



Comparison of OCO-3 XCO₂ Measurements with TCCON

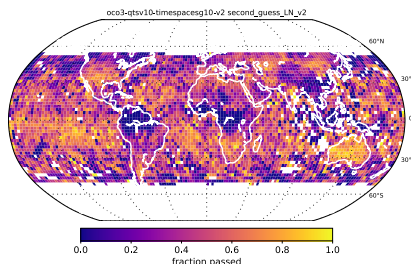
Matthäus Kiel¹⁾, Christopher O'Dell²⁾, Annmarie Eldering¹⁾, Brendan Fisher¹⁾, and the OCO-3 Development Team

¹⁾Jet Propulsion Laboratory, California Institute of Technology, Pasadena, CA, USA ²⁾Cooperative Institute for Research in the Atmosphere, Colorado State University, Fort Collins, CO, USA

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.

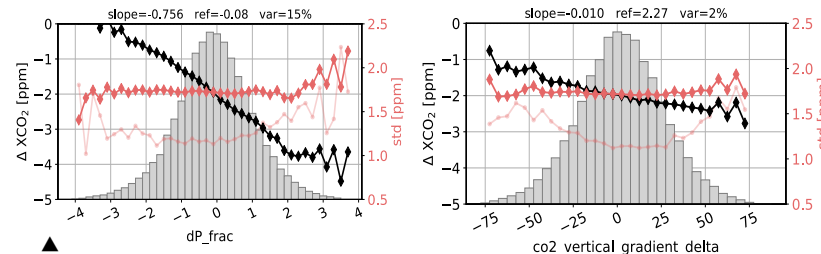
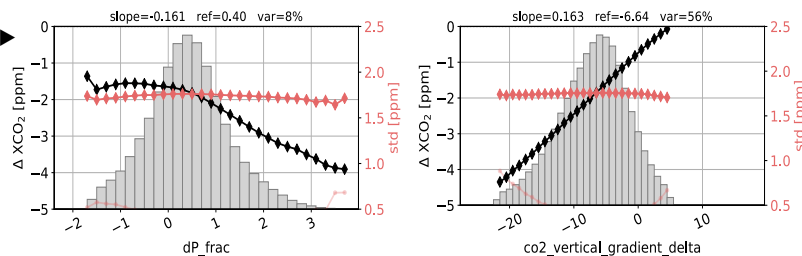


OCO-3 v10 Quality Filters:

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.

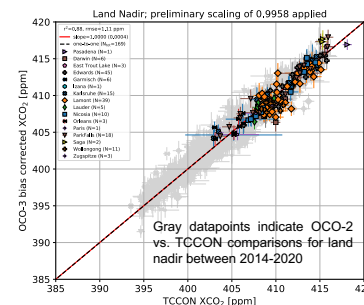
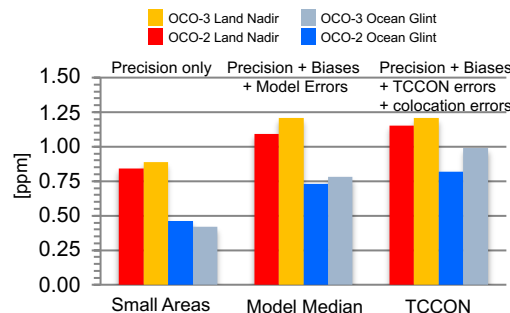
Comparisons for ocean glint against small areas.



Comparisons for land nadir against TCCON. Smaller dependencies are also apparent for aerosol optical depths of coarse and fine aerosols.

- 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 co2_grad_del coefficients (currently under investigation). For ocean glint, co2_grad_del explains ~60% of the overall XCO₂ variance. Shown coefficients are subject to changes in the final v10 bias correction.

Statistics against TCCON, Model Median, and Small Areas



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.