Jet Propulsion Laboratory
California Institute of Technology

Early Comparison of OCO-3 XCO$_2$ Measurements with TCCON
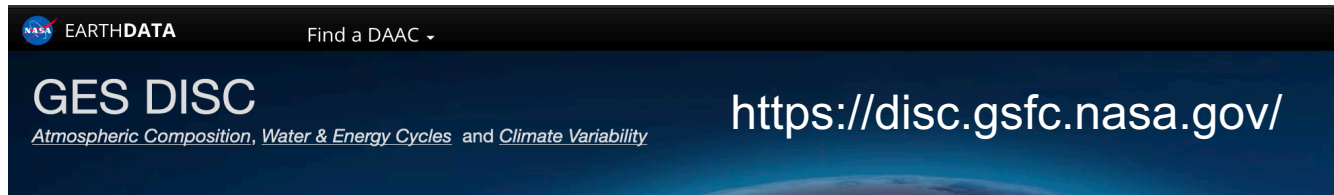
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EGU General Assembly 2020 Virtual Meeting, 4 – 8 May 2020, Vienna, Austria

OCO-3 vEarly Summary

- First version of OCO-3 XCO_2 product (vEarly) released on 30 April 2020 to the GES-DISC

- ACOS v10 used for OCO-3 vEarly XCO_2 data product

- Data quality statement, Data User's Guide and updated L1b and L2 ATBDs are coming along

- Quality Filtering and Bias Correction (QF/BC) based on data from Aug. – Oct. 2019

- vEarly has some pointing and radiometry errors, but is a great set to test data use approaches

EARTH**DATA**   Find a DAAC ▾
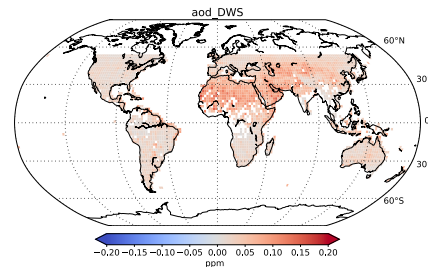
GES DISC
Atmospheric Composition, *Water & Energy Cycles* and *Climate Variability*

https://disc.gsfc.nasa.gov/

OCO-3 vEarly Bias Correction

Parametric Bias Correction:

$$X_{CO_2,bc} = X_{CO_2,fp} - X_{CO_2,para} = X_{CO_2,fp} - \sum_i c_i \left(p_i - p_{i,ref} \right)$$

land nadir	dP_{fph}	brdf_reflectance_weak_co2	aod_DWS
coefficients	-0.212 ppm hPa^{-1}	-4.931 ppm	-11.689 ppm
reference values	-4.716 hPa	0.255	0.016

land SAM/TG	dP_{fph}	co2_grad_del
coefficients	-0.081 ppm hPa^{-1}	-0.008
reference values	-4.766 hPa	29.405 ppm

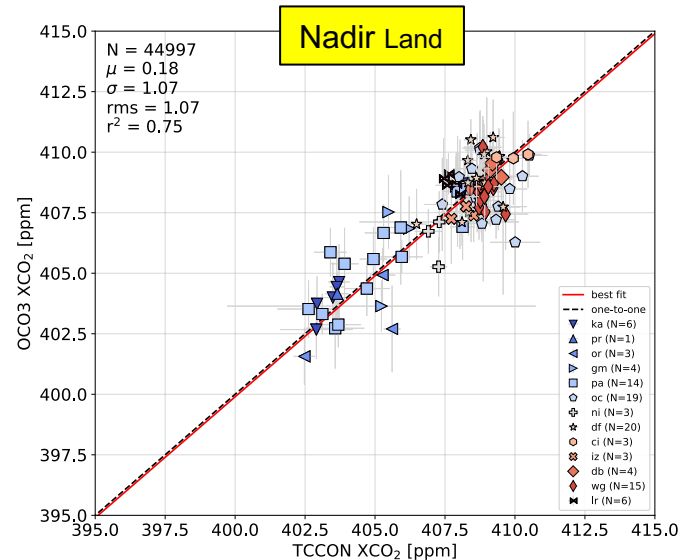| ocean glint	dP_{fph}	min(co2_grad_del, 2.6)
coefficients	-0.208 ppm hPa^{-1}	0.16
reference values	-3.36 hPa	2.6 ppm

Contribution of **parametric bias** correction terms for **land nadir**
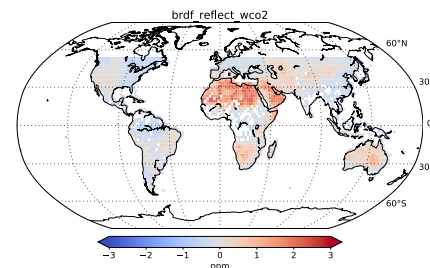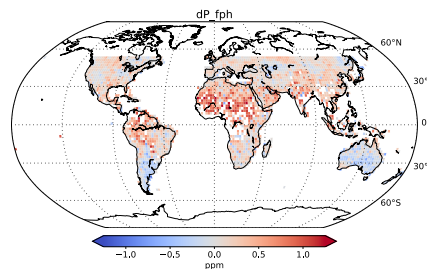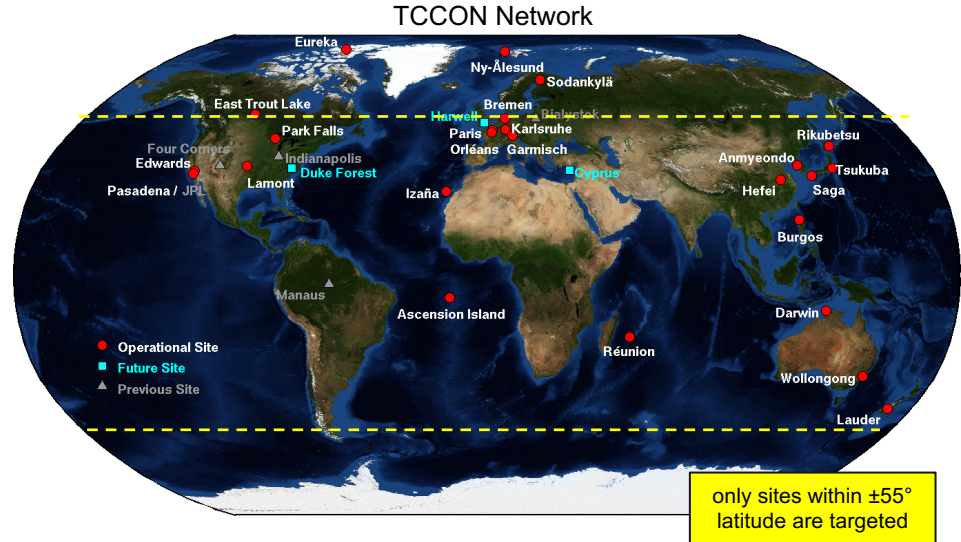

Footprint Bias Correction

Glint Water

Nadir Land

SAM/TG

OCO-3 vEarly XCO$_2$ Data

OCO-3 vEarly

Aug. – Oct. 2019

XCO$_2$

400 402 404 406 408 410 412 414

Nadir Land

N = 44997
μ = 0.18
σ = 1.07
rms = 1.07
r^2 = 0.75

TCCON XCO$_2$ [ppm]

OCO3 XCO$_2$ [ppm]

best fit
one-to-one
ka (N=6)
pr (N=1)
or (N=3)
gm (N=4)
pa (N=14)
oc (N=19)
ni (N=3)
df (N=20)
ci (N=3)
iz (N=3)
db (N=4)
wg (N=15)
lr (N=6)
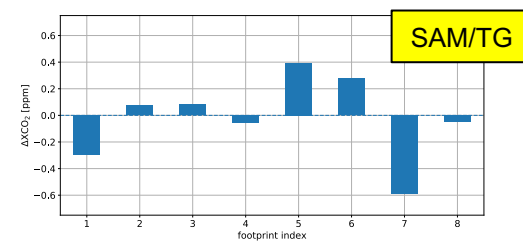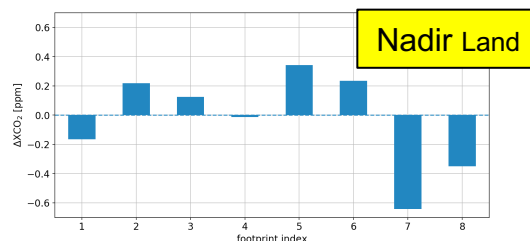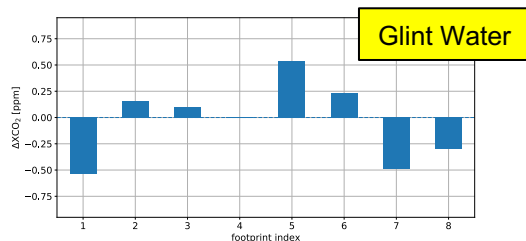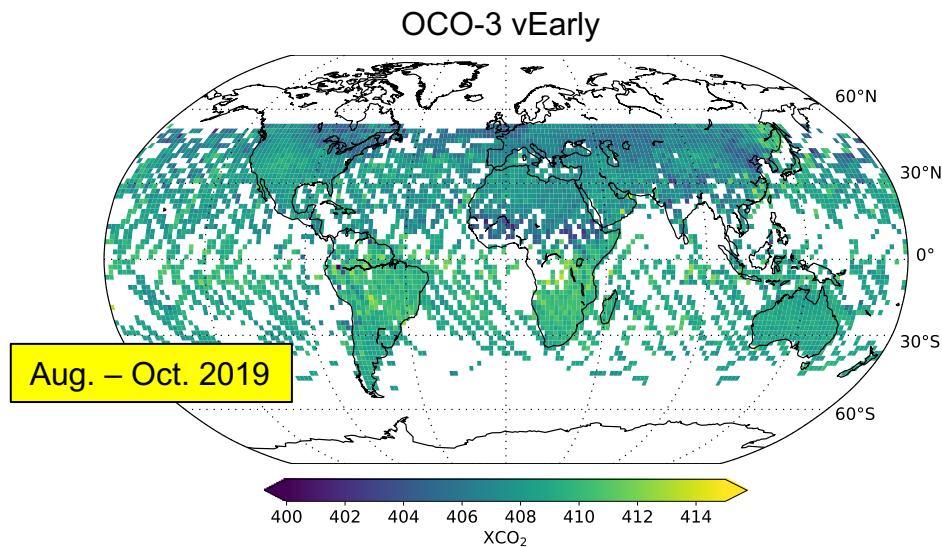
vEarly XCO2 released to the GES-DISC (https://disc.gsfc.nasa.gov/)

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OCO-3 Target and SAM Observations

Figure Courtesy of Brendan Fisher, NASA JPL

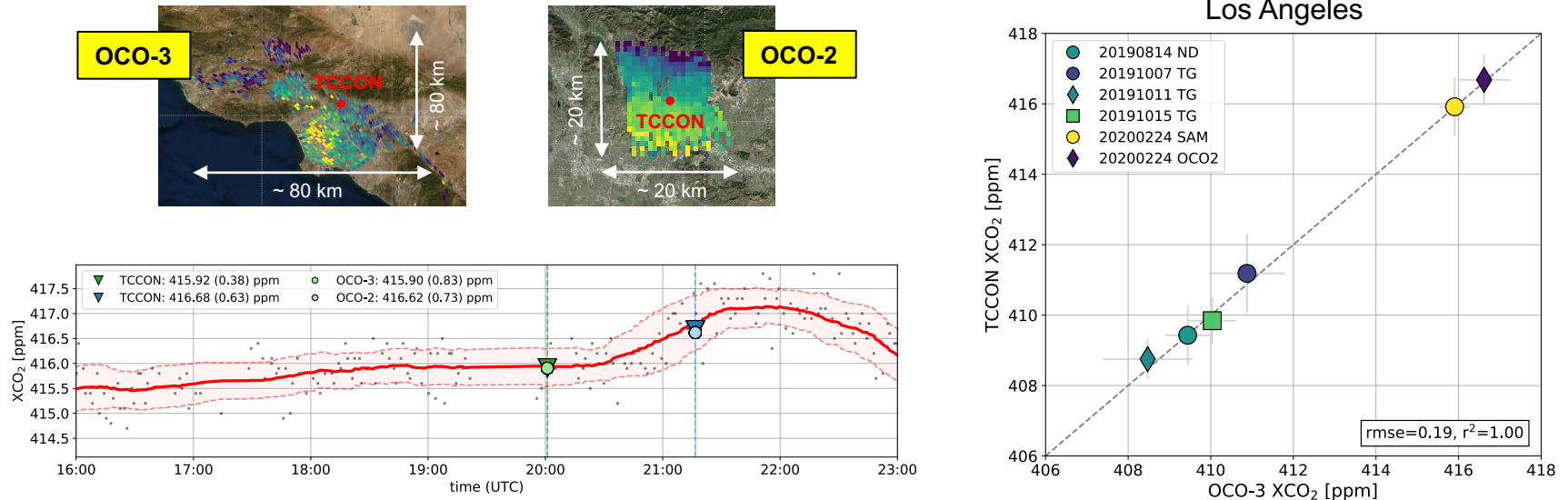TCCON Network
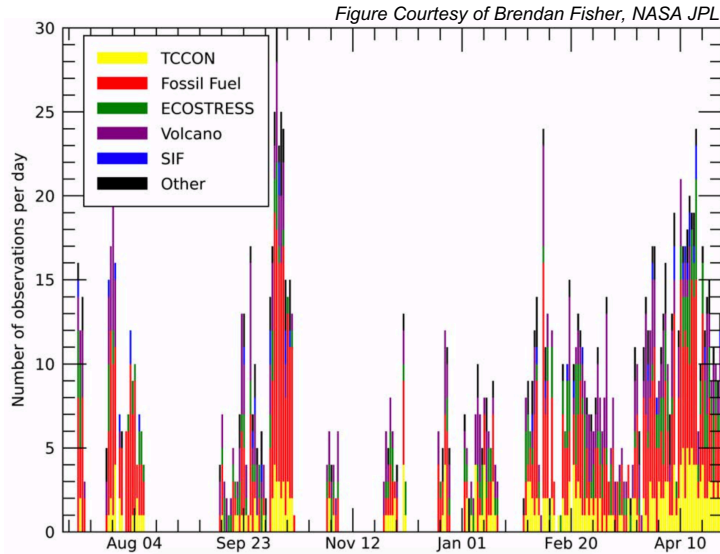
- TCCON serves as a transfer standard between WMO calibrated measurements and the OCO-3 data set
- Placing OCO-3 data on WMO trace-gas standard scale is crucial for obtaining accurate flux estimates

OCO-3 Target and SAM Observations over Los Angeles

- On Feb. 24, 2020, OCO-3 and OCO-2 overpass over Los Angeles/Caltech within 1h

Summary and Outlook

- The OCO-3 project has released the vEarly version of science data

- Comparison for nadir land indicate ~0.2 ppm bias and 1 ppm rmse against TCCON

- Further validation activities are ongoing (global scaling factor, ocean-land contrast, …)

- Great data set to test tools and data use approaches

- We expect an updated version in late 2020, which will address calibration (primarily radiometric) and remaining pointing errors (typically 1-2 km)

Visit:

https://ocov3.jpl.nasa.gov   https://oco.jpl.nasa.gov   https://disc.gsfc.nasa.gov/

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