

***Interactive comment on “Validation of routine continuous airborne CO<sub>2</sub> observations near the Bialystok Tall Tower” by H. Chen et al.***

**Anonymous Referee #2**

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This paper addresses instrument calibrations, inter-comparison and the field measurements approach, although classical and practiced for a while by the community, could provide valuable guidance to the community. Some of the points noted in the paper are common knowledge to the measurements folks and will not necessarily add value, but they may be useful to the newcomers application oriented scientists. Furthermore it should be made very clear that the measurement technologies have moved forward significantly with more stable and robust laser based cavity ring-down instruments, that do not need as frequent calibrations.

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(1) The motivation is particularly broad and should be more concise. For example TCCON FTS validation requires high altitude flights up-to 12+km to sample the column. Does the rental aircraft go that high? Was it used to validate or fly over the Bialystok FTS? If so then mention if not there are other platforms and campaigns that have already done this and please cite them..Wunch et al ACP and Phil Trans.. Similarly discussions on emissions verification should site recent papers or reports (e.g. National Academies US study 2010)

(2) I did not see detailed discussion of flask sample species analysis besides CO<sub>2</sub>, that was compared to in situ data. I would not have this in the abstract.

(3) The way it is written the paper almost points to the obvious, and this could be said in a more concise and clear manner.

(4) I am very concerned about the water contamination and other air contamination issues and the statistics of this should be declared in a transparent manner, at least in an appendix (5) Was any Allen-Variance analysis performed on your system, as deployed or in the lab. This would be extremely valuable to determine zero/cal frequencies. It would also be useful for others to compare various instruments that offer more stable performance....as an example please see and cite in your special issue I think Field inter-comparison of two high-accuracy fast-response spectroscopic sensors of carbon dioxide B. A. Flowers, H. H. Powers, M. K. Dubey, and N. G. McDowell Atmos. Meas. Tech. Discuss., 4, 5837-5855, 2011 Please comment on alternative technologies compared to your IRGA system, in light of problems with water contamination.

(6) Was planetary boundary layer height proxies measured during the in situ airborne analysis e.g. RH as discussed earlier. A more rigorous analysis would be needed to draw meaningful conclusions. Same is true for the longterm time series analysis that is very idealized and simple. The statistics should be presented clearly and the figures may not reveal clear trends without the seasonal fitted profiles. I can clearly see high bias points in the 300m time series. Are these due urban pollution since you are only

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20-30km from a city. Please make this clear. Also are there data on CO that can be used to explain these high bias.

(7) I know you all have done a very rigorous job on the flask vs in situ comparisons. How does the real variability you see effect this, can you use your data to put some limits on when we should compare with flask and when not or how the methodology degrades with real atmospheric variability as measured by aircraft. This would be useful. (8) You have done a good job with the flask vs in situ comparison and the paper will be much improved if other sections also have a similar rigor. The contrast is very distracting to me.

In summary this paper will be valuable to the community as a AMT publications after the major revisions to address the aforementioned comments and a more balanced perspective including other measurement technologies in use by the community. I encourage the authors to revise and share their work.

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Interactive comment on Atmos. Meas. Tech. Discuss., 4, 6987, 2011.