

Interactive comment on “Using airborne HIAPER Pole-to-Pole Observations (HIPPO) to evaluate model and remote sensing estimates of atmospheric carbon dioxide” by C. Frankenberg et al.

Anonymous Referee #1

Received and published: 10 February 2016

Manuscript "Using airborne HIAPER Pole-to-Pole Observations (HIPPO) to evaluate model and remote sensing estimates of atmospheric carbon dioxide" of Frankenberg et al. presents detailed comparisons of HIPPO aircraft CO₂ observations with different satellite-derived atmospheric CO₂ products (primarily GOSAT XCO₂ but also AIRS and TES CO₂) and two global models (MACC and CarbonTracker). They show new interesting results, the topic is appropriate for ACP and the paper is well written. I recommend publication after the minor issues listed below have been considered by the authors (I have not identified any major issues).

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Minor issues:

Page 10, line 24: I think “an excellent agreement” is a bit too strong taking into account that there are differences up to 4 ppm (same page, line 20). I recommend to change this to “good agreement” or so. Similar on page 11, line 21, with the statement “compare extremely well” already in the first sentence before any comparison results are shown and discussed. I also do not think that agreement within 1 ppm and outliers up to 3 ppm is best characterized by “extremely well” (NOTE: in the text on page 11 the unit ppb is given two times (lines 24 and 25) but I guess this should be ppm!).

Page 10, line 25: “In some cases, MACC seems to compare somewhat better, ...”. A MACC colleague is co-author but no CarbonTracker colleague. I wonder if NOAA would agree with this statement. I also wonder if NOAA needs to be acknowledged for their data.

Page 11, line 6: “SCIAMACHY data over the oceans is not yet matured as is has no dedicated Glint mode.” Sounds a bit strange (even if “is” typo corrected). I recommend to replace this with “SCIAMACHY data have not been used as it has no dedicated glint mode and the SCIAMACHY products (e.g., Reuter et al., 2011) are limited to retrievals over land”. Reuter et al., 2011: "Retrieval of atmospheric CO₂ with enhanced accuracy and precision from SCIAMACHY: Validation with FTS measurements and comparison with model results", J. Geophys. Res.

Page 16, line 8: “. . . indicates that GOSAT compares slightly better overall.” Compared to what?

Page 21, Tab. 1: Why is the GOSAT sigma only 0.45 ppm (as far as I know the GOSAT XCO₂ single measurement precision is about 2 ppm; or have data been averaged?)? Please check and add additional explanation if necessary.

Fig. 3: Bottom, middle: Profiles only partially visible as overplotted by legend. Please improve.

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Fig. 5, left: Possibly data points only partially visible as overplotted by legend. Please improve.

Fig. 6, left: Data points only partially visible as overplotted by legend. Please improve.

Fig. 7, right: Symbols for models very difficult to see in printout.

No reference to Figs. 5 and 6 in text (should be somewhere in Sect. 4).

No reference to Fig. 11 in text (should be somewhere in Sect. 5.2).

Typos:

Page 10, line 6: “are usually 162253” ?

Caption Tab. 1: “of different compared to” -> “of the difference compared to”

Interactive comment on Atmos. Chem. Phys. Discuss., doi:10.5194/acp-2015-961, 2016.

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