

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2021-92, clarifications needed

Anonymous Referee #2

Referee comment on "Atmospheric carbon dioxide measurement from aircraft and comparison with OCO-2 and CarbonTracker model data" by Qin Wang et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-92-RC2>, 2021

General

The paper introduces aircraft based measurements of column weighted CO₂ mixing ratio using a lidar at the Chinese coast including comparison with satellite data. The paper is within the scope of the journal but especially section 3.2 requires revision because of misleading sentences. Here the authors should use the papers of the other groups applying similar methods (Refaat, Amediek in introduction). Sections 3.4 and 3.5 are too short.

Specific

Line 143ff: "two-way nested chemistry-transport model Tracer Model 5" (see also Peters et al, 2004). Improve sentence, it is not consistent with the provided references. The reference to CarbonTracker (Babenhauserheide et al, 2015) should be earlier.

Unfortunately the references use different full names for TM5 but not 'transfer model'.

Line 151: I suppose the trace gas is CO₂ here, i.e. online means on a CO₂ line. If yes please say so.

Line 160: "hard target": is that the surface or the cloudtop? Please be more precise here.

Line 170ff: Please define all quantities in equations in the text. What is for example P_p?

Use lower case for atmospheric pressure (p).

Section 3.1: Please improve text for the non expert reader.

Section 3.2: I suppose Eq. 7 describes the signal and Eq.8 the noise, if yes please write that (see also reviewer #1). Please correct misleading sentences. What is on the abscissa of panel a of Figs. 7-9 (with units)?

I would suggest to rearrange section 3.3 to have every results for the 14 March flight together, i.e. exchange the paragraph beginning with line 245 with the part from line 226 to line 244.

Sections 3.4 and 3.5: Please say more to Fig. 18, including the shown standard deviations. Please include the flight data in panel 18b in the same color scale, or maybe a slightly shifted scale, to consider that the satellite data must have a systematic low bias because of the influence of the altitude region with lower CO₂ above the flight track (upper troposphere and the stratosphere). This bias should be mentioned in the text, here and also in section 3.5 as justification of the use of CarbonTracker (please spell out in caption

of Fig.19). The last sentence of section 3.5 has to be replaced, I don't think you refer to the stratosphere here when in the figure is only the troposphere. It might be useful to indicate the flight altitude in Fig.19.

Line 376: Please replace the preprint by: Krol, M. C., S. Houweling, B. Bregman, M. van den Broek, A. Segers, P. van Velthoven, W. Peters, F. J. Dentener, and P. Bergamaschi (2005), The two-way nested global chemistry-transport zoom model TM5: Algorithm and applications, *Atmos. Chem. Phys.*, 5, 417– 432.

Technical corrections

Additional to the remarks of reviewer #1 there are the following issues:

Line 64: Don't create fantasy names for existing institutes. The correct name is 'German Aerospace Center (DLR)'.

Line 143: Typo in citation.

Table 3: Is 'wind scale' 'wind strength in Beaufort'?

Line 266: Typo

References: Please remove control sequences (e.g. line 312) or blanks (e.g. line 449) and use subscripts instead.

Several times the name of the journal and the volume are missing, indicated by ',,', please insert it. In case of Yokota also the DOI is missing, meaning that it is impossible to find the paper. For books please provide publisher and city.

Use μ instead of mu, and CO₂.

References

W. Peters, M. C. Krol, E. J. Dlugokencky, F. J. Dentener, P. Bergamaschi, G. Dutton, P. v. Velthoven, J. B. Miller, L. Bruhwiler, and P. P. Tan (2004), Toward regional-scale modeling using the two-way nested global model TM5: Characterization of transport using SF₆, *J. Geophys. Res.*, 109, D19314, doi:10.1029/2004JD005020.