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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Quality assessment of O_3 profiles measured by a state-of-the-art ground-based FTIR observing system" *by* M. Schneider et al.

Anonymous Referee #1

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The paper by Schneider et al, "Quality assesessment of O3 profiles ....", follows on from an earlier paper by Schneider et al that compared ground based FTIR with Brewer data. This current paper uses the same methodologies as the earlier paper, this time however comparing the FTIR retrievals to O3 ECC sondes, and compares the two datasets on the basis of profiles and partial columns.

The methods used are very robust, and probably are, as the author claims, currently the most advanced methods in this particular research area for ground based FTIR data. There is a good discussion on error sources with respect to the FTIR data, which is nicely presented in figures 3, 4 and 5. Generally the discussion is easy to follow, the

figures well constructed, and the flow of the paper well organised.

The following are major/general comments on the paper, after which is a list of minor grammatical/typographical errors.

Comments:

1. section 1, pg 4979 line 12; this sentence is in true in principle about "all trace gases" with absorptions similar to O3. The only problem with this is that there is probably only one species, namely O3. So do you mean absorption features that have a mixture of strong and weak lines, some with isolated lines (around 1140-1160 cm-1 for example), and others bands that have a forest of lines (1000 cm-1), and mixed isotopic composition? With O3 vertical distribution as it is, the particular methodologies developed for O3 by this author and others preceding this paper are all very good, and do a great job for O3. I would suggest that it is probably the methods themselves and careful development of the approach to each individual case that is probably more important and can therefore be adopted for almost any gas.

2. section 2, page 4980, line 12; the justification for the use of a log scale relates to the log-normal distribution of the mixing ratio profile. This was shown for water vapour, but is this also true for O3?

3. page 4980, line 13; the isotopic O3 lines have quite different absorption characteristics compared with the main isotope, ie, they are generally much weaker and isolated. How does this feed into the retrieved O3 profile as these weaker O3 lines will not have any sensitivity in the troposphere?

4. section 4.1, page 4984, line 5; an agreement of 0.6% is stated but between which geophysical parameters exactly?

5. section 4.1, page 4985. In the discussion here on what to do with the O3 residual, the authors refer to the 1998 Potsdam meeting minutes. These minutes suggest two possible methods amongst others, ie, 1) using satellite climatologies, or 2) an exten-

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sion of the O3 mixing ratio at a constant value above the burst altitude. The minutes do not suggest either one is better, but suggested that the choice of method depends on circumstances. While the satellite derived climatology gives some connection to real variability (for example a monthly mean climatology), it is not clear how a constant mixing ratio can relate to any real variability in the O3 residual, other than offsetting possible bias. So the sentence reading "It is argued that this approach..." does not really reflect what the minutes are saying completely. There is a residual, and if one wants to compare with a total column, then these approaches may account for variability's.

6. The inline ratios (and %) on pages 4988 and 4990 are not of course strictly correct in the sense that there should be a factor of 100. A minor point; maybe the editor is comfortable with this as it is very obvious what is meant.

7. section 5, page 4989, 5th sentence. The recommendation maybe relevant for Izana but there are other circumstances where the use of seasonally adjusted a priori is necessary. One example is in polar regions where the a priori mixing ratio of O3 during depletion events is so different from non-depletion chemistry that the choice of different a priori is necessary for the successfully convergence of the fitting algorithms. In general if the a priori is too far from the final solution then information from the measurements alone is not going to be sufficient to reach the global solution.

8. table 1, page 4994. The truncated terms in the table should be defined; will most readers know that z. bl. is zero baseline? (similarly figure 3,4).

9. Figure 1, page 4997 define the term (rho ij) on the graph. Above 32.8 km the values are estimated from what?

Minor comments/typos

10. page 4978, line 5; " ... in the form .."

11. line 6; " ... achieved by an intercomparison with ECC..."

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12. line 15; "... " application as a reference ...requires precise ..."

13. line 21; " ...well suited ..."

14. line 22; " ... and has been monitored over many ..."

15. page 4979 line 15; "... briefly discuss the ..."

16. line 22; "...we have operated a ..."

17. page 4980, line 5; "...consists of a ..."

18. line 15; "... allows the additional constraint ..."

19. line 21; do the 2006 hitran updates have a reference?

20. page 4981, lines 2, and 4; should the term "entries" be "elements"?

21. line 14; extension -> width?

22. line 16; "...estimation is based on ..."

23. line 28; "...are the retrieved..."

24. line 29; " ... state respectively, ..."

25, page 4982, line 7,16; rough -> coarse

26. line 9; define ILS

27. line 16; missing right bracket

28. line 17; "... Fig. 2 provides a basis on which to make reasonable choices for the widths of these ..."

29. lines 20,21 remove "subsequently called" as this is used in the previous sentence, so it does not need to be repeated to make the meaning clear.

30. line 25; "For the VMR profile errors (Figs. 3 and 4), we restrict the discussion

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...standard deviation, separating these partial column amount errors into random errors, ... components."

31. page 4983, line 7; "For the layers depicted in the right panel of Fig. 2, the ..."
32. line 10; rough -> broad
33. line 12; "... would only make the interpretation of the FTIR data more difficult."
34. line 16; "...profiles with ..."
35. line 17; applying -> using
36. page 4984, line 6; "...allows us to conclude ..."
37. line 8; " ...consistent with ..."
38. line 21; " ...by the error introduced by the ECC ..."
39. page 4985, line 5; " ...altitude up to the ..."
40. page 4986, line 18; "6% as suggested ..."
41. line 28; "...ECC is a mean of ..."
42. page 4987, line 2; "It is in satisfactory agreement with ..."
43. line 8, " ... profiles obtained from spectra of ..."
44. line 26; "These estimated ..."
45. page 4990, line 1; "...insight into ..."
46. line 9; "In section 4.1 ..."
47. line 16; "This enables good quality checks ..."
48. line 2; "This site offers unique conditions, on a world-wide basis, for intercomparing ..."

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49. page 4990, line 4; "... documentation is essential...for the purpose of validating satellite measurements."

50. page 4996, table 3. I presume that the "-" signs in the table mean that the numbers are zero?

51. page 4997, figure 1 caption. "up to 32.8km, profiles and ..."

52. page 4998,5000 figure 2,4 captions, colored -> coloured (English not US spelling)

53. page 4999, figre 3 caption; "... except for smoothing."

54. page 5002, figure 6 caption, "... altitude to the ..."

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 4977, 2008.