Status of OCO-2 and OCO-3

David Crisp, for the OCO-2 and OCO-3

Jet Propulsion Laboratory, California Institute of Technology

9 July 2019

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Status Summary

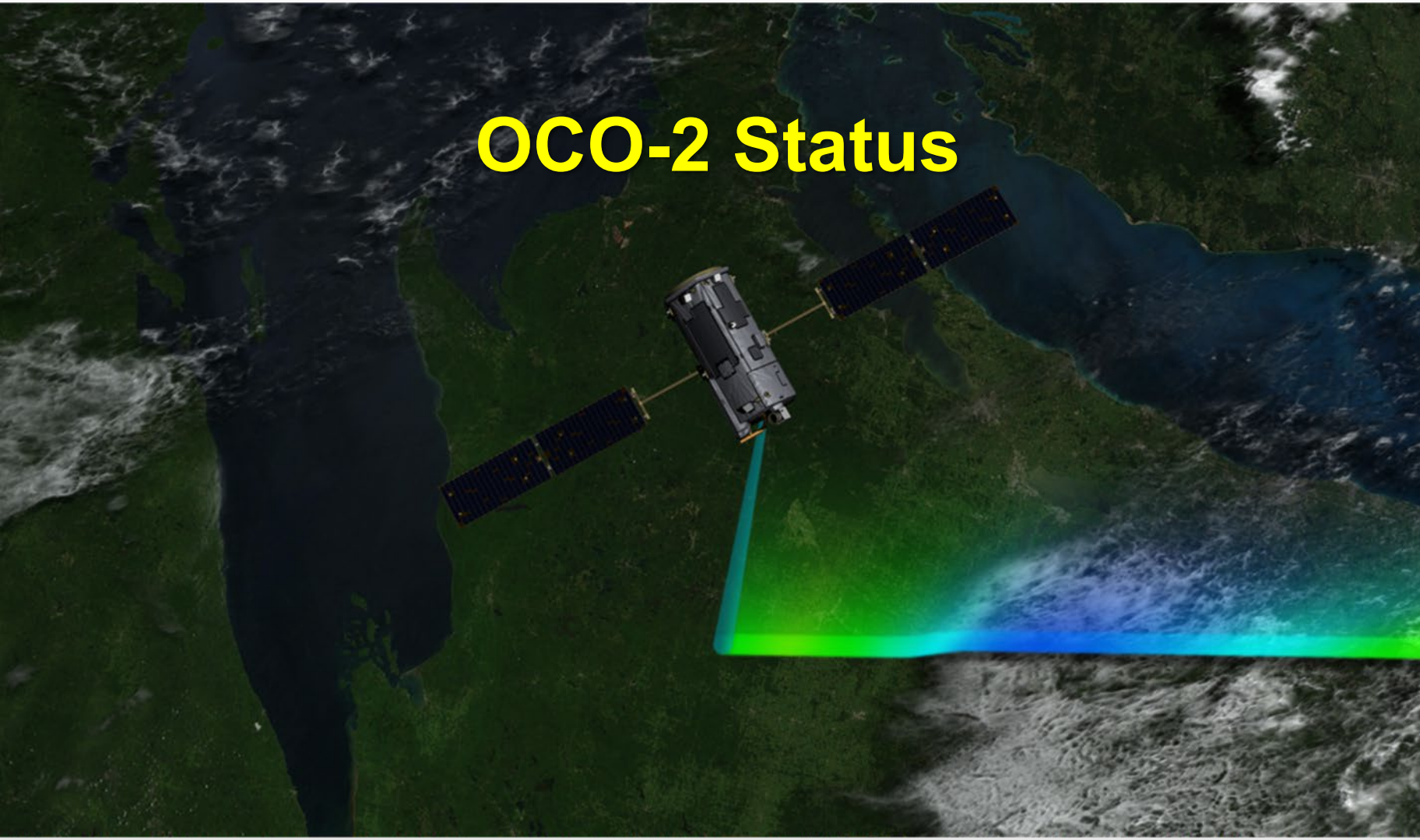
OCO-2 Status

- Observatory Status: Nominal
  - The flight software was patched to remove the inertial measurement unit (IRU) from the attitude control routines
  - Now successfully operating in "gyroless" mode
- Instrument Status: Nominal
  - Last Full Moon and Solar Doppler Calibration experiments performed
  - Observations suspended while flight software patch was installed
- Science Status: Nominal
  - "Build 10" testing ongoing – O_2 ABSCO Scaling + Constrained P_{surf} tests

OCO-3 Status

- In-Orbit Checkout proceeding
  - First light data collected over North Texas on 26 June 2019
  - First Snapshot Area Map (SAM) obtained over the Railroad Valley, NV (RRV) vicarious calibration site on 3 June

OCO-2 Status

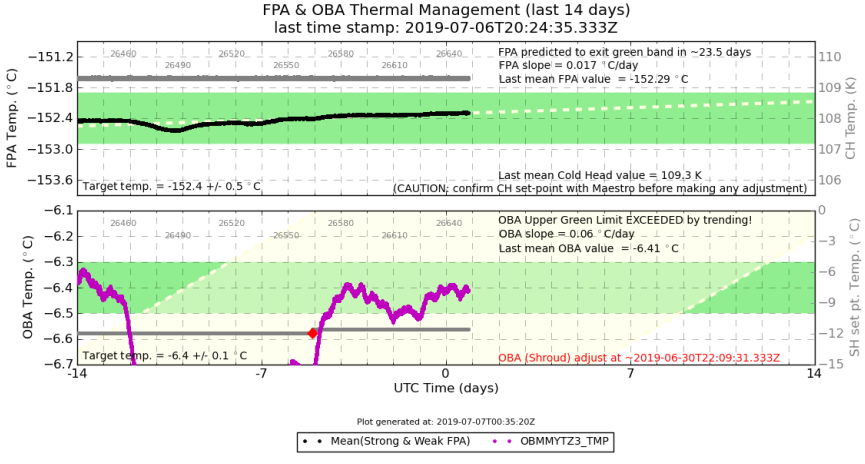


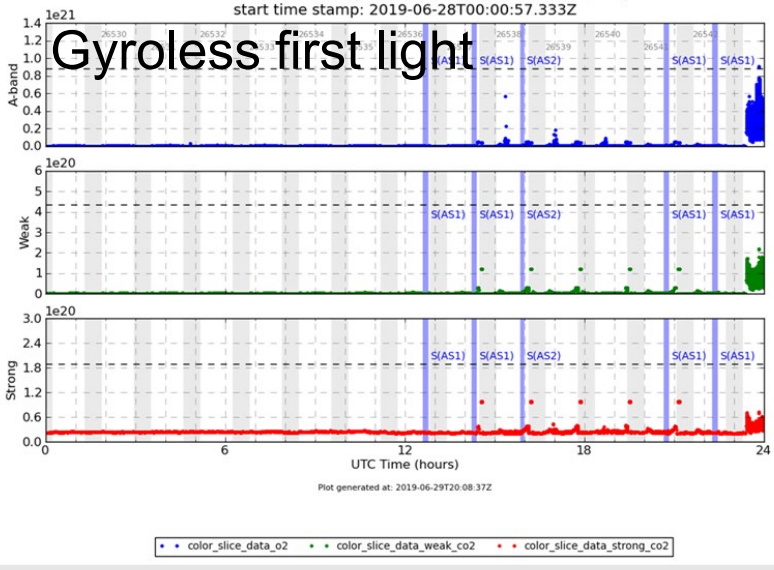
OCO-2 Passes the 5th Anniversary of its Launch

A Birthday Card from our GOSAT Colleagues at NIES

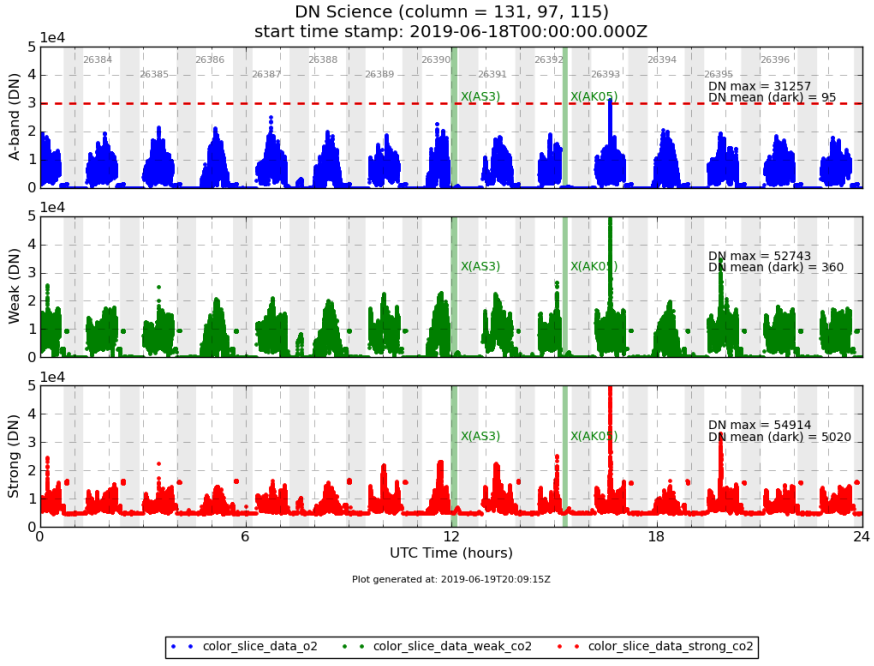
The Era of Gyroless Operations has Begun

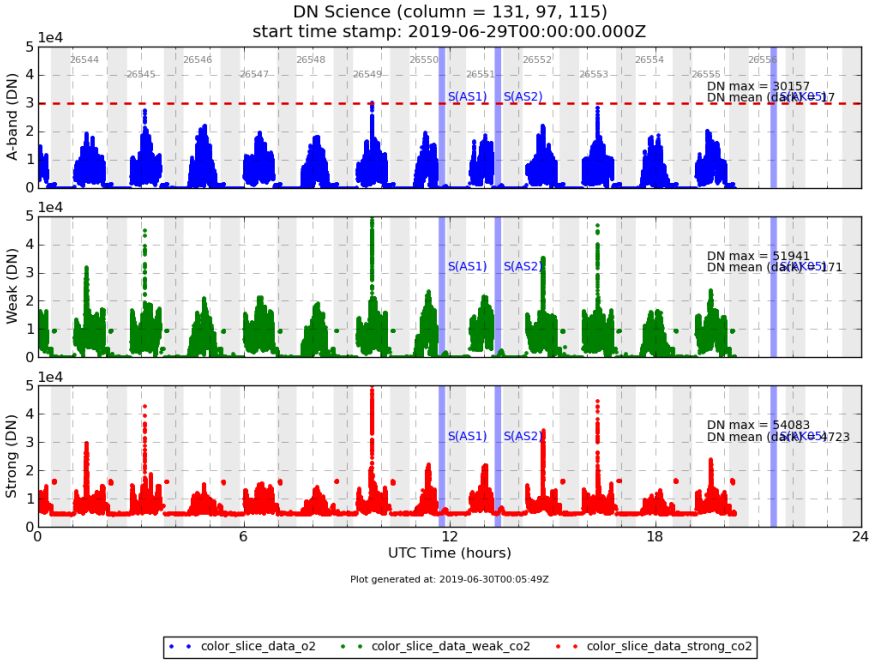
- The OCO-2 flight software was patched to remove the Inertial Reference Unit (IRU) from the attitude control routines
  - All systems are now operating as expected
- The aperture door was unlocked and science data operations were restored on Orbit 26545 on 6/28/2019
- The instrument optical bench floated down to ~-7 °C during the testing, but retuned to nominal values by 7/2/2019 all data salvageable back to orbit 26545





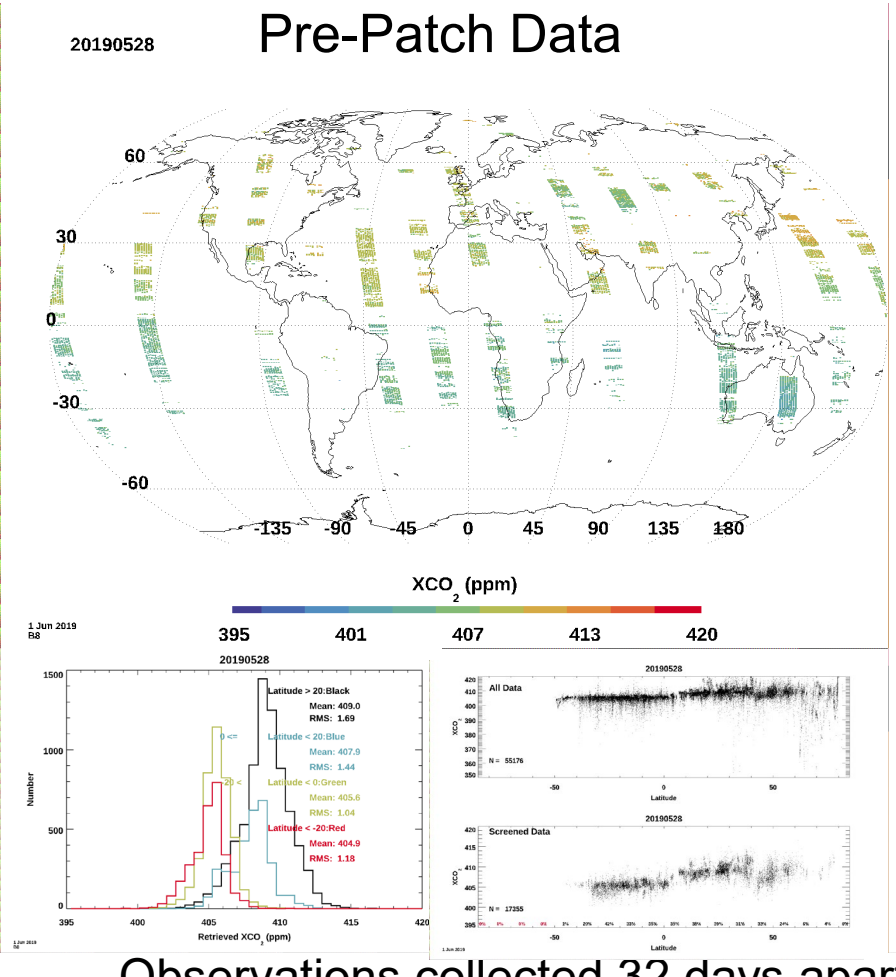
Pre- and Post Radiance Trends Look Similar

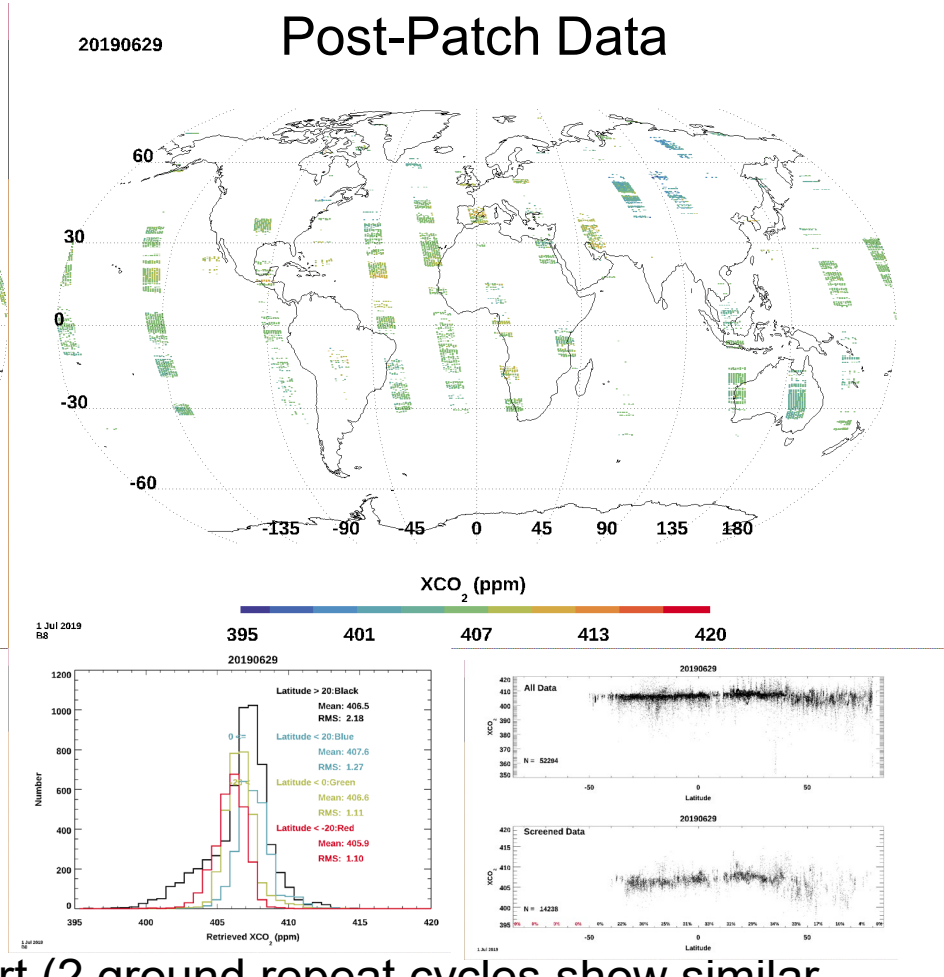




Radiance trends look similar before (6/18/2019) after (6/29/2019) the flight software patch was implemented. We continue to see bright glint scenes at low latitudes over the ocean.

Pre- and Post-Patch Data Look Similar



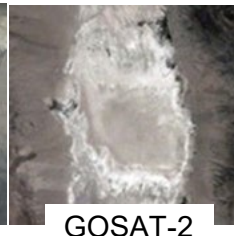


Observations collected 32 days apart (2 ground repeat cycles show similar coverage and sounding densities are similar pre- and post-patch

A Quick Summary of the 2019 RRV Campaign

July 1 Clear

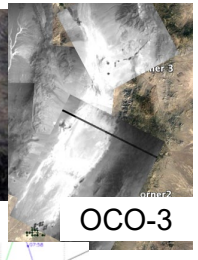
GOSAT



GOSAT-2

July 2 Clear

GOSAT-2



OCO-3

July 3 Cloudy

GOSAT-2

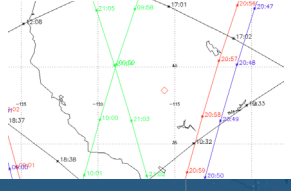
July 4 Partly Cloudy

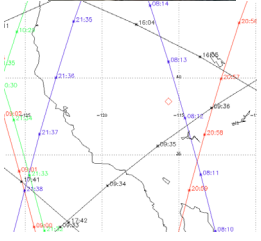
GOSAT

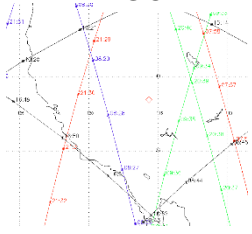
July 5 Partly Cloudy

GOSAT

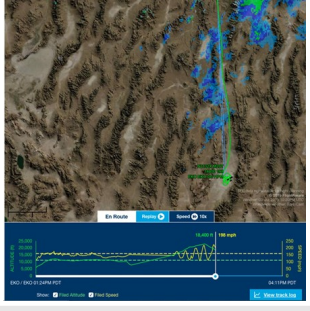
Paths

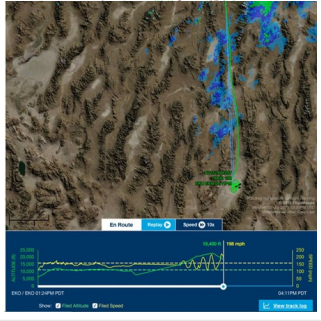






Ames Aircraft



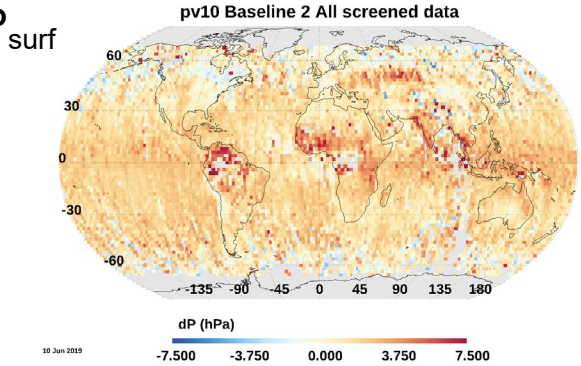


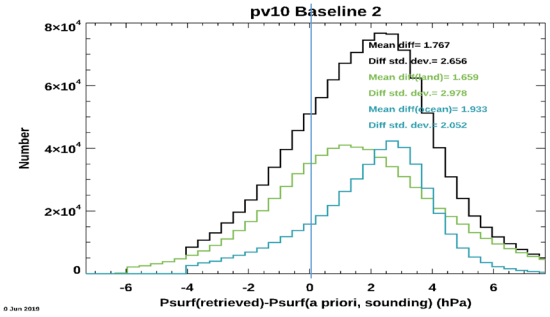
Based on Akikiko Kuze's RRV Digest Reports

B10 Testing – Rescaled ABO2 ABSCO

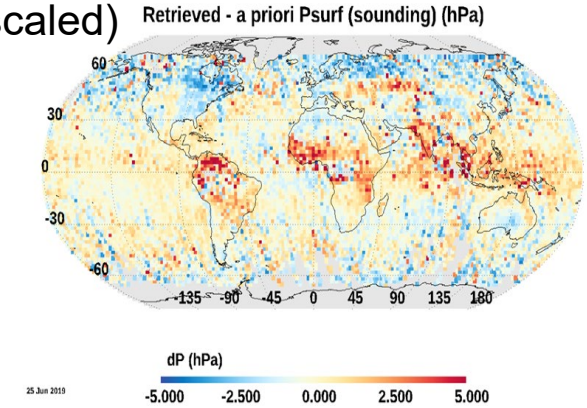
- The ABO2 cross sections in the new B10 new baseline were scaled by 1.0048 to reduce the global surface pressure bias
- This test was needed as a precursor to the tests of fixed surface pressure and limited surface pressure apriori covariance tests

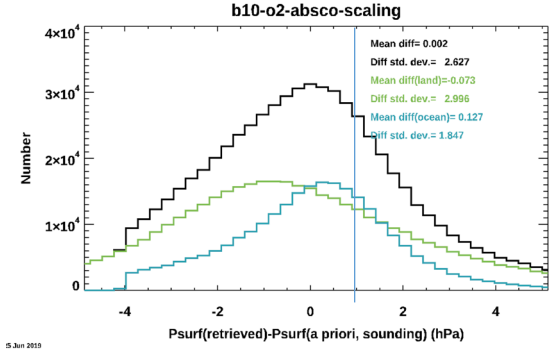
δP_{surf}





δP_{surf} (scaled)

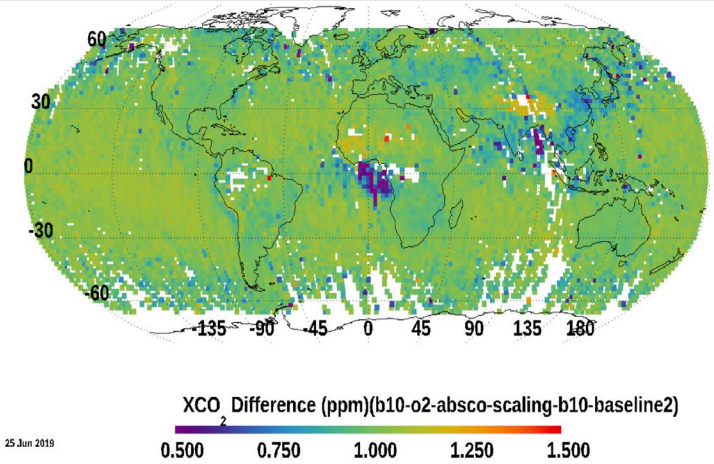


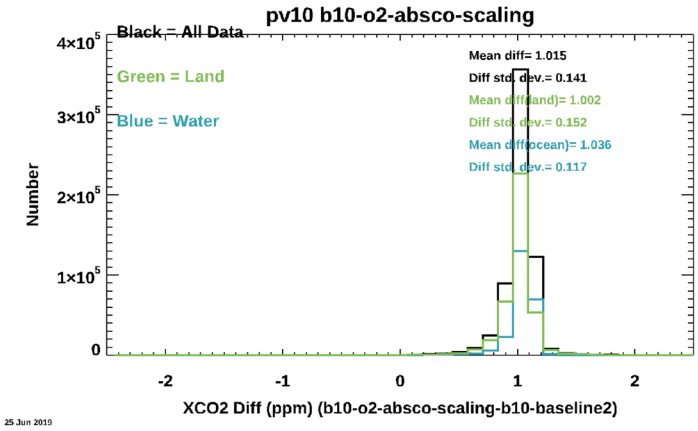


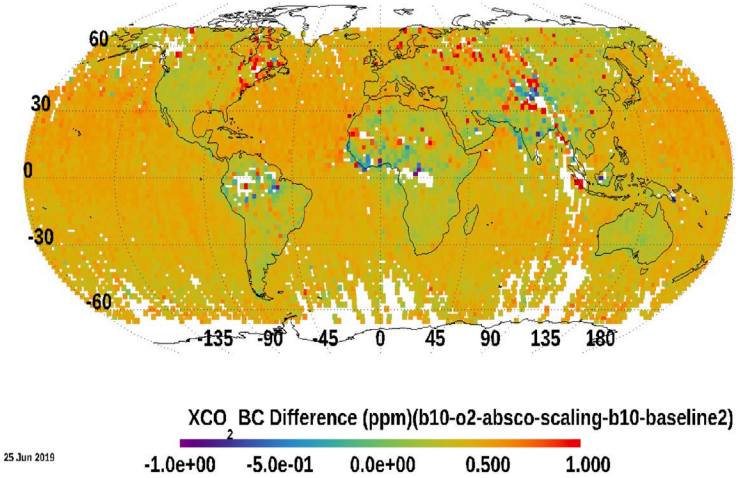
ABSCO ABO2 scaling brings mean surface pressure bias much closer to zero but does not substantially change spatial variations in the surface pressure bias

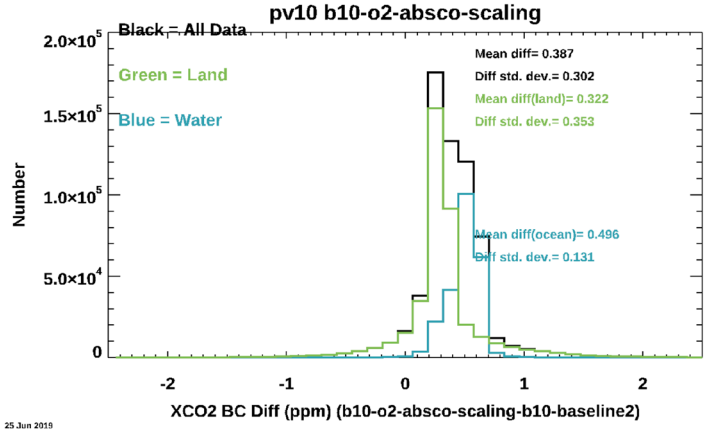
Elva Kuai

Impact of ABO2/P_{surf} Scaling on XCO_2





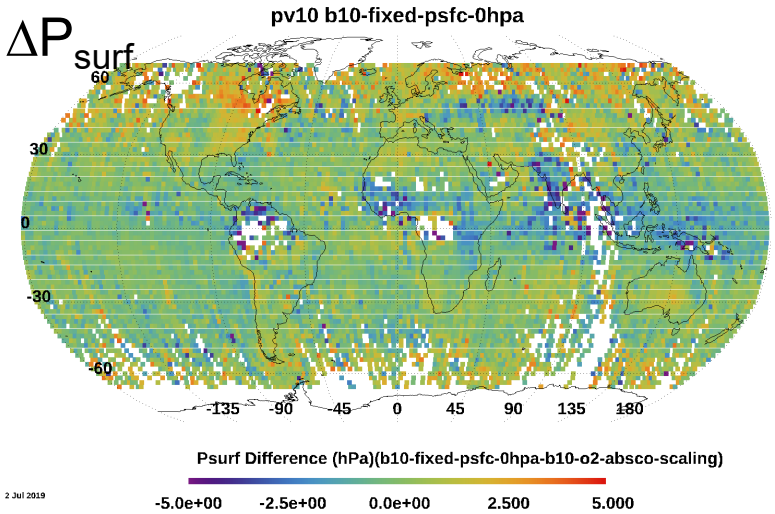


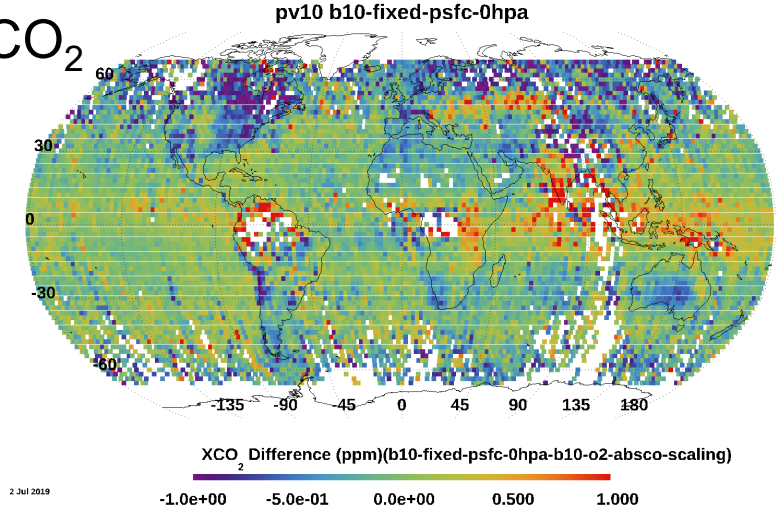


ABO2 scaling introduces a ~+1 ppm positive bias in the XCO2 values that is reduce to ~0.5 ppm by the bias correction.

Elva Kuai

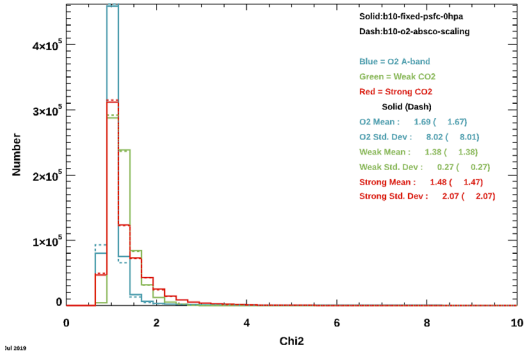
Fixed P_{surf} Test

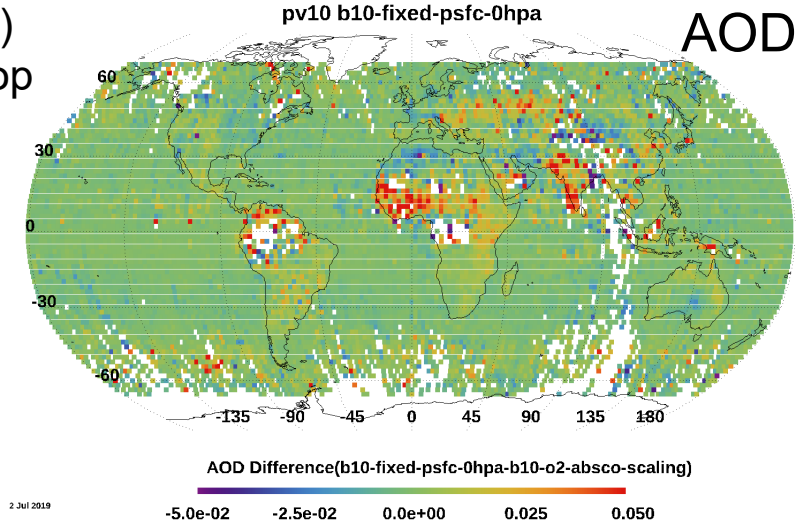




Fixing surface pressure to the apriori values (above) introduces corresponding changes in both XCO2 (top right) and small changes in the total AOD (bottom right)

Fixing the surface pressure produces little change in χ^2





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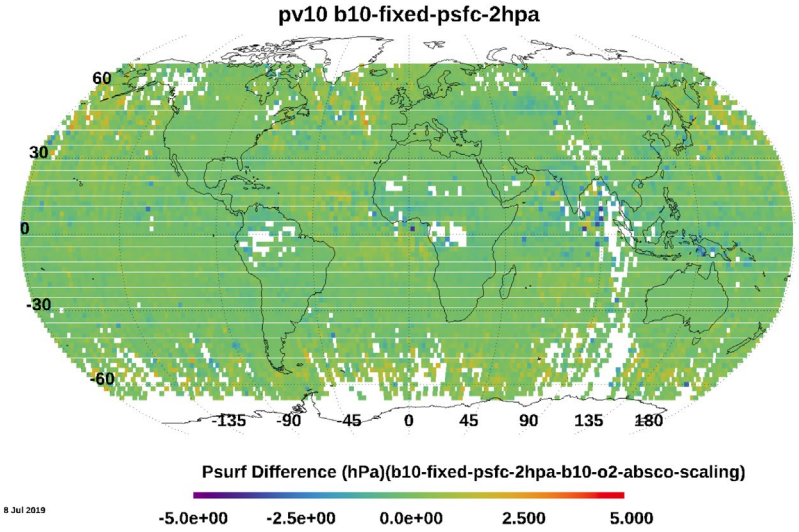
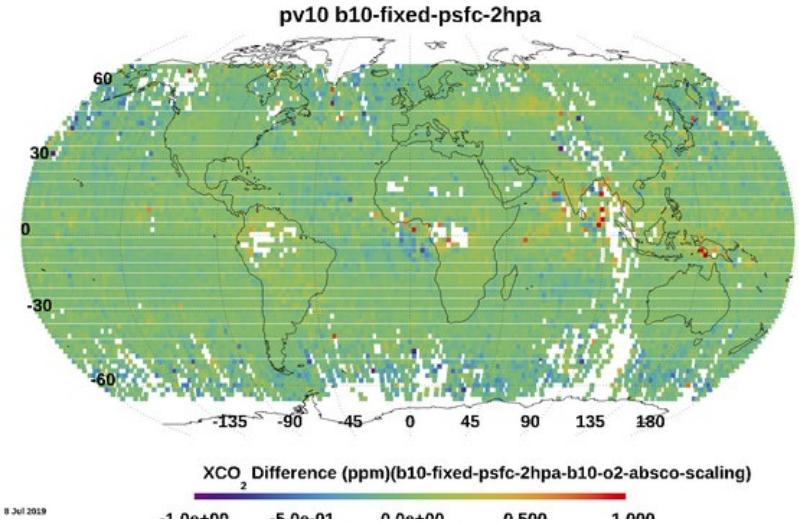
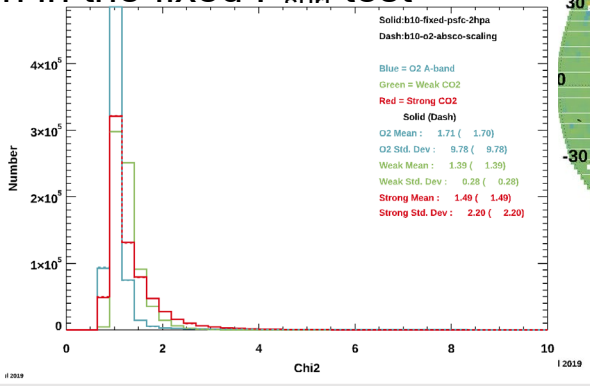
δP_{surf} < 2 hPa Test

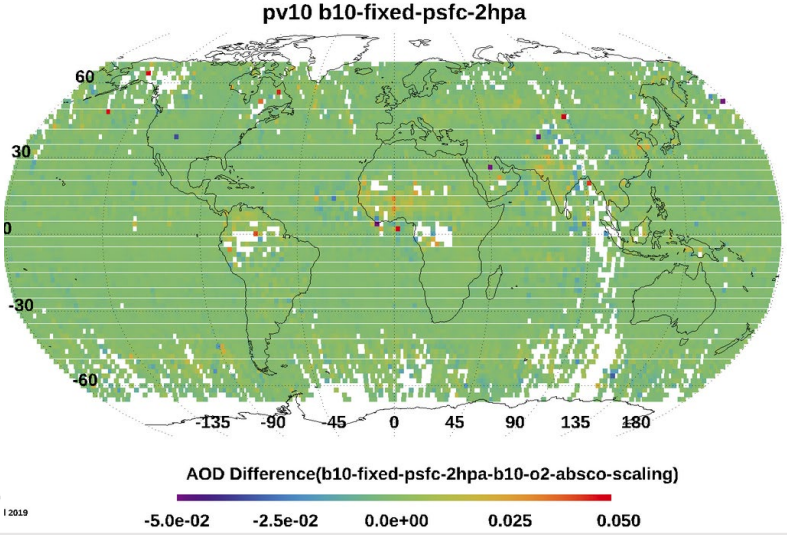




Differences between the updated baseline (δP_{surf} < 4 hPa) and the test with δP_{surf} < 2 hPa are much smaller than those seen in the fixed P_{surf} test

Constraining δP_{surf} to < 2 hPa produces little change in χ^2





Elva Kuai

Publications Statistics

- 2014: OCO-2: 7 refereed papers, 1 book chapter
- 2015: OCO-2: 8 refereed papers
- 2015: ACOS: 3 refereed papers, 1 book chapter
- 2016: OCO-2: 18 refereed papers
- 2016: ACOS: 12 refereed papers
- 2017: OCO-2: 48 refereed papers
- 2017: ACOS: 2 refereed papers
- 2018: OCO-2: 37 refereed papers
- 2018: ACOS: 5 refereed papers
- 2019: OCO-2: 17 refereed papers
- 2019: ACOS: 2 refereed paper

Blue text indicates items that have been updated since the last report
Source: http://www.isiknowledge.com (key word: OCO-2 OR Orbiting Carbon Observatory-2 OR Atmospheric CO2 Observations from Space OR ACOS)

Publish!

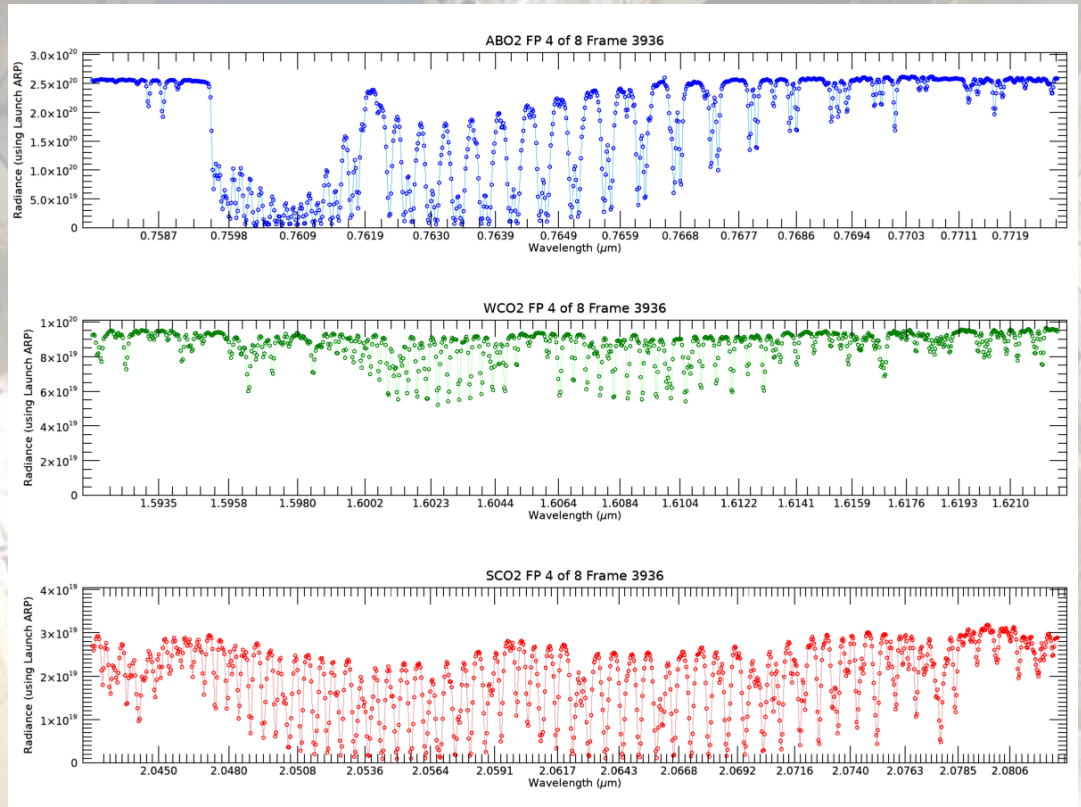
- The OCO-2 publication record is lagging
- The anomalously low publication rate makes it hard very for Ken or I to advocate for new OCO-2 R&A funding
- It also compromises our ability to compete for funds to extend the OCO-2 and OCO-3 missions

- Drop whatever you are doing and start writing it up!

OCO-3 Status

Orbiting Carbon Observatory-3 (OCO-3)
– FIRST LIGHT SPECTRA –

Acquired on Wednesday, 26 June 2019
North Texas Area, Nadir mode Operations
[Ref: R. Rosenberg and the Calibration Team, 27 June 2019]

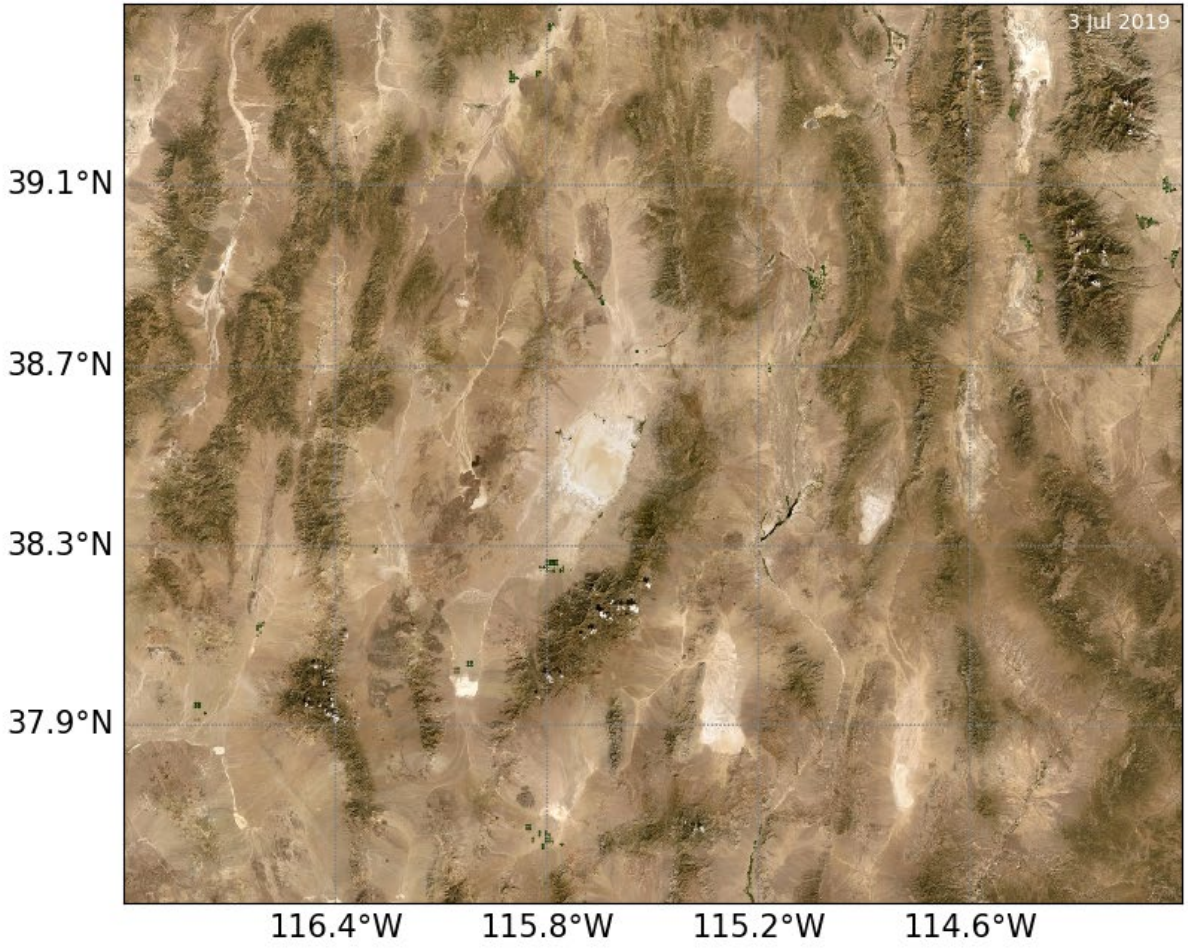


ABO2: O_2 A-band channel (0.765 micron wavelength)
WCO2: Weak CO_2 channel (1.61 micron wavelength)
SCO2: Strong CO_2 channel (2.06 micron wavelength)
FP: Footprint [There are eight total spatial footprints]

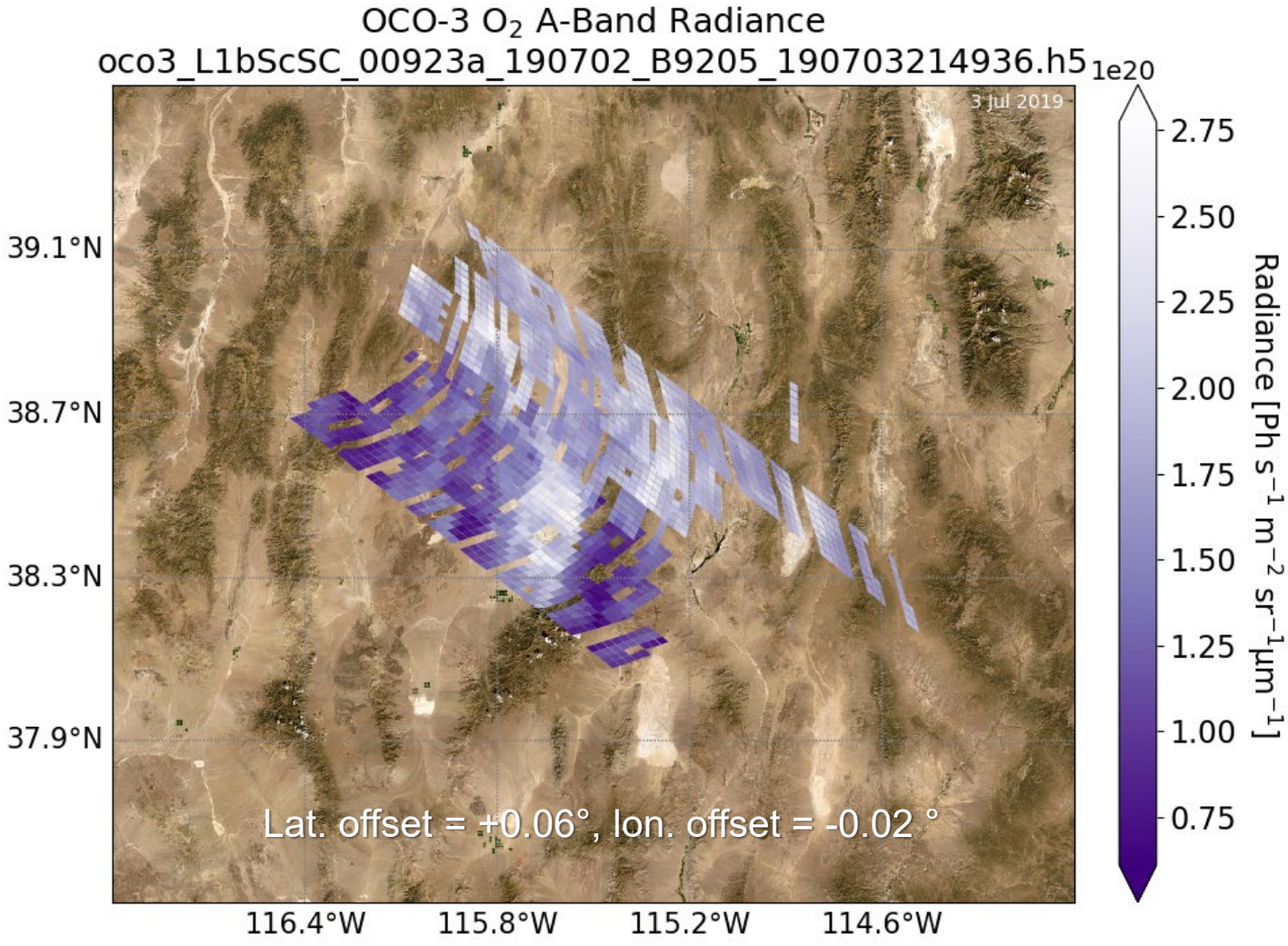
Ralph R. Basilio, 27 June 2019

Railroad Valley, NV

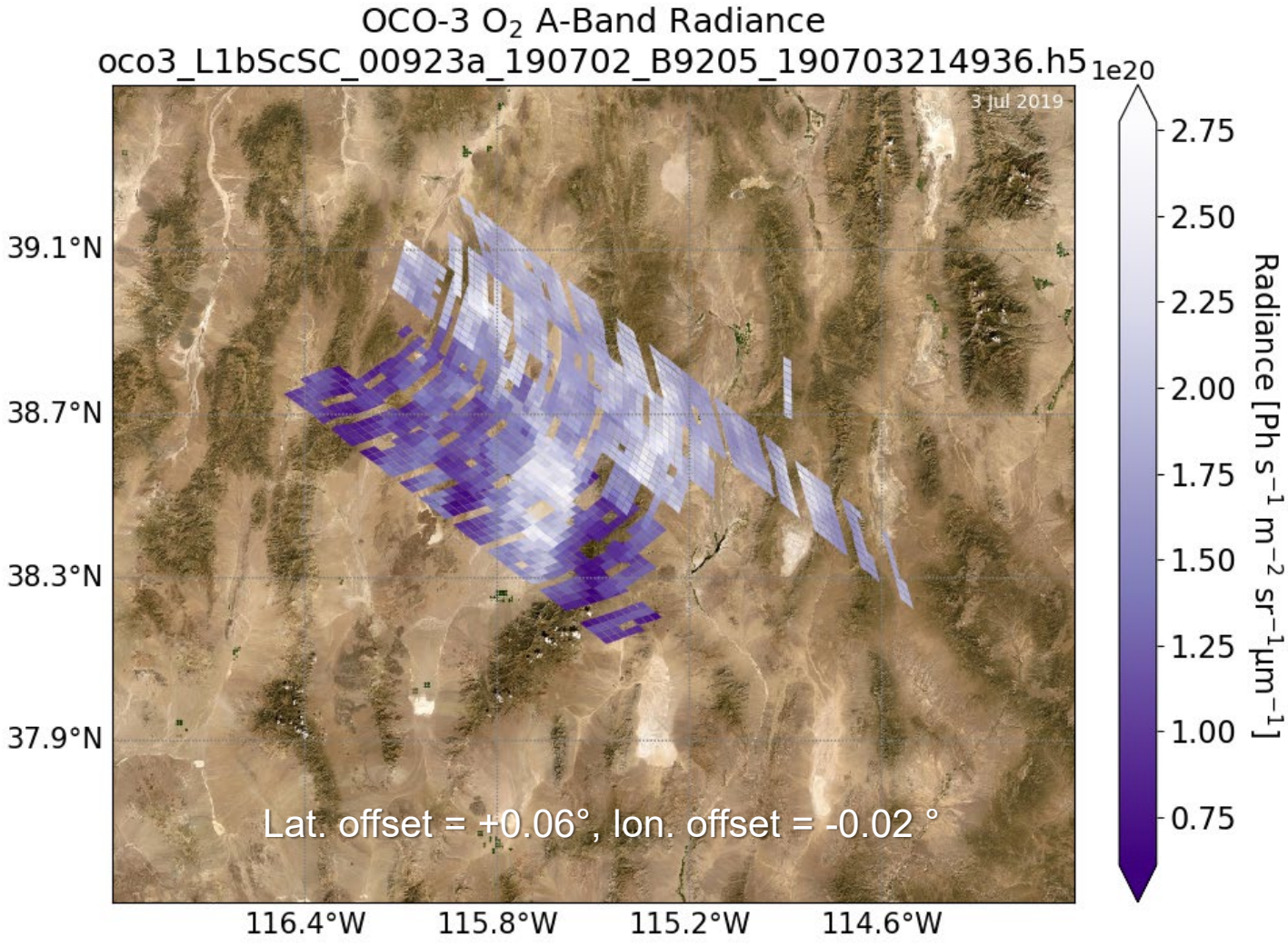
OCO-3 O_2 A-Band Radiance
oco3_L1bScSC_00923a_190702_B9205_190703214936.h5



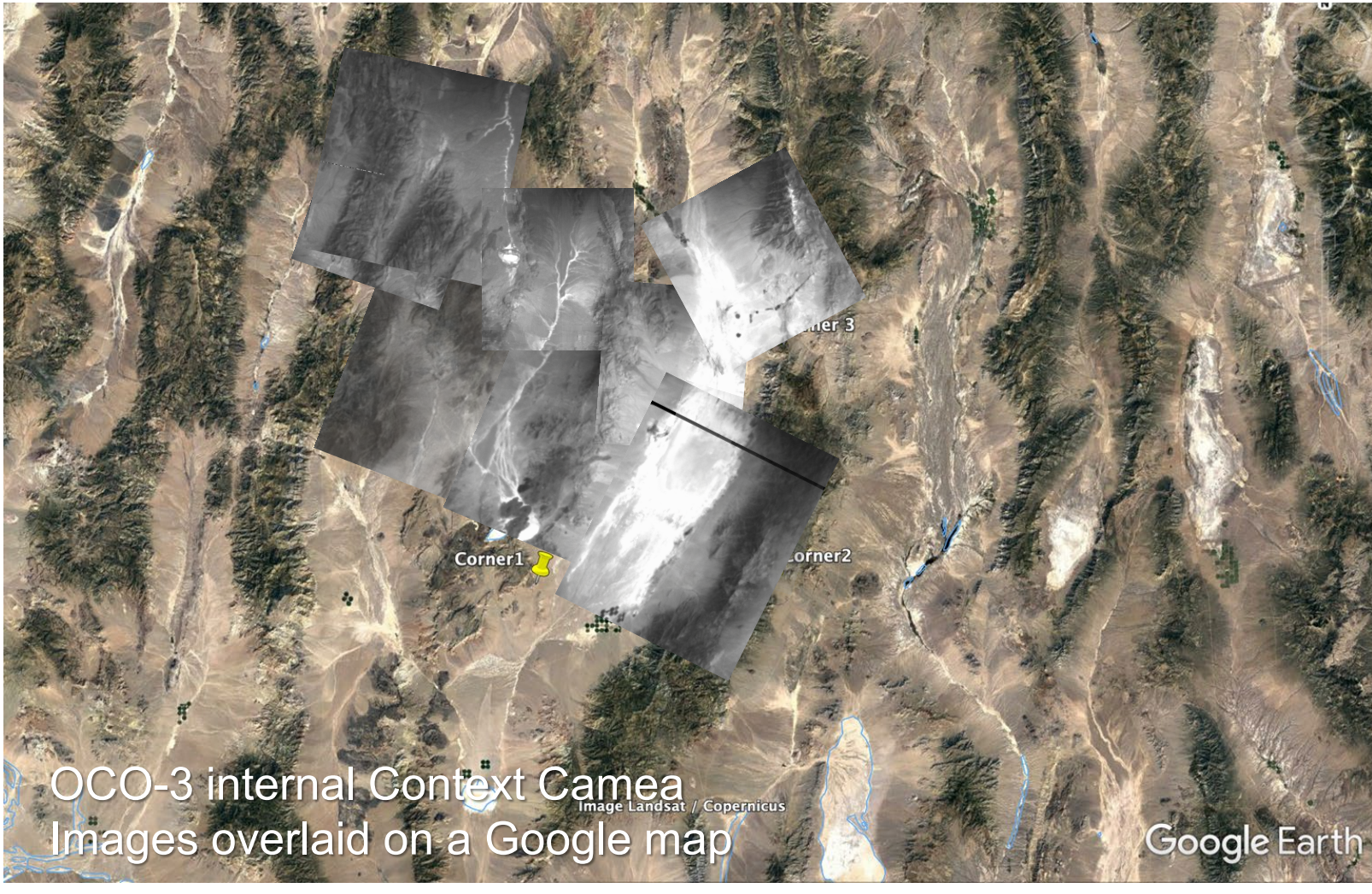
Railroad Valley, NV



Railroad Valley, NV



Railroad Valley – Internal Context Camera



OCO-3 internal Context Camea
Images overlaid on a Google map

OCO-3 Status and Near Term Plans

- Pointing Mechanism Assembly (PMA) calibration is ongoing
  - Functionality verified
  - PMA Calibration continues
- First light: Wednesday, June 26
- Calibration commences immediately after first light
  - PMA calibration with flight instrument field of view
  - Radiometric and spectroscopic calibration commences
  - Railroad Valley successfully targeted on 3 July, 2019
- IOC expected to be complete around August 7th
- Post Launch Assessment Review (PLAR) tentatively set to August 9th

Key Near Term Activities

Planned Date	Activity Description
31 Jul	AGU Abstracts Due
1 Aug	AMS Abstracts Due
9 Aug	OCO-3 Post Launch Assessment Review (PLAR)
26-29 Aug	Chapman Conference: Carbon-Climate Feedbacks, San Diego
10 Nov	OCO-3 L1b Product Delivered
9-13 Dec	2019 Fall AGU Meeting, San Francisco