

Interactive comment on “CO measurements from the ACE-FTS satellite instrument: data analysis and validation using ground-based, airborne and spaceborne observations” by C. Clerbaux et al.

C. Clerbaux et al.

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Dear Reviewer 1, Thank you for the useful and constructive comments.

1. The description of the ACE mission could be shortened; details of ACE are given in many other papers. A suitable reference is sufficient.

As recommended we have shortened a bit the description of the mission. Paragraph 2.1 (The ACE mission and the ACE-FTS instrument) now only contains the material we need for the discussion in the paper.

2. I suggest that the microwave observations at Cervinia are discussed in a different chapter. Although only a few data are given for only one site, these observations should

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not be mixed with the FTIR data. This should also be made more clear in Table 3.

We agree with the suggestion (changes were done both in the text and in Table 3).

3. Table 3 should give the DOFS for a all sites, otherwise a comparison makes no sense.

All DOFS are now removed from Table 3, as some participants were not able to provide DOFS for their stations.

4. I do not fully understand Figure 8 and 16. The reader might get the impression that ACE performs only very few measurements per year, which is not the case. If Table 3 gives for example 39 coincidences for Kiruna, I would expect 39 symbols in Figure 8, but I find only 9.

Time coincidences often occur, and hence symbols are superposed. We changed the symbols in order to better distinguish close events and added a sentence related to this in the Figure caption.

5. Figure 11 gives no ACE data for the altitude region 22–23 km. I assume the retrieval gives negative values, which is unrealistic. But I do not see any problems in negative values, as long as the error bars allow to explain these outliers. For completeness all data should be shown, and also the negative data must be included in the mathematical analysis, otherwise a positive bias of ACE could be artificially created. The high positive values around 27 km might be caused by the negative ones around 23 km. This needs to be discussed somehow.

We have negative values for the ACE-FTS profile around 23 km indeed. The plot was redone to show this, and the following sentence was added in the text: The ACE-FTS high positive values around 27 km might also be related to the negative ones around 23 km ...

6. Due to the large error bars it makes no sense to show MLS above 30 km in Figure 18, any comparison above 30 km is meaningless.

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Figure 18 was changed to take this into account: the top panels are now limited to an altitude of 30 km. The lower panels (which show averaged percent difference) are still provided up to 80 km as the agreement, even with large error bars, is good for MIPAS and SMR.

7. The ATMOS instrument on the space shuttle, flown in 1985 and 1994, was also as a solar absorption FTS instrument. I assume ATMOS has measured CO. If so, the results should be discussed here for comparison.

Yes ATMOS was measuring CO and is a precursor of ACE. We have chosen to present comparison with only current data.

8. Page 15285 and 15286: The impact of southern hemispheric emissions and biomass burning contributions of CO on the UTLS have already been studied in detail by Notholt et al. (Notholt et al., *Science*, 300, 307-310, 2003) and Rinsland (*Geophys. Res. Lett.*, 32, L20803, doi:10.1029/2005GL024214, 2005). These papers should be mentioned here. The Rinsland paper is discussed later on in a different context.

The Notholt et al. reference was added as recommended.

9. page 15286: The impact of thermospheric and mesospheric CO on FTIR profiles and columns in the polar regions have been discussed by Kasai et al. (*Adv. Space Res.*, 35(11), 2024–2030, doi:10.1016/j.asr.2005.04.099, 2005) and Velasco et al. (*Atmos. Chem. Phys.*, 7, 1305–1312, 2007). Both papers should be cited here, the Velasco paper is cited already in a different context.

Both the references were added as recommended.

10. Page 15288: It is written there: 'Until recently only total column retrievals were available, but improved retrieval algorithms now allow profiles or partial column data to be derived (Hase et al., 2004)'; This is not true, CO profiles have already been retrieved from ground-based IR spectra in 2003 (Notholt et al., *Science*, 300, 307-310, 2003). These results should be discussed here. Furthermore, after

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mentioning the paper by Hase et al. (2004) I do not understand the following sentence.
‘The quality of the CO vertical profile information extracted from ground-based
FTIR solar absorption is discussed in Barret et al. (2003).’

This part of the paragraph was re-organized as recommended.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 15277, 2007.

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