

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.

A. Fraser et al.

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We thank H. Roscoe for his comments on our paper. In the following, the original comment is repeated in italics and our responses follow.

1. The team have still not resolved the merit of "agreement within error bars" when failing to meet NDACC standards (p16296 lines 13 25, and elsewhere). Some discussion would be fruitful.

By agreeing within error bars, we mean that the range of possible values of the value in question includes part of the range of the NDACC standards. We don't mean to imply that agreeing with the standard within error bars is the same as meeting the standards. We've clarified this by adding the following discussion in the conclusion.

"While the comparisons that meet the standards within the standard error (which represents the random error) fail to meet the NDACC standards, their range of possible values includes part of the NDACC range. Not meeting the NDACC standards within the standard error implies that there is a systematic bias between the instruments."

2. In order to substantiate the claim that the daily reference is better because of smaller wavelength shifts (p16299), the wavelength shifts should be instanced. If they routinely exceed 0.5 pixels, the claim is not true, as interpolation errors mirror at half-integral pixel differences. Also, WinDOAS software has an excellent interpolation scheme, and only a half-daily reference taken in the midst of the twilight, as often done for BrO measurements, so reduces the wavelength shift that the interpolation error is removed.

In the analysis for the Eureka campaigns, we choose a single spectrum from noon each day to be the reference spectrum. In the analysis for the previous MANTRA campaign, we selected a single spectrum from the entire campaign to be the reference spectrum. We do not select a half-day reference.

We've added the following paragraph to the discussion in this section:

"The wavelength shifts determined by WinDOAS for the Eureka spectra are generally small, between 0 and 0.2 pixels through one twilight period, while the shifts determined by WinDOAS for the MANTRA spectra vary between 0 and 3 pixels, depending on the day. Over one twilight period during MANTRA, the variation can be as high as 0.8 pixels."

3. The text of section 6 is full of detailed results that would be much better in tables.

The results discussed in section 6 are already in Tables 4 and 5. We agree that this section is over-run with numbers. To reduce this, we have combined the discussion of the morning and afternoon comparisons between instruments. We have also combined the ozonesondes and ground-based instruments in the discussion of the agreement between the satellite partial columns and total columns from the other instruments.

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We've also reordered section 6 to put more emphasis on the satellite comparisons. We have grouped the ozone and NO₂ ground-based comparisons together in Section 6.2 (now titled "Comparisons between ground-based instruments") and the ozone and NO₂ satellite comparisons together in section 6.3 (now titled "Comparisons with satellite instruments"). This has resulted in the reordering of Figures 15-20.

4. *Tables 4, 5, and 6 have minus signs mixed with hyphens and they are almost indistinguishable. At least leave spaces, better would be to spell out "minus".*

We're replace the minus signs with "minus".

5. *Figure 1 caption would be better as "ECMWF potential vorticity at 475 K potential temperature (about 19 km in the lower stratosphere) on 4 March ..."*

We have made this change.

6. *Figure 5(b) is what one might expect from different wavelength ranges being used (AMFs being different at different wavelengths, and the slant columns used in the figure being the equal vertical columns times the different AMFs). But the wavelength ranges of UT-GBS and SAOZ for ozone analysis are the same in Table 1. This worthy of comment, and even of investigation - has misinformation crept in here?*

All four instruments were analysed with the same wavelength ranges, to eliminate the expected differences in slant columns resulting from analysing the spectra in different wavelength regions. This feature is consistent in the UT-GBS vs. SAOZ regressions done for Eureka, and is possibly due to the difference in fields-of-view of the two instruments. We have added a comment to this effect in section 4.3:

"The increasing residuals seen in Fig. 5b are typical of DSCDs that were analysed in different wavelength regions. This is not the case for this comparison, and this feature is common to all UT-GBS vs. SAOZ comparisons performed for Eureka. This is possibly due to the differing fields-of-view of the instruments, the effect of which is further discussed in Sect. 5.1."

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