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Atmospheric Measurement Techniques Discussions

Interactive comment on "Drift corrected Odin-OSIRIS ozone product: algorithm and updated stratospheric ozone trends" *by* Adam E. Bourassa et al.

Anonymous Referee #2

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1 Summary

This paper reports on additional corrections to the OSIRIS limb ozone retrieval that reduce an apparently too large upper stratospheric trends as reported by Bourassa et al. (2014). The correction is mainly an altitude registration correction called "RSAS" based on the analysis of the 350 nm limb radiance profile, which is also known as the "knee" method (utilising the information from a bend in the radiance profile), to derive a (constant) shift to be applied to the altitude coordinate prior to the trace gas retrieval. The main focus on the paper is to describe this correction procedure and in the second part to repeat the multilinear regression from Bourassa et al. (2014), but applied to the

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Discussion paper

corrected data, to update ozone profile trends up to year 2017.

The paper is very concise and well written and it is very suitable to AMT. I have one major issue which I think needs to be properly addressed before publication.

2 Major issue

This study assumes that the intial average and "stable" altitude bias of $+200$ m until $\sim$2011 as derived from RSAS is a modelling artifact (p.5,l.26) and then assumes that the true bias must be zero, thus offseting the entire time series of altitude shifts by -200 m (making the initial average bias zero). One argument in favor for doing this was that without altitude corrections the ozone bias from prior data versions with respect to other measurements (Adam's papers) was showing no meridional structure. I find this argument not convincing as we should not favor a certain procedure just to optimize a bias to some external data. It would be certainly better to show that indeed high level clouds introduce a systematic error in RSAS based upon RTM simulation. Alternatively, one could consider to show that by limiting OSIRIS data to cloud free scenes indeed a zero altitude bias can be found (at least on average). Figure 3 is in my regard only a hand waving argument.

3 Minor comments

p.1,l.23: In the list of references profile trend papers are cited, but the Weatherhead paper is a total ozone trend paper. Why is this paper cited?

p.2,l.8-10: Which of the three points raised by Harris et al. (2015) are addressed by this paper (probably i and ii), please state them.

p.4,l.25; change "350 km" to "350 nm".

p.4.,l.26: Why is the match done for radiances at 40 km and not higher? Does the albedo change if other altitudes are used? Please clarify.

p.4,l.27: omit "the scan is".

p.6,l.5: are " albedo, stratospheric aerosol extinction, NO2, and O3" retrieved simultaneously or is the same algorithm (with different settings) used to retrieve the various quantities separately. Please specify. You may want to add a reference here.

p.6,l.5-7: The sentence "No changes were made to the retrievals of the other species other than the pointing correction to the radiances; the impact of this correction on these other species has yet to be assessed." sounds awkward. What are "other species" than listed in the sentence before. You probably meant that the impact of the altitude corrections has only been assessed for ozone so far.

p.6,l.8: The sub phrase "is not equivalent to simply shifting the retrieved ozone profile by the RSAS correction" implies that somebody has used that simple solution. If yes, then please cite the study or explain where this has been done.

p.7,l.24ff: The trend results should be compared to more recent results from Steinbrecht et al. (2017) and Sofieva et al. (2017) that are also part of this special issue.

Figure 3: a better color scale for the contour plot that distinguishes between negative and positive values would be good.

Figure 4: Replace "GEOGRAPHIC AVERAGE FIGURE" in the caption by the correct figure number (guess Fig. 2).

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