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Atmospheric Measurement Techniques Discussions

Interactive comment on "Retrieval and validation of O_3 measurements from ground-based FTIR spectrometer at equatorial station: Addis Ababa, Ethiopia" *by* S. Takele Kenea et al.

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Response to Referees' comments and suggestions

We would like to thank the referee for useful comments and inputs that we have used to improve the manuscripts substantially. We appreciate the positive recommendations and understanding of the relevance of our work for FTIR observation of O3 and its comparisons given by the referee. In the following, we will address issues raised and recommendations by the referee.

Referee #1

General comment:

This paper describes a new measurement station at Addis Ababa that has been equipped with a high resolution solar remote sensing Fourier transform spectrometer. Spectra recorded by this instrument on an InSb detector have been used to derive total column amounts and vertical mixing ratio profiles of O3. These results have then been compared to O3 data products from a number of different satellites taken nearby in time and space. It is planned that this new site will join the network for detection of atmospheric composition and change (NDACC). As such it will be the first African site and it is located in a region of the earth that is poorly characterized. As such the station is an important addition to the global network of solar remote sensing FTIRs and this paper (the first paper describing the site and its capabilities) is appropriate for this journal and in essence is worthy of publication. There are however a very large number of minor corrections needed - the paper as presented looks like it has had no editorial work done before submission.

Response

We have accepted and addressed the referee's general comment which is also reflected in specific comments shown below.

Specific comments:

1. It is not clear exactly what is meant by "validation" as used by the authors, and the term seems to be used interchangeably with the term "intercomparison". The techniques described have been validated against other measurements of O3 at different locations (as referenced by the authors). It is usual to use such measurements as these to validate satellite data products (which are subject to a much larger number of uncertainties), not vice-versa. I believe that the authors should make a clear statement that the intercomparisons described here will act both to validate the satellite products over the tropics and to add confidence to the new instrument's performance (since the differences found are similar to other such comparison exercises performed

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elsewhere.).

Response

In the old manuscript we used validation and inter-comparison interchangeably, now in the revised manuscript; validation replaced by the word inter-comparison.

2. The references are not formatted in a consistent way throughout the paper

Response

References are now formatted according to the journal requirement.

3. The figures are not given in the order that they are referenced in the text.

Response

We have corrected the order of figures in the text. The figures are now arranged as follows: Fig.4 is moved to Fig.1, and similarly Fig.1 is renamed as Fig.2, Fig.2 as Fig.3, Fig.3 as Fig.4.

4. Figure 5 and 8 seem to be muddled - the captions and title are contradictory which shows MLS and which show MIPAS?

Response

The figure captions are now corrected in the new version of manuscript.

5. The x-axis of Figure 6 rather unusually has negative values to the right hand side. This is confusing especially as all other Figures follow the usual convention of negative values to the left.

Response

We have accepted the reviewer's useful comments and made the changes accordingly.

6. It would be better to chose either "Fig" or "Figure " and stick to it.

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Response

We have used “Fig.” in the text to be consistent.

7. The descriptions of the satellite instruments are quite long and contain some redundant information.

Response

We have removed some unnecessary details from the descriptions of the satellite instrument and have rewritten all sections. In the new manuscript, Section 4.1 has now be reduced to 16 from 36 lines. Similarly, Section 4.2 reduced from 31 to 15 lines; Section 4.3 is reduced from 30 to 11 lines; Section 4.4 is reduced from 35 to 14 lines; Section 4.5 is reduced from 34 to 9 lines; and Section 4.6 is reduced from 31 to 14 lines.

8. In the description of intercomparsisons there seems to be an assumption that any bias is due to the FTIR spectrometer but no explanation is given for this. In previous studies the ground-based FTS has been shown to have lower uncertainties than satellite-based measurements so these assumptions must be explained - or the text rephrased to say simply that a difference was found.

Response

We have rephrased the text in the discussion of comparison by “. . . difference was found to be . . .. . .” as suggested by the reviewer.

9. In section 5.7 the authors find a very good level of agreement that looks like it may not even be statistically significant. It is then stated that the most likely explanation is spectroscopic differences between the UV and IR - but no justification is given for why other uncertainties will not contribute. Perhaps what is meant is that this level of differences could be fully explained by the known biases between the UV and IR? If so this should be re-phrased. The authors should state whether or not the differences are statistically significant.

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Response

We rephrased this part of the statement in Section 5.7 and the statement that describes the difference is statistically insignificant is included.

10. The conclusion section is rather too long I think and might better be described as a summary. Perhaps the main points could be summarized by showing that in the main the comparisons showed similar findings to other such comparisons elsewhere and describing any deviations from this along with the results as shown in Table 2.

Response

We have accepted that the conclusion section is too long and therefore we have made substantial changes that have reduced the length in the new version. However, we maintained the section title as conclusions.

Minor comments

In addition there are a number of grammatical suggestions that I have and minor corrections suggested for the text. These are quite numerous and I have included a marked up version so that the authors can consider if they would like to make any of the suggested changes.

Response We thank the reviewer for her/his useful and detailed editorial comments which we have accepted completely and made the changes. These comments have improved the manuscript appreciably.

Interactive comment on Atmos. Meas. Tech. Discuss., 5, 6763, 2012.