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Atmospheric Measurement Techniques Discussions

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

Anonymous Referee #1

Received and published: 2 November 2018

Review for Optimal Estimation Method Retrievals of Stratospheric Ozone Profiles from a DIAL Lidar by Farhani et al., 2018

P2 L12, 'spatial' resolution may be an incorrect word choice

P2 L14, likely some older references to O3 DIAL (e.g. Megie)

P3 L5, 'relatively lower' absorption cross section as opposed to 'low'

P3L10, Overlap function O(z) is introduced without the definition. C = ... should be added.

P4, should add the aerosol component into eq. 2/6. It is fair to say that using ancillary data at OHP we have determined that aerosols were not a strong influence on these

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retrievals. But, it should still be included in the OD calculation.

P7, L27, there will likely be fluorescence from the hydroxyl radical at 308nm between 80-100 km. Has this impacted the background subtraction model?

P12, L10 "The trade-off between the retrieval resolution and the retrieval uncertainty should be considered when comparing the methods." This is a subtle aspect of lidar analyses, is it possible to quantify this somehow. "Using the same VR scheme in the traditional and OEM results in a xx % increase in our statistical uncertainty assessment".

Fig 8 - OEM minus sonde appears to result in a negative value above 20 km. However, these curves are positive in this region. Is this actually Sonde minus OEM instead? Perhaps making the x-axis [-20,20] limits and a grid box would enhance this discussion as well. Also, at some point there is mention of Raman lower gain channels, are they also plotted on here? Is there differences there as well?

Figure 10, are there uncertainty associated with resolving times (dead times) as well? What about a final summed standard uncertainty on this plot? These uncertainty values of $\sim$10% near 35km seem to be quite a bit larger than most traditional stratospheric DIAL measurements for an entire night. Is this evidence to modify the vertical resolution? This would be improved if you had the traditional uncertainty budget in a companion plot to show the differences.

Fig 12, it would be useful to have this figure with the different retrieval techniques using the same vertical resolution. It's not as straightforward to say one is picking out features and the other isn't if the VR is a factor of 3 different. Are the ozonesondes also being passed through the same low-pass filter for these comparisons?

Fig 13a Traditional DIAL background subtractions can be challenging to compare to 'truth'. Were there any other data sets (e.g. the NASA O3 Lidar), that would help bring closure to this discrepancy? Is this -10% bias in the top (<35km) could be attributed to

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improper background subtraction?

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