

Interactive comment on “Consistent evaluation of GOSAT, SCIAMACHY, CarbonTracker, and MACC through comparisons to TCCON” by S. S. Kulawik et al.

Anonymous Referee #2

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Kulawik et al. look in depth into various BESD, ACOS, Carbontracker and MACC vs. TCCON comparison results. Most notably they try to separate the correlated from the uncorrelated errors and take a deeper look into seasonal-dependent biases, all of which is useful to the scientific community. However some major issues need to be addressed before becoming publishable.

General comments:

Most of the issues with this paper have already been flagged by Referee #1 and I will try not repeat them here. Suffice to say that I concur with his assessment. Particularly the

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lack of and, if at all present, the often erroneous representation of confidence intervals on the retrieved data is troublesome. In its present state I cannot deduct from this work if any of the attained biases are indeed statistically significant. This is crucial given that the data is often derived from small data samples.

There is no mention of applying the TCCON column averaging kernels and a priori to the model and satellite data as per the TCCON guidelines(https://tccon-wiki.caltech.edu/Network_Policy/Data_Use_Policy/Auxiliary_Data). One should at the very least outline why this was omitted.

The Izana station is located at 2370m asl. Chapter 3.2 mentions Garmisch, Four Corners, Bremen and JPL as sites which (due to their location), potentially harbor a significant collocation error impacting the overall bias, yet Izana remains curiously unmentioned here even though its high altitude is bound to generate a bias with surrounding satellite soundings (not to mention that it mostly collocates measurements from the Saharan desert, while Izana itself is located on an island). Later when discussing the seasonality, Izana is suddenly flagged, while stations like Bremen are deemed ok (apparently the authors are confident that the local urban sources at Bremen show no seasonal pattern). I think it would make more sense to predefine a subset of ‘clean’ TCCON sites on which all parameters are drawn instead of tailoring the subset based on the particular results. Predefining such a set in the TCCON section would also greatly clarify the results section as this is, in its current state, often convoluted and confusing.

Minor comments:

Title: The paper consistently mentions that it is evaluating GOSAT and SCIAMACHY, while it in fact evaluates one particular GOSAT and SCIAMACHY algorithm (ACOS and BESD). Granted this is mentioned in the paper but I feel it should be part of the actual title. Now I cannot but feel that the reader is left under the impression that these are the definitive GOSAT and SCIAMACHY algorithms.

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p 6228,line 4: using $\pm 5^\circ$ latitude and longitude for the geometric criteria, puts high latitude stations at a disadvantage. Better to use a distance limit to the TCCON site.

p 6228,line 5: Satellite data is paired with 90 minute TCCON averages. It is unclear if this is done prior to the collocation routine or after. It would also be useful to report the TCCON variability within this time frame.

p6233,line 12: "The purple dashed line represents spatio-temporal mismatch error and as expected, this value is much smaller for the geometric than dynamic coincidence criteria". This mismatch error is derived from the CT values at the sat retrieval and the TCCON site. Given the inevitable smoothing associated with model output, this value should be describe as an estimate of the spatio-temporal mismatch error or even "a lower-bound estimate of the spatio-temporal mismatch error". Secondly, the fact that it is straightforwardly assessed that the geometric criteria performs better begs the question if other more stringent dynamic criteria would yield other results. Thus replace "than dynamic" with "than our dynamic" coincidence criteria.

p6234: section 3.5: This essentially deals with the same issues as section 4.1

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 6217, 2015.