Comparison of OCO-3 XCO₂ Measurements with TCCON

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Summary

- The derivation of the OCO-3 v10 quality filters and bias correction is ongoing and the current status is presented here.
- OCO-3 v10 has updated geolocation and calibration, and is a large improvement over vEarly.
- First preliminary comparisons between OCO-3 v10 XCO₂ and TCCON, models, and small areas indicate similar error statistics as seen for OCO-2.

Truth Proxies: Similar to OCO-2, three truth proxies are used to derive OCO-3’s v10 quality filters and bias correction coefficients, and to evaluate the overall performance of the OCO-3 v10 XCO₂ TCCON (GGG2014), small areas, and the median of the following models: GEOS-5 LoFi, ECMWF CAMS, CarbonTracker CT-NRT v2021-3, CAMS Flux Inversion v20r3.

OCO-3 v10 Quality Filters: For soundings that pass the prescreening criteria, threshold-based filters are derived based on comparisons between the ACOS L2FP output and the truth proxy training sets. For OCO-3 v10, 40-60% of all L2 soundings pass the v10 quality filters over land and ocean.

Parametric Bias Correction: The parametric bias correction accounts for spurious variability in XCO₂ that is correlated with parameters in the retrieval state vector. A multivariate regression is performed between the spurious XCO₂ variations and the parameters that account for the largest fraction of the variability.

Statistics against TCCON, Model Median, and Small Areas

- For land nadir, the same parameters are included in the bias correction as for OCO-2; however, the impact of the overall bias correction is about half the size due to smaller dP_frac and c2_vertical_grad_del coefficients (currently under investigation). For ocean glint, c2_vertical_grad_del explains ~60% of the overall XCO₂ variance. Shown coefficients are subject to changes in the final v10 bias correction.

Ongoing work

- Finalize quality filters and bias correction development for all modes including SAMs and targets, footprint dependent bias correction, derivation of global scaling factors.

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