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Atmospheric Measurement Techniques Discussions

Interactive comment on "Is a scaling factor required to obtain closure between measured and modelled atmospheric O_4 absorptions? ndash; A case study for two days during the MADCAT campaign" *by* Thomas Wagner et al.

Anonymous Referee #1

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General comments

This manuscript discusses the statistical significance of the gap between observed and simulated AMFs of O4 on selected two clear-sky days during MADCAT campaign. Thorough and detailed analysis of various factors producing uncertainties in the observed and simulated AMFs was made. The authors pointed out the importance of proper usage of temperature and pressure for the condition, proper account of aerosol optical parameters (phase function, aerosol profile extraction) in the simulation, and standardization of DOAS settings (spectral range, degree of polynomial etc) for obser-

vations. Considering these factors altogether, the authors conclude that the gap was insignificant on one day (June 18) but was significant on other day (July 8), supporting conclusion from some previous works. Recognizing that there is a hot debate in the community if the scaling factor is necessary, the manuscript is valuable since it provides as thorough analyses as ever provided.

Nonetheless, I would like to request revision on the following points. First, I find the studied uncertainties could be classified into two types: those from apparently ill treatment (i.e., 203K O4 cross section, US standard atmosphere without temperature correction, no offset in the DOAS analysis etc) and those unavoidable even with the state-of-the-art analysis. For the purpose of evaluating spread of results from multiple groups and of determining best practice to avoid potential hazard during the analysis, determination of the former type uncertainty helps. But when discussing the significance of the gap between observed and simulated AMFs of O4 critically, only latter type uncertainties should be used. In such a way better control of the determined uncertainties is recommended. Secondly, it should be more clarified in Abstract that the precise determination of the uncertainties (+/- 0.16 and +/-0.12 here) is the main point. Careless readers may not realize the importance. Thirdly, possible influence of horizontal heterogeneity of aerosol optical parameters should be mentioned. When the aerosol abundance over the line of sight is becoming less with distance (which may be likely when instrument is located in a city looking out of it), the observed higher O4 dAMFs might be better explained by considering such inhomogeneity even on July 8. I understand that with 1-D radiative transfer models homogeneity needs to be assumed and detailed discussion would be beyond the scope. However, some simple analysis such as that on spatial distribution of AOD from satellite with a fine resolution maybe possible. Lastly, conciseness should be attained during revision. I would suggest shortening section 4.1 and section 5 (paragraphs before section 5.1).

Overall, I would suggest minor revisions on the general comments above and some specific comments listed below.

Specific comments

1. Line 359. Probably appendix A2?

2. Line 526. US standard atmosphere

3. Figure 10. What are the differences of the first three series, with same legend "HG AP 0.6?"

4. Figure 11. Although the panel is for showing noise influence, the gap related to the main conclusion of this study is well represented as the difference in the O4 optical depths in the first two panels. Such discussion should be added in section 4.3.1.

5. Table A12 in line 1922 is mislabeled. (Table A10)

6. Table A11. MCARTIM

7. Lines 846-848. Second and third points should be exchanged, considering the order of Fig. 14b and c and the following discussion.

8. Line 906. Overall uncertainty calculation deriving 0.12 is not clear. When considering 3% uncertainties for VCD, 6.1% from radiative transfer simulation, and 10.8% from spectral analysis, the overall uncertainty may be 13%. When it is around 0.71, it can be 0.09?

9. Line 944. 8 July

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