Atmospheric
Measurement
Techniques
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Discussions

Interactive comment on "Impact of aerosols on the OMI tropospheric NO$_2$ retrievals over industrialized regions: how accurate is the aerosol correction of cloud-free scenes via a simple cloud model?" *by* J. Chimot et al.

Anonymous Referee #2

Received and published: 30 September 2015

General remarks:

This paper presents useful results on a critical aspect of NO2 retrievals over polluted areas: the impact of aerosols and its implicit inclusion through the modified retrieval of cloud parameters. In particular, the authors quantify the error associated with the implicit correction by comparing the latter with an explicit aerosol correction. This is obtained by using an explicit radiative transfer calculation of the aerosol optical effects as input to the OMI cloud algorithm. While relevant for the community, this paper is not

suitable for publication in AMT in its current form. I believe the paper will be publishable in AMT after the authors address the following recommendations. The English should be carefully checked throughout the paper, preferably by a native speaker. There a many typos. Surprisingly, the authors do not cite some recent studies focusing on the effect of aerosol on NO2 retrievals and therefore fail to provide the necessary discussion comparing their results with previous ones. In particular, the authors should clearly differentiate between new results and confirmation of previous findings. Some sections are very dense and confusing for the reader and need to be more synthetic. More details are given below:

Detailed comments:

- The citation format inside a sentence is Author et al., (date), not (Author et al., date). There are many instances of this error in the manuscript.

- Page 8388, line 22: a least one sentence explaining the impact of aerosols on the NO2 retrievals is needed before the last sentence of the paragraph.

- Page 8389, line 17: Bousserez (2015) focused on the impact of aerosols on NO2 retrievals and should be cited here.

- Page 8389, line 23 to end of section: Please provide a number for each section.

- Page 8390, line 8-9: Those two sentences are not needed.

- Page 8390, line 22: replace "geophysical conditions" with "optical properties of the atmosphere ".

- Page 8391, line 10: Figure 2 appears in the text before Figure 1. Please correct the order of the figure .

- Page 8391, line 11-12: Not, from Fig. 2, the scattering weight (a(p)) values decrease toward the surface with or without the presence of aerosols. Also, it is odd to comment on Fig. 2 at this point since this section is dedicated to the description of the algorithm

to compute the AMF.

- Page 8391, line 15 to end of section: this discussion is a bit confusing. The satellite measurement is sensitive to both the NO2 shape profile and the scattering weights. I do not understand why the authors try to separate those effects here and linger on this discussion.

- Page 8392, line 19: "in the OPPOSITE direction".

- Page 8394, line 8-16: please summarize the description of the set up in a table. Also, it would be useful to give more details on the model simulation in an Appendix.

- Page 8394, line 23 to end of section: This paragraph should belong to the next "Results" section.

- Page 8395, "Results" section: the authors should cite Leitao et al., (2010) and Bousserez (2015) here, and compare their results with those studies. In particular, results described in line 12-25 are not new.

- Page 8396, line 1-15: The conclusions presented here seem similar to what was found in Bousserez (2015). Please discuss that.

- Page 8396, line 14-15: Not sure what this means. Please rephrase.

- Page 8397, line 19-20: What figure are you referring to? Figure 6? This is not mentioned.

- Page 8397, line 25: it seems "tropospheric NO2" should be replace by "AMF" here.

- Page 8398, line 3-7: Explain why.

- Page 8398, line 9-10: Which figure are you commenting?

- Page 8398, line 15-20: A bit confusing and unecessary. We already know that the cloud retrieval is sensitive to aerosols. Also, the shielding effect does not depend on the season but rather on both the aerosol and NO2 profiles (which may have different

characteristics depending on the season).

- Page 8399, line 25-28: Not clear, please rephrase.

- Page 8401, section 3.3.1: Is the right surface albedo used for the cloud retrieval in those experiments? In other word are all parameters identical in the aerosol effects and cloud parameters computations?

- Page 8401, line 14-16: Explain why.

- Page 8402, line 20: Not sure "LUT" was defined before.

- Page 8402 to end of section 3.3.2: This part is difficult to read and needs to be more synthetic.

- Page 8405, line 6-13: Those results seem in contradiction with findings in Bousserez (2015) (see Fig. 6), where the shielding effect was shown to enhance the NO2 shape factor error. Please comment on that.

- Page 8405, line 16 and 21: What does "statistic decrease" mean? Please rephrase.

- Section 4.1.1: This section is very dense and needs to be more concise.

- Page 8406, line 3-5: Not clear. Please Rephrase.

- Page 8406, line 10-12: Check the English.

- Page 8406, line 20 to end of paragraph: Again, these facts are discussed in Leitao et al. (2010) and Bousserez (2015). Please cite and compare when appropriate.

- Page 8409, line 1: the authors should also mentioned results obtained in Bousserez (2015) above biomass burning here.

- Page 8409, line 17: What does "irregular behavior" mean?

Figures and Tables:

- Table 1: Replace "requested" by "required" in the legend. Please do not use qualita-

tive statements in the table, but rather quantify the uncertainties for each parameters.

- Modify order of Figure 1 and 2, which do not appear in this order in the text.

- Figure 2: Use "Pressure" instead of "Vertical pressure profile" for the Y-axis.

- Figure 3: "...as a function of AOT AND AEROSOL LAYER ALTITUDE..."

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