

**Orbiting Carbon Observatory-2 (OCO-2) Data Quality Statement:
Level 2 Forward Processing
Data Release 10 (V10)**

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The Orbiting Carbon Observatory (OCO-2) has released the latest version of the Level 2 (L2) forward processing data product, containing estimates of the column averaged dry air mole fraction (X_{CO_2}), other geophysical quantities retrieved from OCO-2 observations. This version of the L2 Product is release 10.0 (V10) and begins with February 2020 data. The full OCO-2 L2 data set with complete reprocessing back to August 2014 will be complete and posted at the Goddard Earth Sciences Data and Information Services Center later in the year. Updated documentation including the L1B and L2 Algorithm Theoretical Basis Documents and L2 Data User's Guide will be made available at the time of the full data record release later in the summer 2020.

V10 OCO-2 data includes changes in the L2 retrieval algorithm that leads to an improved data set. The list of algorithm and calibration updates included in the v10 data set includes changes to:

- L1B calibration to account for radiometric degradation and bad samples
- Trace gas spectroscopic parameters used in the retrieval algorithm (ABSCO v5.1) including to the O₂ A-band scaling
- the solar continuum model
- a priori information for aerosols and CO₂
- treatment of the surface albedo
- the constraints used in the Solar-induced Fluorescence (SIF) retrievals

The fundamental means for tying the OCO-2 X_{CO_2} to the World Meteorological Organization's CO₂ standard is by comparison with ground-based observations from the Total Carbon Column Observation Network (TCCON). Test sets of OCO-2 V10 data confirm reductions in both the bias and standard deviation compared to the TCCON data. This analysis is constantly being updated as more V10 data is processed and an updated set of validation analyses will be available when the full data set is released later this year. A description of the process of validating OCO-2 data against TCCON is described in Wunch et al., 2017 using an earlier OCO-2 data version. The OCO-2 validation plan was first described prior to launch in an analysis using TCCON and X_{CO_2} estimates retrieved using the OCO-2 retrieval algorithm on data from the Japanese GOSAT satellite (Wunch et al, 2011b)

In addition to comparisons to TCCON, the OCO-2 V10 data has been compared to other estimates of X_{CO_2} from multiple global models and the previous versions of the data products. Comparisons to an aggregate of multiple atmospheric models provides an estimate of changes in patterns of bias of X_{CO_2} on the global scale. Figure 1 below illustrates the differences in the V10 L2 data compared to the aggregated model. These comparisons confirm a decrease in bias and standard deviation of the differences with V10.

There is much more documentation that will help with utilizing the OCO-2 L2 data, all of which is available at the GES DISC OCO-2 documentation page (<https://disc.gsfc.nasa.gov/information/documents?title=OCO-2%20Documents>). While these documents are for earlier versions of the OCO-2 data, much of the information does not change with data version. However, key steps such as a description of how to best screen the data and how the bias correction is performed will be updated for V10 and included in the latest documentation later in the summer 2020.

References

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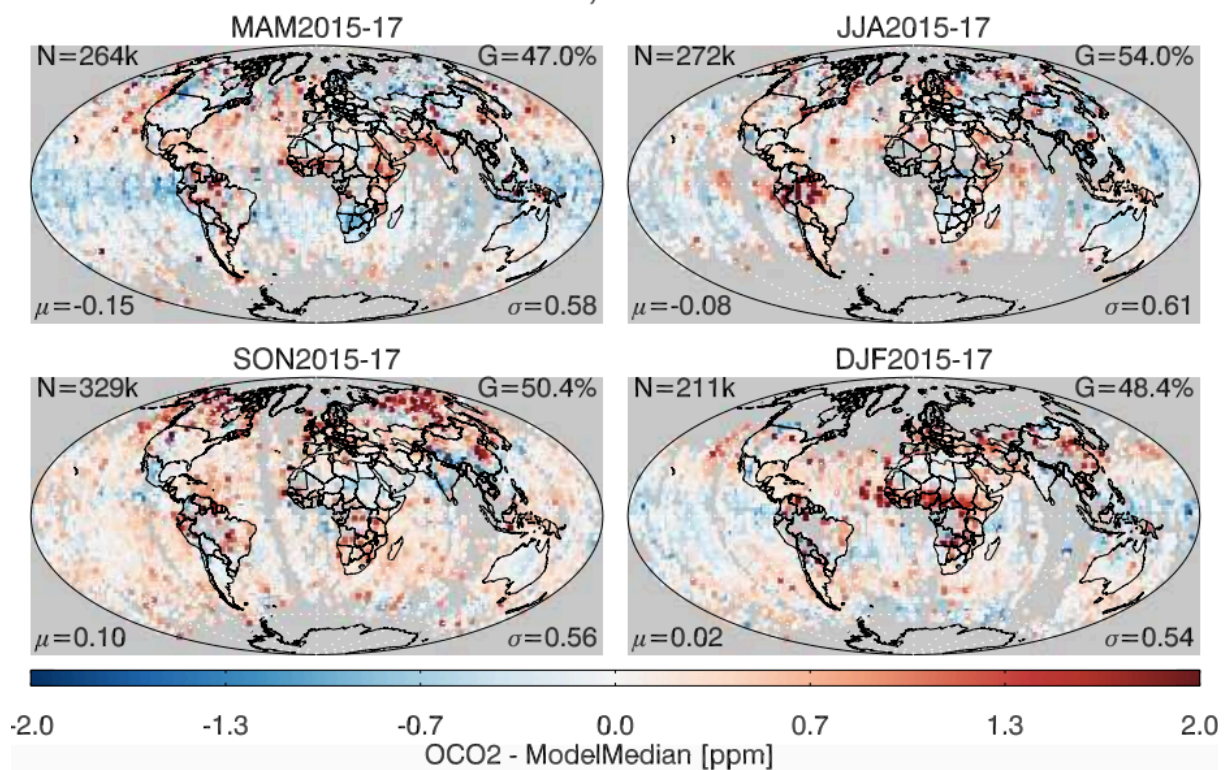


Figure 1. Difference between OCO-2 V10 data from 2015 – 2017 and an aggregation (median) of model results. These preliminary comparisons suggest that differences between the data and model have been reduced for V10 over the same comparisons for V9 data.