

Interactive comment on “Intercomparison of UV-visible measurements of ozone and NO₂ during the Canadian Arctic ACE validation campaigns: 2004–2006” by A. Fraser et al.

Anonymous Referee #1

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Review of "Intercomparison of UV-visible measurements of ozone and NO₂ during the Canadian Arctic ACE validation campaigns: 2004-2006" by Fraser, A., et al. submitted to ACP.

The manuscript presents the results of an intercomparison of 4 (3 in 2004) ground-based zenith-viewing UV-visible spectrometers made during three ACE validation campaigns at Eureka, Canada during 2004, 2005 and 2006. A thorough description of the comparison of ozone and NO₂ DSCDs and VCDs is given based on the protocol introduced by the UV-visible working group of the NDACC. The authors did an impressive job performing and describing the intercomparison study. The results of this study

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Discussion Paper

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show clearly how important ongoing work on instrument intercomparison still is and that is not necessarily straight forward to meet the standards set by the NDACC, even for species like ozone and NO₂.

The research is well presented and well written up and I have only some minor issues and suggestions to add, see list of comments below.

General comments:

The main purpose of paper is the measurement intercomparison between the different ground-based instruments so that these measurements can be used as a reliable source for the validation of the ACE satellite data. However, given that the results from the comparison between the ground-based and satellite data sets is quite prominently presented in the abstract, the actual validation part seems somewhat hidden in text (see also specific comments). Why? I would have rather expected a separate section on the validation results, rather than finding it spread through the text.

Specific comments and suggestions:

Page 16285, line 6: add "of ozone and NO₂" after "vertical columns densities". Although of course mentioned in the title, the measured species should also be listed in the abstract, specially since you then refer in line 8 to "for both species".

Page 16286, line 11: To be consistent, add (MAESTRO) after "onboard ACE".

Page 16286, line 20: respect (typo)

Page 16287, line 25: During (typo)

Pages 16289/90: For MAESTRO and SPS: for further validation campaigns, it probably would be well worth looking into some temperature stabilisation for either at least the PDA or preferably for the whole instrument. Although an initial expense, this should well pay off re data improvement.

Page 16291, line 17: Should read: "can be fitted."

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Page 16292, line 6: "The NO₂ is near the limits of detection of SPS and MAESTRO". There might be other issues as well, but (as mentioned above) temperature stabilisation might well improve the situation substantially.

Page 16292, line 13: I assume there were no box model results for 80N and that is why the NO₂ profiles for 75N is used?

Page 16293 & Table 2 & Figure 4: Is the 5% (for ozone) and 20% (NO₂) error assumption really realistic for MAESTRO and SPS, given the noisier spectra, etc.?

Page 16295, lines 7-9: Sounds somewhat confusing that "the data measured at SZA > 92 is unreliable because the thermal noise increases as the detector gets warmer". Not sure what you want to say here exactly. It is obvious that the thermal noise increases when the detector gets warmer but then the temperature should decrease with increasing SZA. Or do you mean to say that in general the quality of the spectra measured at high SZA gets worse while the campaign progresses and ambient temperatures are increasing?

Page 16295, line 21: further (typo)

Page 16301, line 24: During (typo)

Page 16302, lines 6-7 & Figure 13: Either indicate 8 March in Figure 13 or add day number to text.

E.g. Section 6.2, the comparison between ground-based and satellite data sets is also described here under each of the Sections for each year. Might make sense to separate that part out or at least to reflect it somewhat clearer in the title that the validation of the ACE data sets is discussed here.

Page 16305, line 11: individual (typo)

Page 16307, lines 14-15: Why was the smaller altitude range (22-40 km instead of 13-58 km) chosen for the NO₂ partial columns?

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Table 1: Why did you use 400-450 nm for the NO₂ analysis for MAESTRO and SPS while 400-550 nm was used for the other 2 instruments. Again because of the noisier spectra?

Table 2: gap between O₃ and NO₂ column for MAESTRO?

Figure 1: Text is rather small and hard to read.

Throughout the manuscript, sometimes "Figure" is used, sometimes "Fig.", shouldn't that be consistent?

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 16283, 2007.

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