

Interactive comment on “Total column CO₂ measurements at Darwin, Australia – site description and calibration against in situ aircraft profiles” by N. M. Deutscher et al.

Anonymous Referee #2

Received and published: 14 April 2010

Ground-based remote sensing of the long-lived greenhouse gases in the near-infrared spectral region has become an important tool in understanding the carbon budget. The ground-based observations are internationally organised in the TCCON network. It has been found necessary that each TCCON site is once calibrated by an aircraft overflight where in-situ measurements are performed. The paper by Deutscher et al. presents the TCCON site in Darwin/Australia and discusses an aircraft campaign that has been performed in 2006.

The paper is new, interesting and well written. It is appropriate for AMT and should be published. But I have two comments:

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1.) The chapter on the precision of O₂ and CO₂ is relatively short. A few points could be discussed in more detail, for example: - Since the residuals of Figure 2 show a typical variability of 0.5%, why is it possible to achieve a precision of < 0.1% for the total column? - The diurnal variability as a function of the solar zenith angle is < 0.2%, even when applying the airmass correction. How does this coincide with a precision of < 0.1% for the total columns? Regarding both points, I assume all calculations are correct, but a more detailed discussion would be helpful.

2.) It would be interesting to see how the aircraft data really improve the total column results. Assumptions must be made for the vmr- and uncertainty a-priori profile of CO₂. The aircraft campaigns help to reduce the uncertainties. An aircraft going for example up to 4 km will still leave large uncertainties for the column above. An aircraft going up to 12 km is much better. A separate chapter and/or a table where this is discussed would be very helpful.

Interactive comment on Atmos. Meas. Tech. Discuss., 3, 989, 2010.