

## ***Interactive comment on “Optimal Estimation Method Retrievals of Stratospheric Ozone Profiles from a DIAL Lidar” by Ghazal Farhani et al.***

### **Anonymous Referee #2**

Received and published: 16 January 2019

This is a valuable paper that is well-presented. I find no major issues and the paper should be published, with the minor corrections detailed below.

Minor comments:

Abstract: “first principle”. We usually say “first principles”.

Page 1, lines 20-24 & page 2, lines 1-4: This description of the ozone hole seems irrelevant to the paper.

Page 2, line 12: “The technique also offers the advantage of making self-calibrated measurements.” Perhaps a word or two of clarification would be helpful here. Other differential absorption spectrometers need calibration.

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Page 3, line 10: The overlap function is defined but does not appear in the equation.

Page 3, lines 19-21: Quoting the absolute value of the absorption cross section of NO<sub>2</sub> tells the reader nothing unless the cross section of ozone is also given.

Page 3, lines 23 & 26: Is “paralyzable” a real word?

Page 7, line 12: “The standard deviation to the 2 sigma level for this climatology is 50% below 25 km and 10%...” From the context I think you mean the standard deviation (i.e. 1-sigma), but this sounds like a confidence interval. In Table 1 some of the other parameters are described as standard deviations.

Page 7, lines 19, 30 (and elsewhere): “uncertainty” is not defined. Do you mean one standard deviation (1-sigma)?

Page 7, line 23 (and elsewhere): “correlation length” is not defined.

Page 9, lines 1-2: An “uncertainty” of 19K for radiosondes sounds absurdly large. Uncertainties (1-sigma) for radiosondes are usually quoted in the range of 1K or less. I’m not familiar with MSIS uncertainties but 35K sounds pretty large. I can guess the temperature outside more accurately by simply looking at the calendar.

Table 1: I think you mean “Retrieval a priori values”.

Page 10, lines 31-32: This description conflicts with that in the figure caption.

Page 13, lines 20-24: Why is the lidar biased low in Figure 7? It seems to miss quite a bit of ozone.

Page 13, line 25: Figure 8, not 7.

Captions, Figures 5 & 6: “...the maximum height at which the retrieval is independent from the a priori.” is ambiguous (see Page 10, lines 31-32).

Caption, Figure 7: “...horizontal dashed line shows the cut-off below which the effect of the a priori ozone profile is small less than 10%.” We now have a third definition of

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this dashed line!

Figure 8 appears to be reversed (or the caption is wrong), as it shows the lidar higher than the sonde.

Page 16, line 5: “The ozone retrieval extends from 12 km to 70.2 km.” How much of the upper part is a useful measurement?

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Interactive comment on Atmos. Meas. Tech. Discuss., doi:10.5194/amt-2018-310, 2018.

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