

Interactive comment on “Shipborne solar absorption measurements of CO₂, CH₄, N₂O and CO and comparison with SCIAMACHY WFM-DOAS retrievals” by T. Warneke et al.

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General comments

The title provides an accurate summary of the paper - ship-based measurements of total columns of CO₂, CO, CH₄ and N₂O by solar FTIR absorption spectroscopy, and limited comparisons with CMDL in situ data and space-based retrievals from the SCIAMACHY instrument on the ENVISAT satellite. The paper is generally clear and well written and suited to publication in ACP after incorporating minor revisions and corrections detailed below.

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Specific comments

1. Introduction

Provides background and rationale for the measurements, particularly with regard to the need to validate future planned high accuracy satellite-based measurements of the target gases. This is topical and timely.

P850, line 3: should this read an accuracy (not precision) of 0.5%?

3. Shipborne solar measurements

Using a column averaged mixing ratio to compare with in situ measurements (as is done later in the paper) is strictly only correct if the vertical mixing ratio profile is uniform. For CO₂ this is reasonable, but for CH₄ it is problematic because of the fall-off in the stratosphere. Waschenfelder et al made a correction for this using co-retrievals of HF to allow for the effect of stratospheric reduction. Did the authors also do this? If yes, it should be explicitly mentioned, if not, the consequences for comparison with CMDL in situ and SCIAMACHY DOAS measurements should be discussed.

Diurnal variations.

I would prefer to see a plot of all the FTIR data as a function of time, to see for myself the actual variability and diurnal variation (or lack of it), instead of the current figure 1, which shows only the scatter with any real signal removed. The diurnal scatter statistics can be simply quoted in the text. The authors make an implicit assumption that there is no real diurnal variation, and that whatever variation is seen is due only to the measurement. This assumption may be valid, but it should be explicitly justified. What about the effects of biomass burning plumes? How do these affect short term (< 1 day) variations? (If Fig 1 is replaced with a plot vs time, we the readers could see this for ourselves.)

Comparison with CMDL in situ data

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The biases between CMDL and FTIR data are 4-10% for CO₂ and CH₄. The AT-MOS/HITRAN line parameters are probably accurate to better than 1-2% for strengths, maybe a little worse for widths, so it is not sufficient to assign all the disagreement to the line parameters. Instrument bias (such as imperfect ILS) and retrieval bias must also play some part in the observed biases.

Why is there no comparison with CMDL CO and N₂O data?

It would be good to refer to Figure 3 in this section of the text.

4. Comparison of shipborne...

P854 line 20: "The deviation between DOAS and shipborne data is less than 4% at these latitudes." Is this after the scaling of FTIR data to match CMDL, or before?

Typos and grammar

P851 line 13: This allows calculation of the column averaged vmrs...

P851 line 23: CH₄ was analysed between ... (not in between)

P855 line 9: agreement mis-spelled

Table 1, O₂ line O₂ interfering gas. Should be CO₂?

"Data" is a plural word, and grammar should be corrected in many places accordingly: here is my list, I may have missed some!

P848 line 12: if shipboard data are compared

853line16: also state an error

853line17: threshold were included.

854 lines 8, 14, 16, 20, 22, 23(twice), 26, 28, 29 (and their spread)

855line1, 14

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Fig 3 caption, line 6, the shipboard data for CO₂ were... (There are also several correct uses of the plural in this caption - different writer?)

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 847, 2005.

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