

Response to Editor: Stratospheric and mesospheric HO₂ observations from the Aura Microwave Limb Sounder

February 17, 2015

Dear Gaby,

I hope this new version is more suitable for publication. I am sorry it has taken so many revisions, to clarify the day-minus-night difference.

Below are our my responses to your comments in red (also in red in the new draft).

According to your last reply to reviewer comments you recommend to use MLS HO₂ data from the offline retrieval between 10 and 1 hPa only after correction of a systematic bias. This bias is quantified by the volume mixing ratios/ number densities of the nighttime retrievals for this pressure range, since nighttime HO₂ is expected to be virtually zero. Regarding this issue, I have some further comments/recommendations:

- the abstract needs to make clear that the nighttime data set is for pressure levels below 1 hPa only. Further the recommended bias correction should be mentioned in the abstract.

Added: This new dataset provides two daily zonal averages, one during daytime from 10 to 0.0032 hPa (using day-minus-night differences between 10 and 1 hPa to ameliorate systematic biases) and one during nighttime from 1 to 0.0032 hPa. The vertical resolution of this new dataset varies from about

4 km at 10 hPa to around 14 km at 0.0032 hPa.

- a statement regarding the recommended bias correction should be added to the summary (Section 5).

Added: The MLS non-zero nighttime HO_2 abundances between 10 and 1 hPa were used as measure of systematic biases in the retrievals. Assuming that these biases are constant throughout day and night, we used the day-minus-night differences, only at these pressure levels, as a more accurate daytime HO_2 estimate.

- regarding the comparisons to the SMILES instrument, you do not make use of the recommended bias correction as far as I read your paper. It is not clear to me why the bias correction has not been applied for this comparison. The discussion is inconsistent here. I recommend for the MLS- SMILES comparison in the 10 to 1 hPa altitude range to show bias-corrected daytime comparisons only

Even though this was mentioned in section 4 (Results) and in the figure caption we added: To alleviate biases in the MLS HO_2 data, the day-minus-night differences are used as a measure of daytime HO_2 for pressures between 10 and 1 hPa.

- page 8, line 17/18: the restriction to above 1 hPa for nighttime values needs to be mentioned here.

Added: Furthermore, as shown in the following sections, it also estimates HO_2 during night between 1 and 0.0032 hPa

- page 9, line 20 to the end of the section: the discussion on systematic errors is completely unrelated to the bias correction by nighttime values you recommend earlier. A link between the recommended bias correction and the assessment of systematic errors needs to be established in the text.

Added: As already mentioned, between 10 and 1 hPa, the effects of the systematic biases can be diminished by subtracting the nighttime retrieved values from the daytime, taking advantage of the pronounced HO_2 diurnal variation below ~ 1 hPa where negligible HO_2 is expected during night.

- section 4.3 (Comparison to WACCM): please make clear if the bias correction has been applied for this comparison as well, i.e. if day-minus-night MLS data are compared to WACCM for the daytime comparisons between

10 and 1 hPa.

Added: To alleviate biases in the MLS HO_2 data, the day-minus-night differences are used as a measure of daytime HO_2 for pressures between 10 and 1 hPa.

It might be clearer to use the explicit term "day-minus-night differences" instead of "day-night differences" all over the paper, but this is up to you.

Done