wide range of curves implied by the shaded regions and there is a very qualitative nature to such a statement. Given that the chlorine burden decreases at roughly 1%/year, this is not a statement that can be made quantitatively, given the presentation that is currently provided, certainly. I would expect that the implications regarding ODS amounts should be removed from such a discussion if nothing more quantitative can be provided as a response (although a



mention of Salby et al. could be used). The portion of the discussion dealing with the breakup of the ozone hole and dynamical factors is not well developed either in this brief manuscript, but it is more believable. But any relationship versus changes in chlorine or bromine should be a subject of detailed calculations and a more rigorous defense of these types of statements. Without this, I would have to view this as wishful thinking or a fairly crude overstatement rather than a scientifically robust discussion. At least, the authors did not include such a discussion or "conclusion" in the Abstract, but the current summary section contains this sort of overstatement, and should not do so, in my view. The peer-reviewed work by Salby et al. uses satellite data over Antarctica and appears to be more robust than (or as robust as) the use of sonde data (in reference to the Hassler et al. work mentioned in this manuscript). Further detailed quantitative discussions of these issues are undoubtedly warranted, but simple "visual" qualitative statements cannot be considered to be sufficient.

More minor comments and suggestions

- Line 9, change "are critical" to "is critical".

- Last parag. (same page), why write "Section" in some cases and "Sect." in other cases?

- Page 5, Line 4: change "atmosphere" to "atmospheric".

- Line 26, add "the" before "altitude range".

- Page 6, Line 12: delete "the" before "biases".

- Line 22, delete "concentration"; also on line 28 [or change to concentrations].

- Page 7, Line 2; I would suggest adding a brief note regarding the large variability near 17.5 km, as this is seen by both satellite datasets but not in the sonde data; so this could well be real, and the satellites can/do agree better between themselves than versus the sonde data in places.

- Parag. before section 4: this seems useful, but one needs to know a few more things (over what period or region were these comparisons performed?). Or is this statement out of place? Is this different than what is mentioned on page 6 in the 2nd paragraph?

- Page 7, line 10/11; this statement repeats what was mentioned in the Introduction; if this is favored, a repeat of the same references seem superfluous, and better reference could be made, instead, to the time series from past studies.

- Page 8, Line 11: change “minimums” to “minima”.

- Page 9, are the values shown in Fig. 7 daily values? It is hard to tell, but it looks like some smoothing may have been applied to the daily points; if not, this comment can be ignored.

- Line 13, change “show” to “shows”; Line 15, change “off of” to “off”.

- Page 10, Line 13, change “The estimates” to “These estimates”; change “is within” to “are within”. It might also be useful to provide the percent differences in these numbers.

- Figure 2: Change “AURA MLS” to “Aura MLS”; change “relative their” to “relative to their” in the caption.

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