



Minutes of the OCO-2 Science Team Telecon

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November 20, 2018

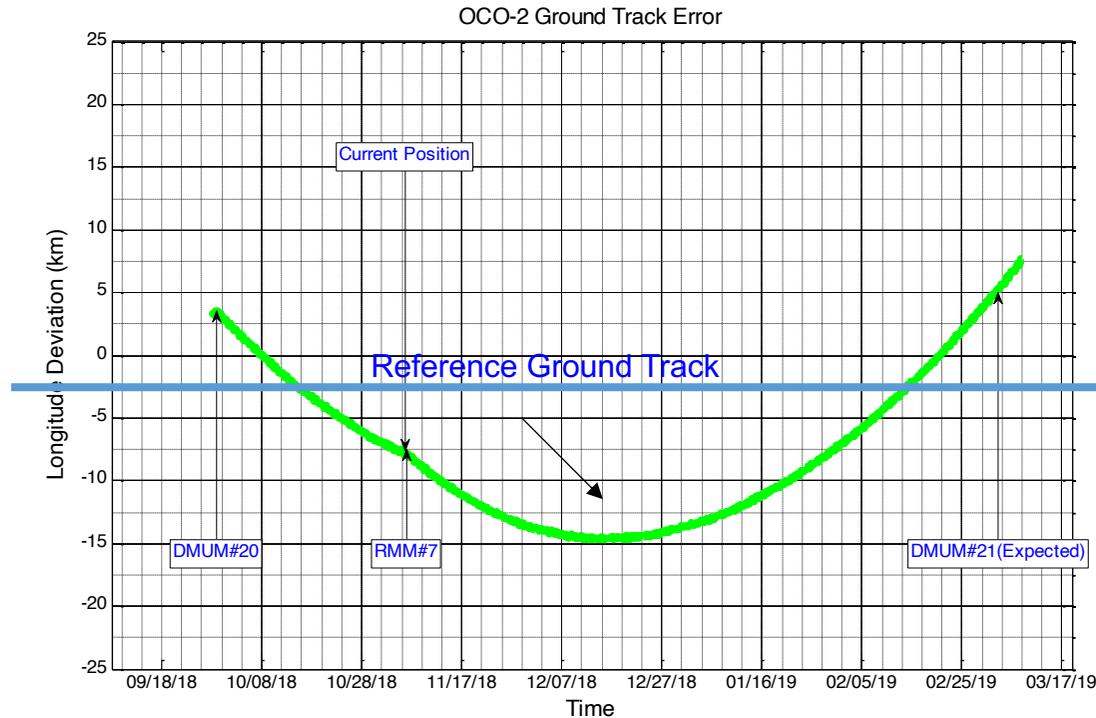


Status Summary

- Observatory Status: **Nominal**
 - On 5 November, OCO-2 executed its 7th Risk Mitigation Maneuver (RMM#7)
 - This is the first RMM since 3 March 2016
- Instrument Status: **Recovering from Decontamination Cycle 11**
 - Decon start: November 10th, 2018, Orbit 23187
 - Decon stop (estimated): November 17th, 2018, Orbit TBD
 - Return to science: November 26, restart of Forward stream
- Science Status: **Nominal**
 - “Version 9” Lite file updates (geolocation, met re-sampler fix)
 - New Subsetting capability at the GES-DISC
 - ACOS/GOSAT version 9, slowly coming together
 - EOFs still needed
 - Production schedule being reviewed



OCO-2 Ground Track



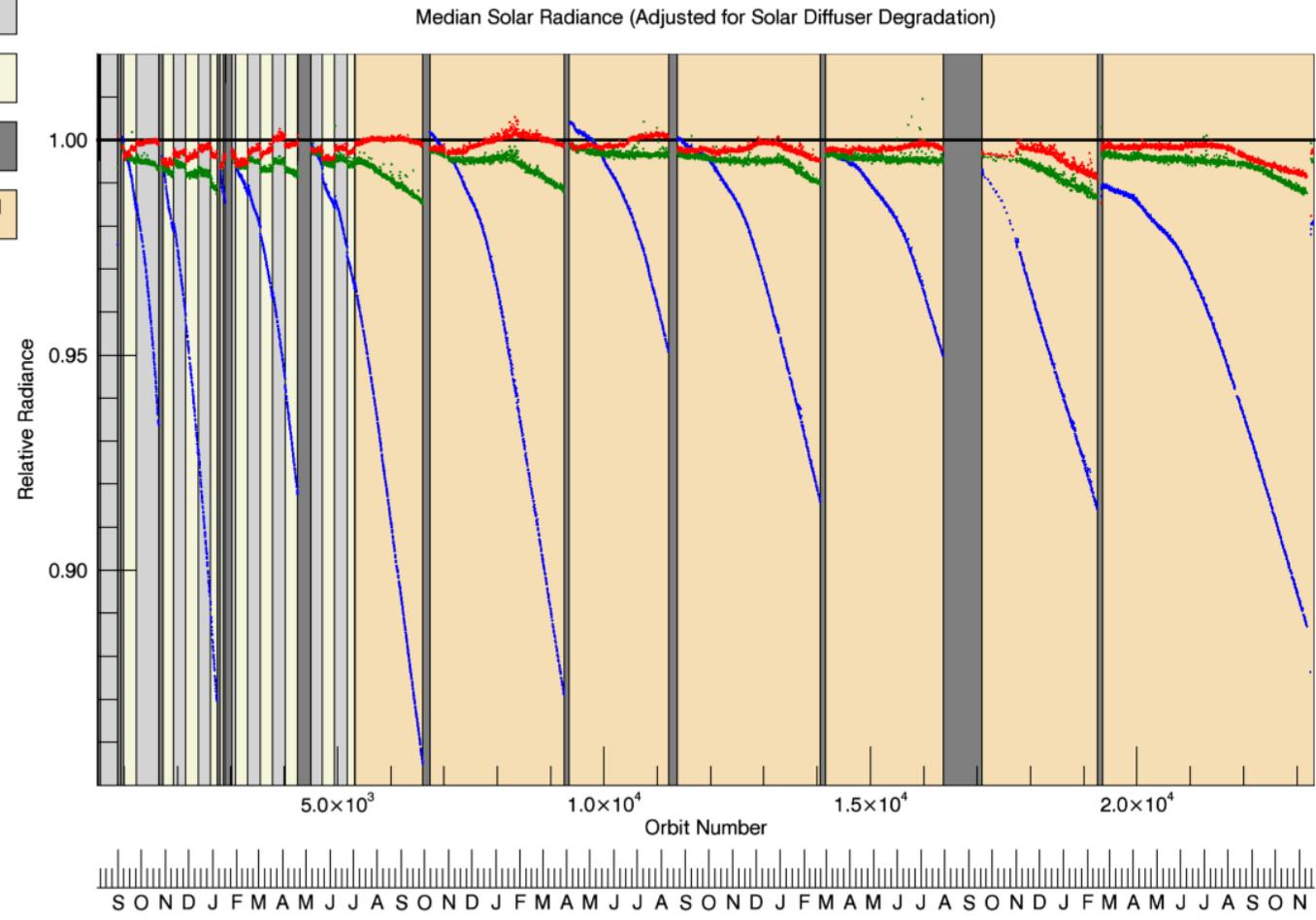
The Risk Mitigation Maneuver on 5 November produced a small change in the predicted OCO-2 ephemeris. The next Drag Makeup Maneuver is tentatively scheduled for 3 March 2019.

The next Constellation Mission Operations Working Group meeting is scheduled for December 4-6 at GSFC



Contamination Trending

- Nadir
- Glint
- Decon
- Interleaved



88%

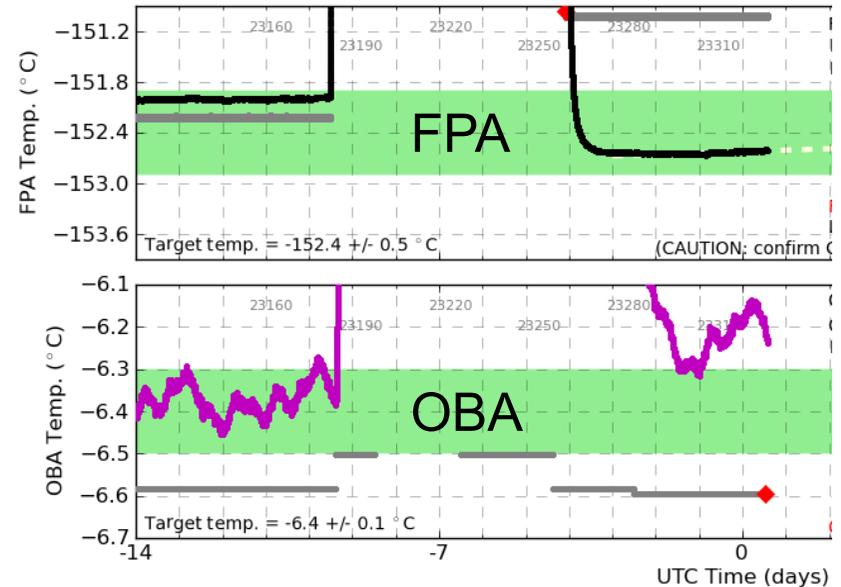
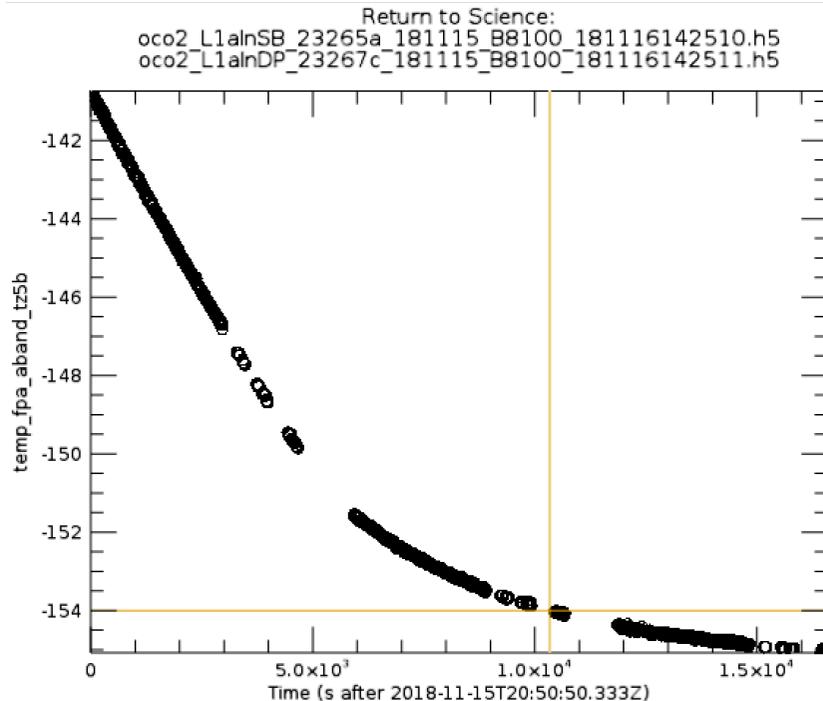
Decon Cycle #11 initiated on 10 Nov (Orbit 23187) when A-Band throughput was at ~88%





Decon Status

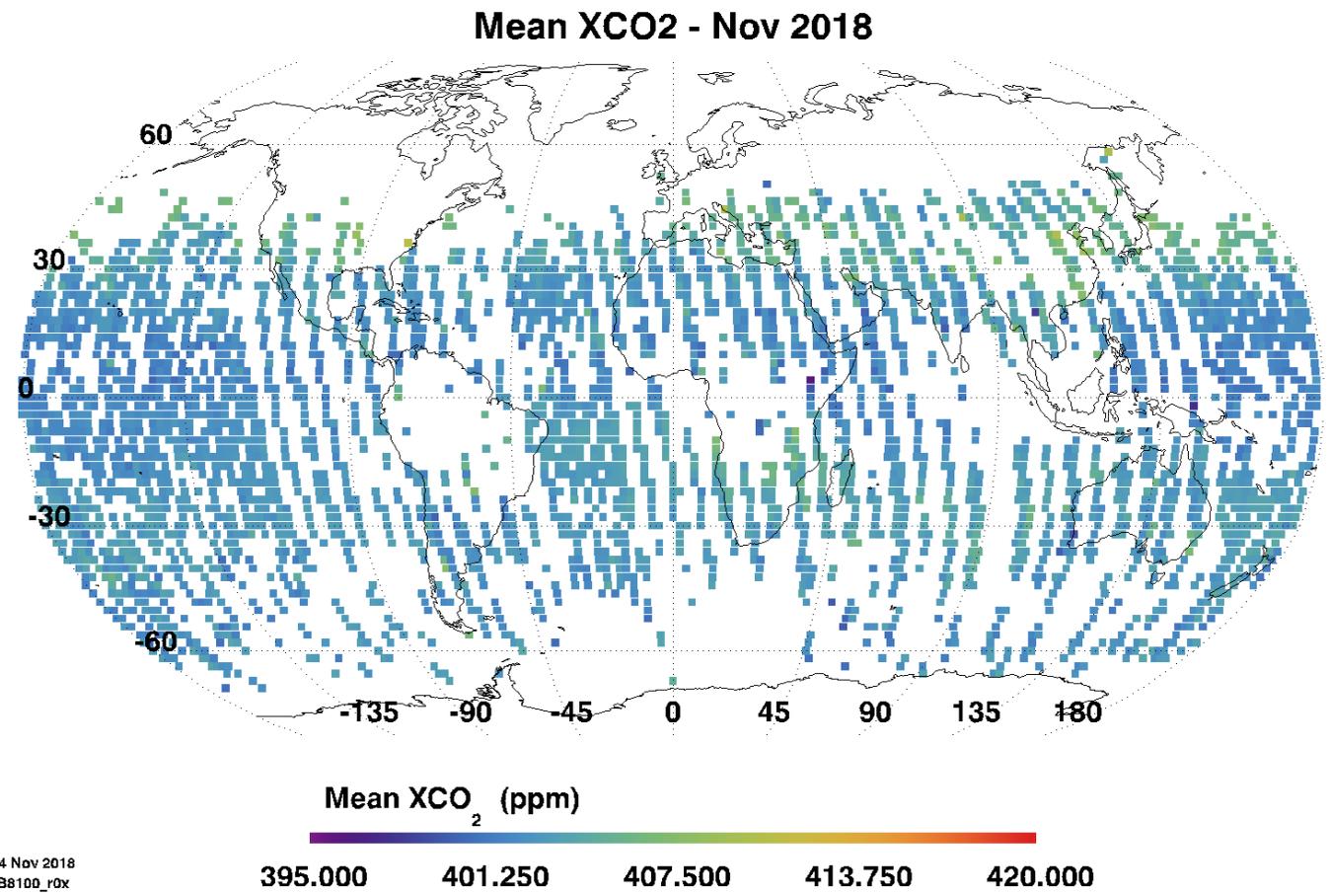
- Cryocooler shutdown on orbit 23186 (10-Nov)
- Return to science rule: 19 orbits after ABO2 FPA cools below $-154\text{ }^{\circ}\text{C}$
 - Thermal stability delayed by warm Optical Bench Assembly (OBA)
 - Restart of forward stream targeted for Mon 11/26



The OCO-2 FPAs are now cool, but another temperature adjustment is needed to bring the OBA into its operating range.



November X_{CO2} (V8 forward stream)



14 Nov 2018
Ops_B8100_r0x

The coverage for November is sparse due to the Decon cycle.
The V8 Forward Stream will be restarted on 11/26.





The Ongoing Battle for Railroad Valley

- **Relevance:** Earth Science Missions use the large, homogeneous Railroad Valley playa (RRV) for vicarious radiometric calibration of passive optical instruments
 - RRV is well characterized and instrumented and its surface is ideal for quantitative calibration traceable to international standards
 - Railroad Valley, NV, is the only site in the U.S. that is homogeneous over a large enough area to accommodate large-footprint sensors, such as OCO-2, OCO-3, GOSAT, GOSAT-2, Sentinel 5p, and GeoCarb and for cross-calibration of these instruments with reference instruments, such as MODIS
- **Problem:** Mining claims threaten to disrupt the playa floor, rendering this critical asset useless for large footprint instruments
 - Railroad Valley is under the jurisdiction of the Bureau of Land Management and currently available for multiple uses
- **Objective:** Submit a “Withdrawal” application to preserve RRV
 - To preserve Railroad Valley in its natural state, the OCO-2 team is working with NASA HQ to prepare a “withdrawal application” to preclude the mining and other activities that will disturb the playa floor



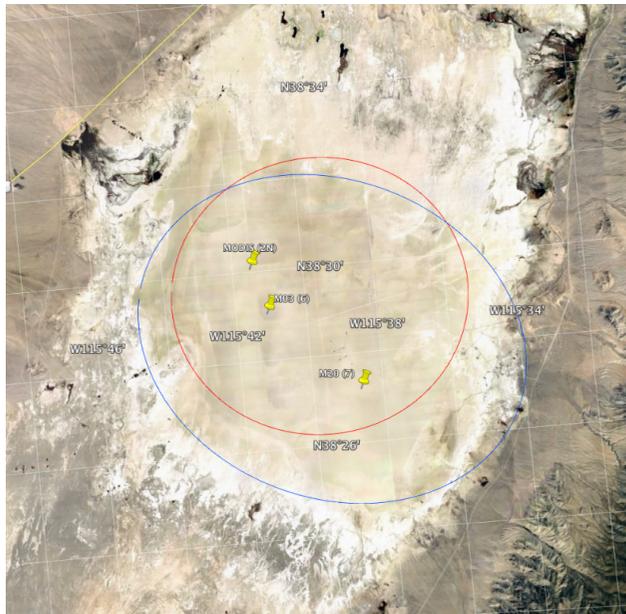
GOSAT/OCO experiments

- The OCO/GOSAT programs are examples of large footprint sensors that have been using RRV since 2009
- NASA Orbiting Carbon Observatory (OCO) and Japanese Greenhouse gases Observing SATellite (GOSAT) teams formed a close partnership to cross-calibrate their measurements and cross-validate their products
 - Missions include OCO-2 (2014), OCO-3 (Feb. 2019), GOSAT (2009) and GOSAT-2 (Oct. 2018)
 - All four missions require unprecedented calibration accuracy to meet their demanding (0.3%) data product accuracy requirements
 - Many of their science goals can only be addressed by combining data from all four missions, to produce a harmonized, continuous climate data record that spans the lifetimes of both missions
- Cross-calibration methods pioneered by the OCO/GOSAT collaboration have been adopted as best practice for cross-calibrating atmospheric composition sensors by the CEOS Atmospheric Composition-Virtual Constellation (AC-VC)

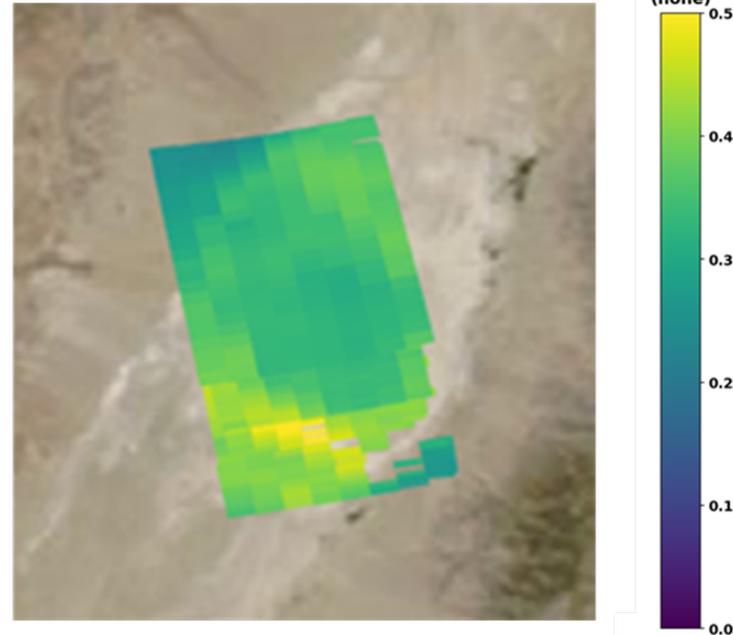


Withdrawal request suitable for AC-VC needs

NASA will request that the dry lakebed playa at Railroad Valley (RRV), NV be withdrawn and preserved in its current state so that it can continue to be used for the routine calibration and validation of Earth observation instruments flown by NASA and its partners. The subject area of NASA's withdrawal request is an approximately 43,000-acre flat playa.



GOSAT footprints on the RRV Playa

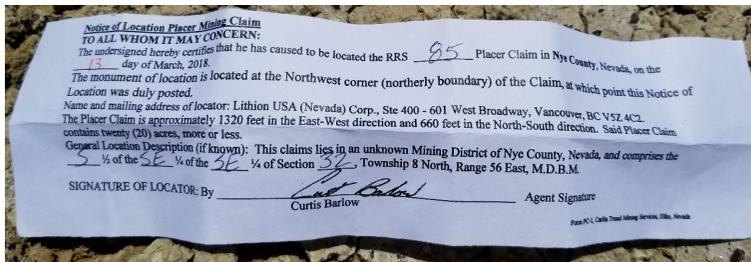


OCO-2 Target Observations over RRV



Mining claims

- Mining claims filed in 2018 now threaten RRV
 - RRV is on public land, managed by BLM
 - BLM's charter is to sustain public lands and coordinate shared usage
 - The mining act of 1872 authorizes mining on public lands
 - The oil industry has explored RRV since the 1980's, but our understanding is that the wells have been abandoned on the playa itself, due to low yield
 - A greater threat to the preservation of RRV are recent lithium mining claims
 - Beginning in March 2018, Lithium Energy Corp, Vancouver, B.C. filed a claim to 10,000 acres at RRV (495 placer claims)
 - Currently, *3PL Links* of Ontario, Canada has made 55 claims and *Lithium Holdings* of Nevada has made 17; additional mining companies are known to have interests in RRV



Example of a placer claim form in RRV



Evaporation ponds like those planned for RRV



Summary and Prospects for RRV

- The Railroad Valley playa is a critical surface calibration site for several operating and planned Earth Science missions by NASA and its partners.
 - Only instrumented site within the U.S. that is sufficiently homogeneous and undisturbed over a large enough area to enable vicarious calibration of large-footprint instruments, such as OCO-2, OCO-3, GOSAT, GOSAT-2, and GeoCarb.
- Recent mining claims threaten to disrupt the surface of the Railroad Valley playa, rendering it useless for vicarious calibration
- We are working with NASA HQ to draft a Withdrawal application that will be submitted to the U.S. Bureau of Land Management to restrict public uses of this land that disturb the surface
- Wish us luck!



Theme Group Summaries

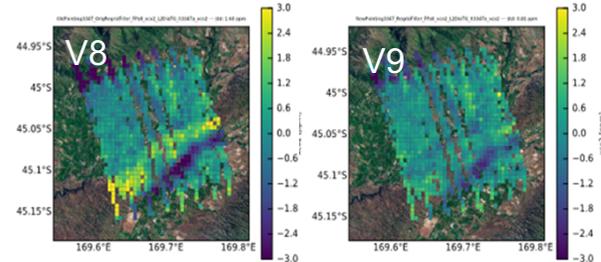
- ABSCO
- Cloud/Aerosol
- Flux Inversion
- L2
- Point Source
- SIF
- UQ



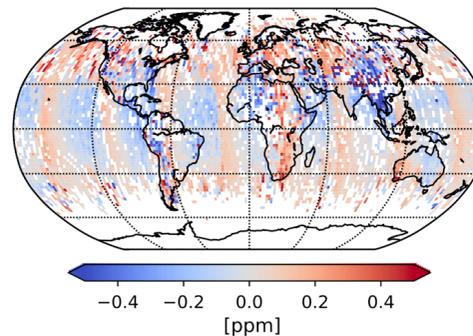
The OCO-2 V9 Product

- The OCO-2 Team released the Version 9 (V9) product on 10/15.
 - refined pointing
 - a correction to the prior meteorology
 - updated filtering and bias correction
- These updates
 - reduce bias in the presence of rough topography
 - Provide better sampling over tropical and boreal forests with slightly more scatter
- This new dataset is available through the GES-DISC

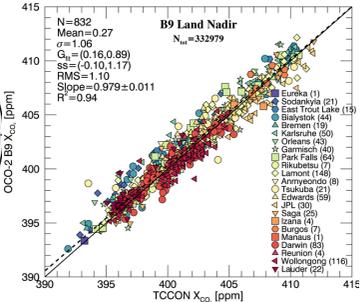
<https://disc.gsfc.nasa.gov/datasets?keywords=oco-2&page=1>



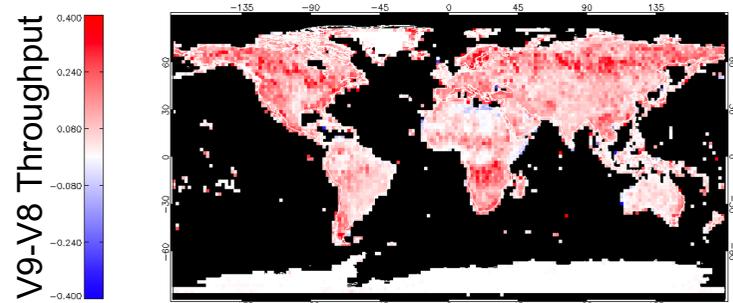
Pointing Correction Reduces XCO₂ Bias



XCO₂ Differences: V8 - V9



V9 vs TCCON



Improved Coverage over Tropical and Boreal Forests

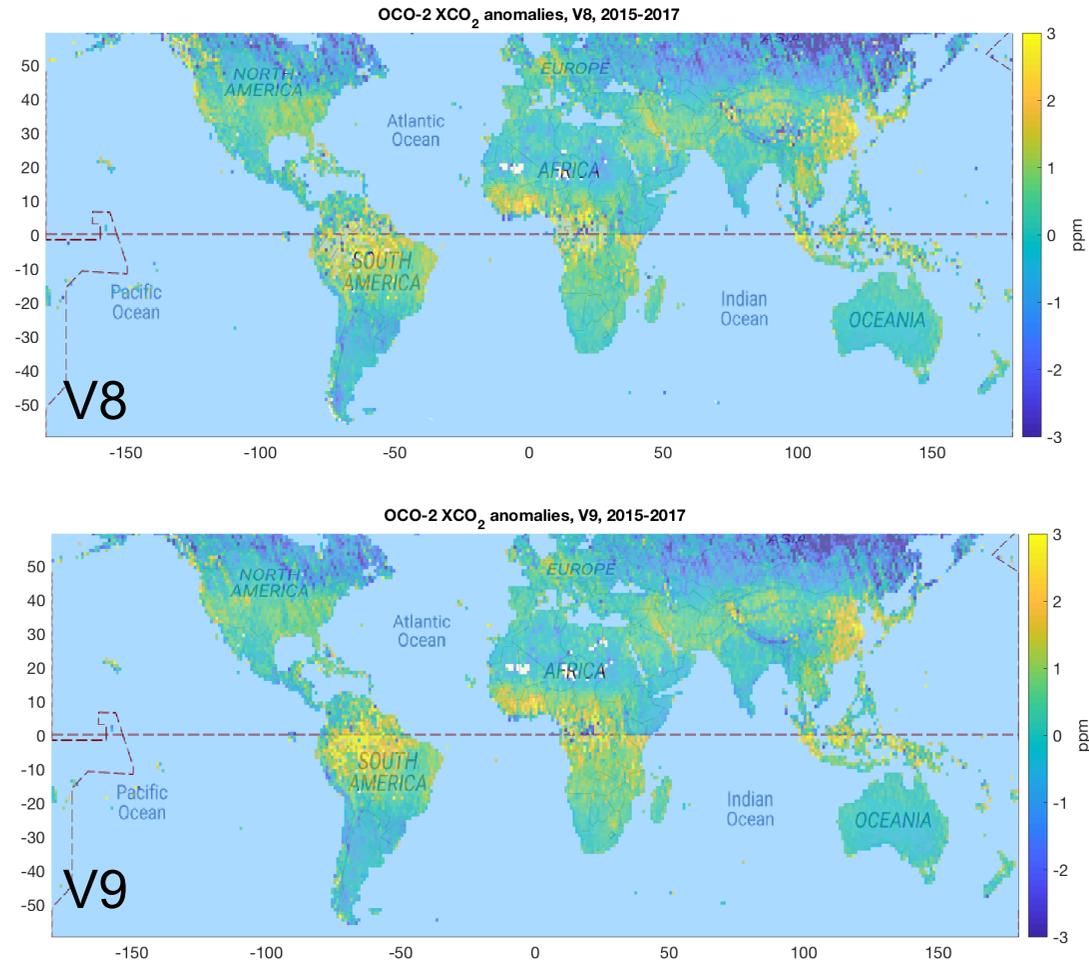




Persistent X_{CO_2} Anomalies

Comparison of the V8 and V9 Products

- OCO-2 X_{CO_2} estimates are being used to look for persistent anomalies associated with CO₂ emissions (sources) and uptake (sinks) from human activities and the natural carbon cycle
- The X_{CO_2} anomalies identified in the version 8 (V8) product (top) is compared to those from the recently delivered V9 product (bottom)
- While the patterns are similar, the V9 product has much less scatter than v8, especially in areas with rough topography (i.e. Himalayas, Canadian Rockies)



Hakkarainen et al., press, 2018 (Finnish Meteorological Institute)



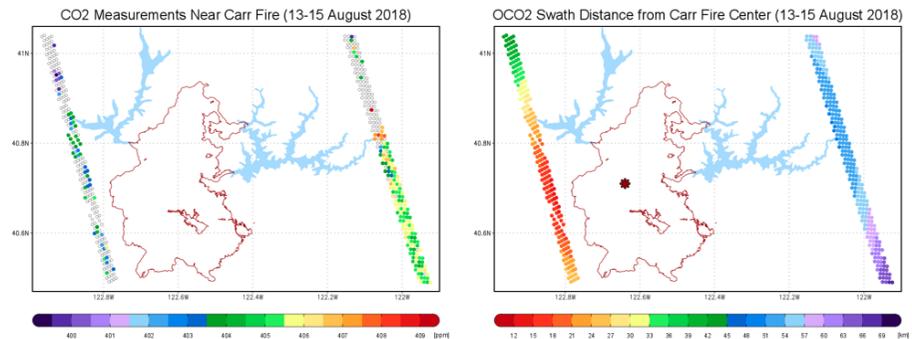
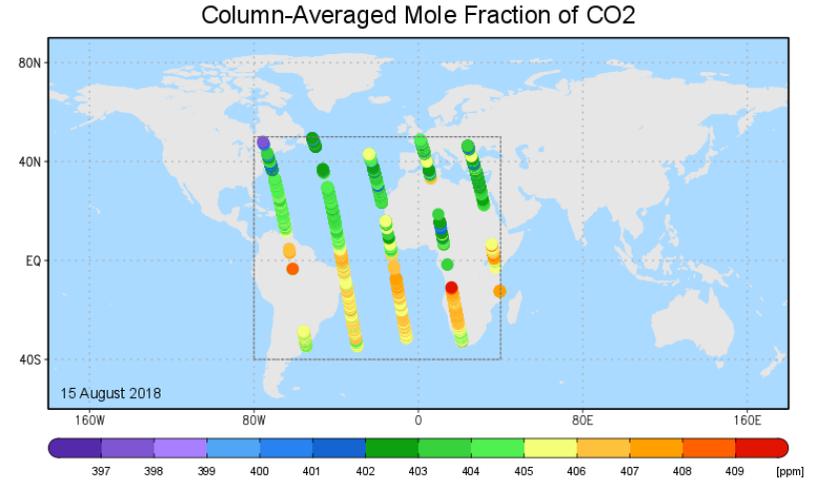


Subsetting Capability Added for OCO-2 "Lite" Files

- OCO-2 and ACOS Level 2 "Lite" files can now be subsetting spatially and by variable
 - Spatial subsets may be selected within a bounding box or within a user-defined radius around a user-specified location ("point+radius subsetting")
- This service is now operational

<https://disc.gsfc.nasa.gov/information/news?title=Subsetting%20capability%20added%20for%20OCO-2%20%22Lite%22%20files>

- Questions:
 - Dana Ostrenga, Thomas Hearty, Paul Huwe, Jennifer Adams, Andrey Savtchenko, Jerome Alfred, Lena Iredell



Left: XCO₂ for two OCO-2 orbits from 13 (left) and 18 Aug (right) that passed within 100 km of the Carr Fire.



Preparations for AGU

- Oral and Poster talks
 - Please let us know if you need presentation materials from other team members
- OCO-2/OCO-3 Hyperwall
 - Scheduled for Tuesday 10:30 – 10:45 AM at NASA Booth
- GOSAT/OCO-2/GOSAT-2/OCO-3/GeoCarb Technical Interchange Meeting (2-5 PM on Tuesday 11/11).
 - Plans coming together and venue is being arranged
- SIF Technical Workshop (Karen Yuen is the point of contact)
 - focused on developing SIF communities and studies, as well as combining other SIF measurements with OCO-2.
 - Date and Time: Wednesday, 12 December 2018: 08:00 - 12:20
Location: Grand Hyatt, Room: Declaration AB