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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Calibration of TCCON column-averaged CO_2: the first aircraft campaign over European TCCON sites" *by* J. Messerschmidt et al.

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Final response to D. Griffith (Referee)

We would like to thank the referee for his constructive suggestions for our paper. In the following, you find the respond to his comments.

Major comments:

The major concern of D. Griffith was the error analysis in Section 3.6. He wrote "The approach outlined at the start of 3.6 is correct [...] However I find that the error analysis discussion for the TCCON measurements is incomplete."

1)

Therefore Section 3.6. was rewritten (see attached pdf-file), now discussing the main systematic error sources and describing random errors.

1.1.)

The paragraph Section 3.6 was completed, giving now an overview of known systematic effects, unknown systematic effects, and random effects.

1.2.)

At the beginning of Section 3.6.1 three paragraphs were inserted. They recapture known systematic effects, described by Wunch et. al 2011 (The Total Carbon Column Observing Network , Phil. Trans. R. Soc. A 2011 369, 2087-2112) and Deutscher et. al. 2010 (Total column CO2 measurements at Darwin, Australia – site description and calibration against in situ aircraft profiles, Atmos. Meas. Tech.,3,947-958). The third paragraph discusses the implication for the IMECC campaign. The following paragraphs are mainly unchanged.

1.3.)

Table 3 was left unchanged, highlighting the fact that of the systematic effects only the ghosts are not taken care of prior to the FTS measurements or within the standard retrieval procedure.

1.4.)

Table 4 was checked for completeness, but left unchanged.

Furthermore the referee stated “In table 5, I have trouble relating the total column uncertainties with the error analyses in tables 3 and 4. Most are quoted as +/- 0.1ppm, but for example the total error from Table 4 for aircraft proïňĄles is at least 3 ppm. ”

1)

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Table 3 gives the total uncertainty for all FTS measurements at one site

2)

Table 4 lists the uncertainties contributing to the total uncertainty for one assembled aircraft profile

3)

Table 5 states the total column uncertainties.

3.1.)

Regarding the FTS measurements, these values are the same as Table 3 adjusted in the decimal place.

3.2.)

Regarding the aircraft measurements, the total column uncertainty is calculated from the sum in quadrature of the contributing uncertainties (Table 4) weighted by their relative contribution to the completed profile in terms of pressure. This means for example for the conservative uncertainty estimate of 2 ppm for the CO2 seasonal cycle in the lowermost stratosphere that it contributes only a few percentage in respect to the entire profile. The total column uncertainty is mainly influenced by the uncertainty of the aircraft profiles as the aircraft ceiling was in the upper troposphere. Therewith the total error does not sum up to 3 ppm. This procedure is described in Section 3.6.. Therefore I have checked the calculation, and left the values unchanged.

Minor comments: 1) The supplement comments were included in the new version.

Janina Messerschmidt, 30th September 2011

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/11/C9608/2011/acpd-11-C9608-2011-supplement.pdf

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