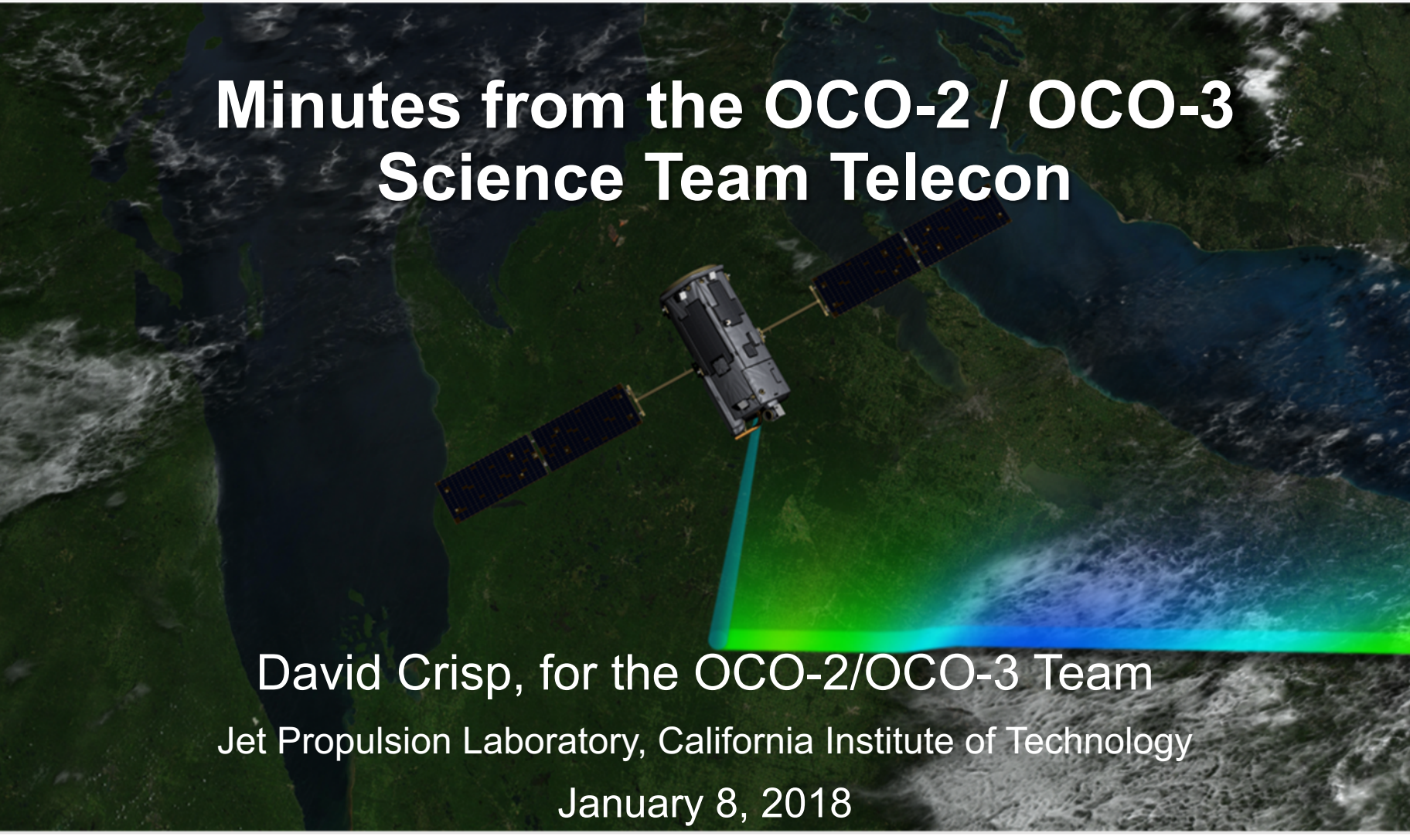
Minutes from the OCO-2 / OCO-3 Science Team Telecon



David Crisp, for the OCO-2/OCO-3 Team

Jet Propulsion Laboratory, California Institute of Technology

January 8, 2018

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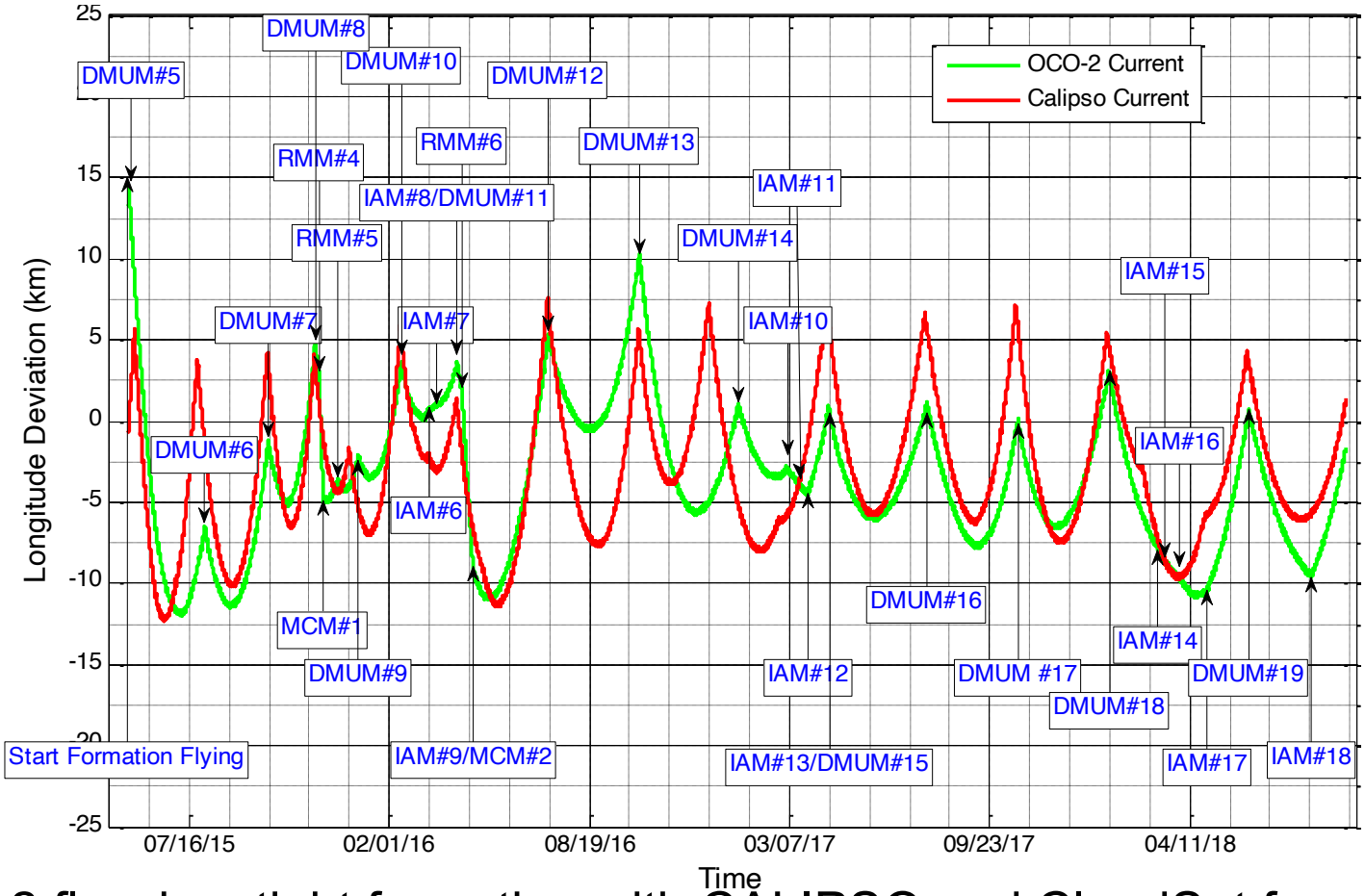
Government sponsorship acknowledged.

OCO-2 Status Summary

As we enter 2019 in a partial Government shutdown:

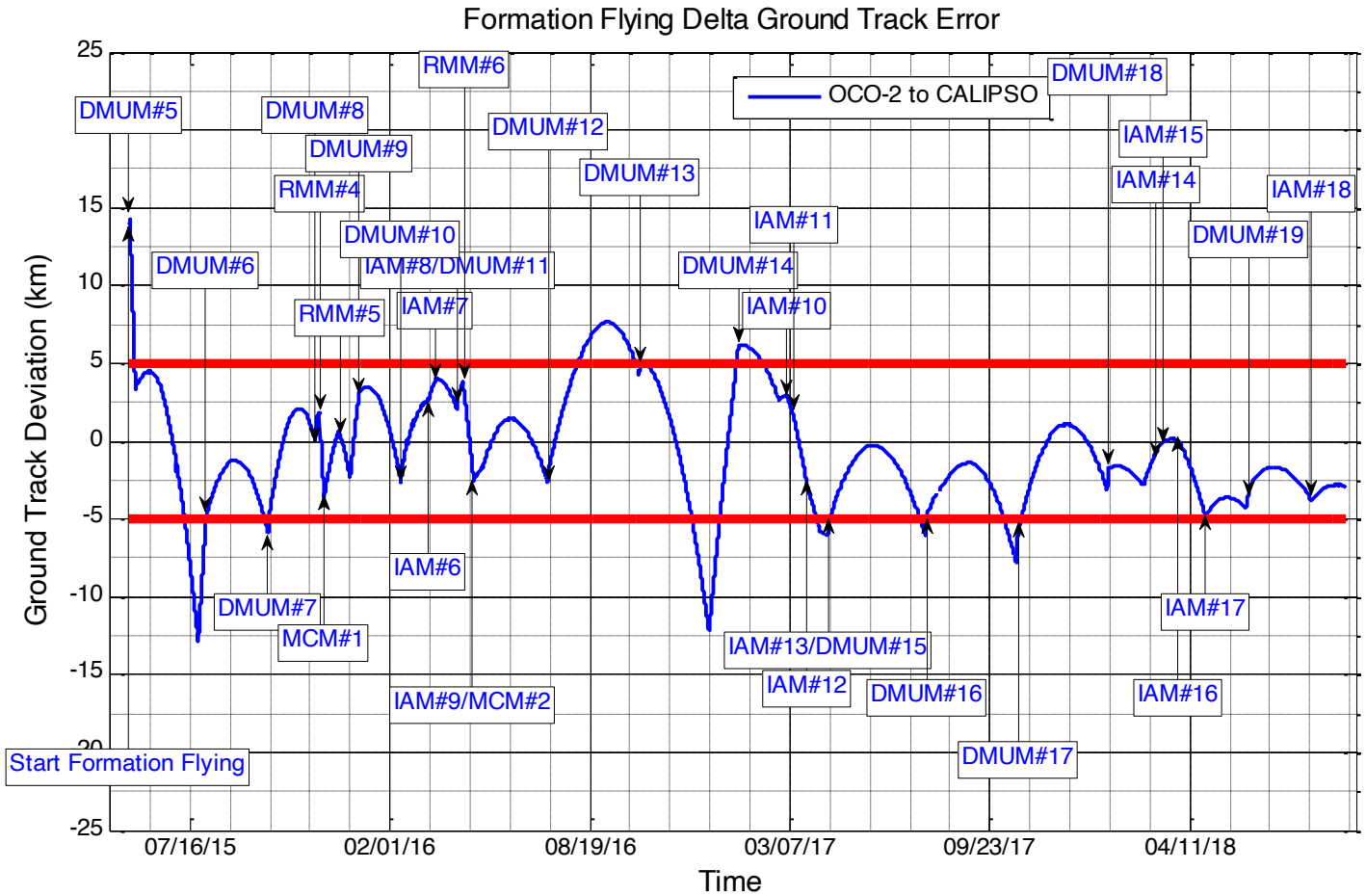
- Observatory Status: Nominal
  - Next Drag Makeup Maneuver (DMM) tentatively scheduled for 21 March 2019 to coincide with a the annual Inclination Angle Maneuver (IAM)
- Instrument Status: Nominal
  - Most recent Decon Cycle: 10-17 November 2018
    - Return to science: November 26, restart of Forward stream
  - Suspected Single Event Upset of SCO2 Data Processing Unit on 12/03/2018. DPU reset normally. 41 hours of data (orbits 23526-23550) lost
  - Continuing to refine bad sample list
- Science Status: Nominal
  - Recent publications
  - OCO-2 Activities at AMS
  - “Build 10” testing plan beginning to come together
  - ACOS/GOSAT version 9, slowly coming together

OCO-2 / CALIPSO Ground track Overlap (Lifetime Formation Flying 15 May 2015 to 13 Sep 2018)



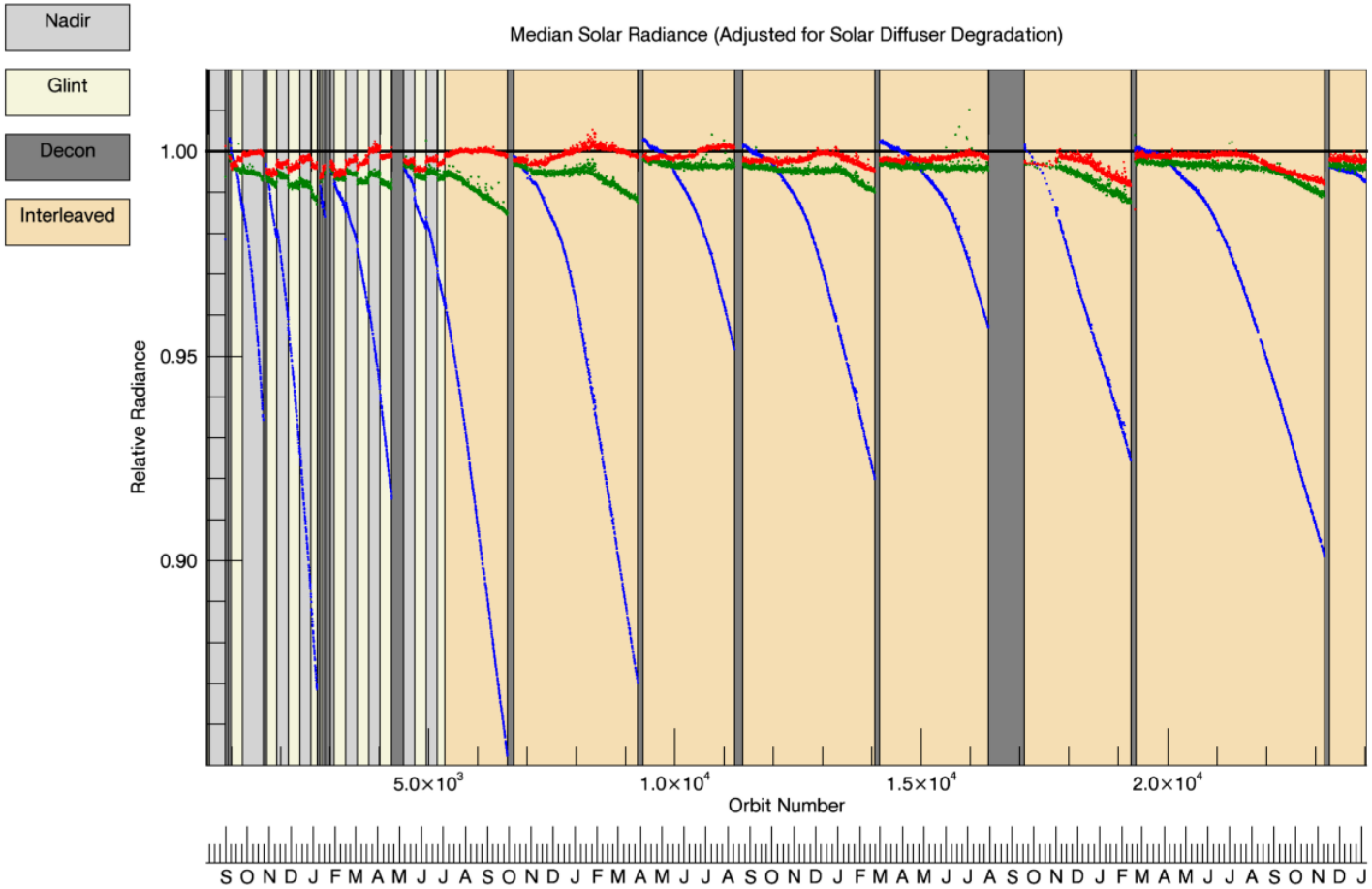
OCO-2 flew in a tight formation with CALIPSO and CloudSat from May 2015 until September 2018, when CALIPSO left the A-Train.

OCO-2 / CALIPSO Ground track Overlap Time



Between 15 May 2015 and 13 Sep 2018 the OCO-2 and CALIPSO ground track centers were within 5 km 84.75% of the time.

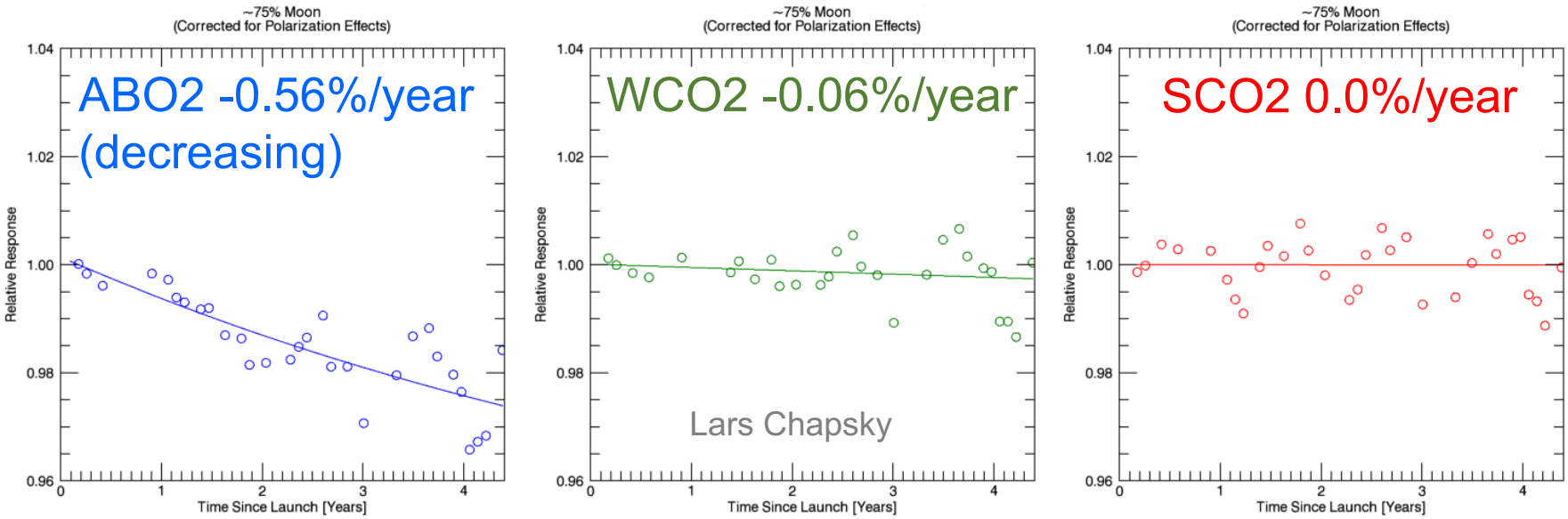
Throughput Trending



November 2018 Decon restored throughput to > 99% in all 3 channels.

- No threat to mission life -

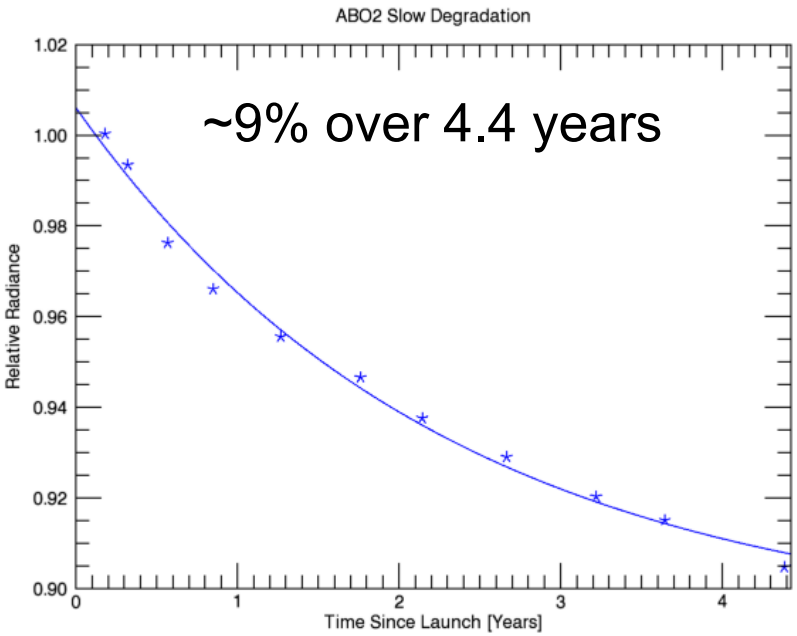
Lunar Calibration Tracks Science Throughput

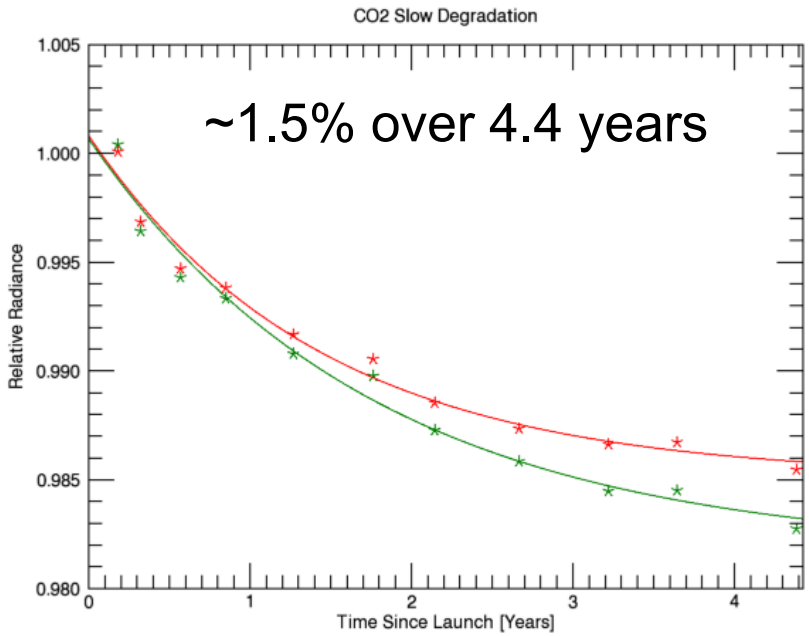


Observations of the Moon acquired twice each month (at 75% phase and full) track the long term degradation of the throughput of those parts of the optical system used for science observations. The largest changes (~2.5% over 4.4 years) are seen in the ABO2 channel, but the rate of change is decreasing over time.

- No threat to mission life -

The Slow Degradation of the Solar Diffuser Using Comparisons of Lunar and Solar Observations

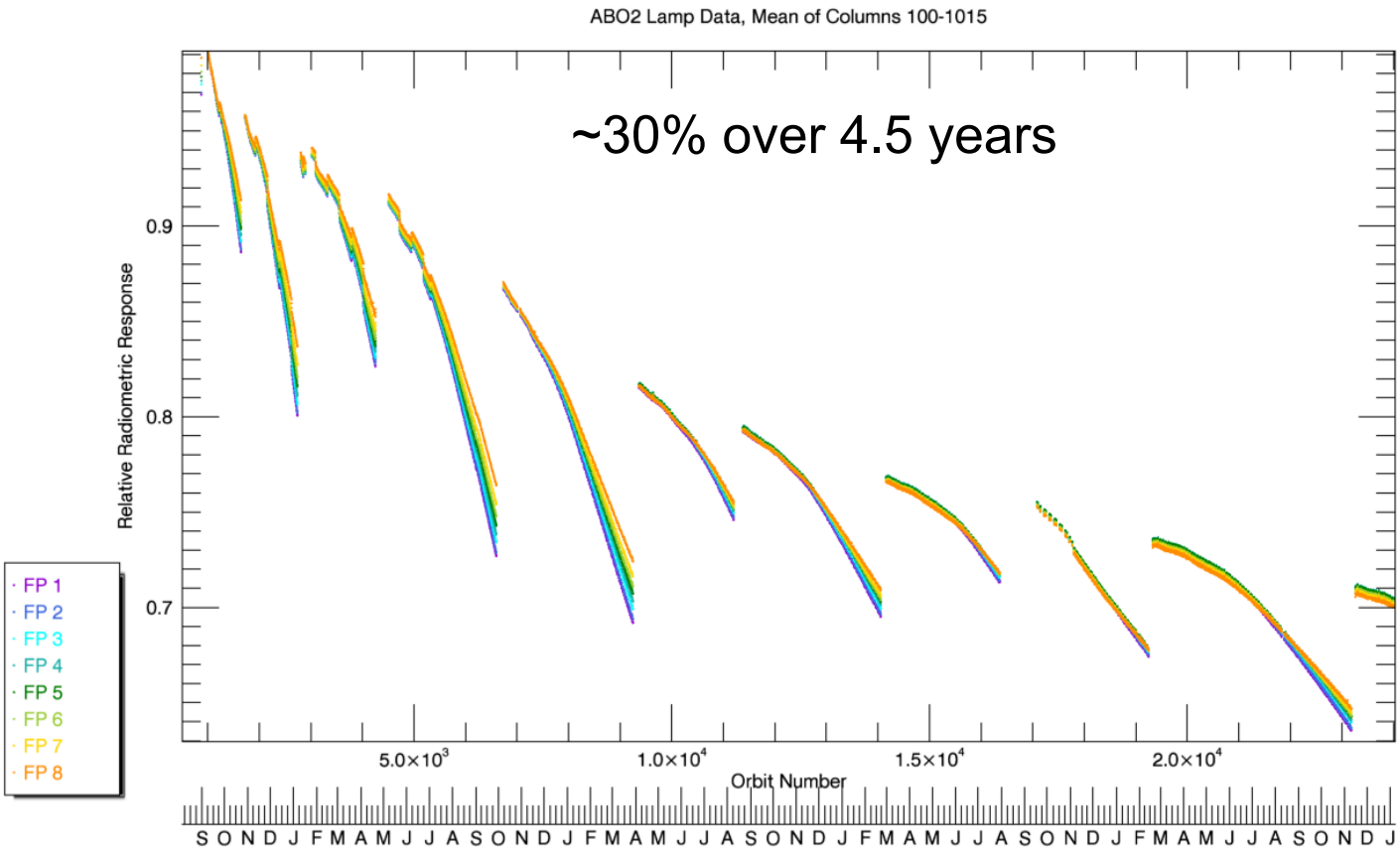




Comparisons of Solar calibration (with diffuser) and Lunar calibration (without diffuser) data are used to track the long term degradation of the solar calibration diffuser. The larges changes are seen in the ABO2 channel, but the rate of change in decreasing in all three channels.

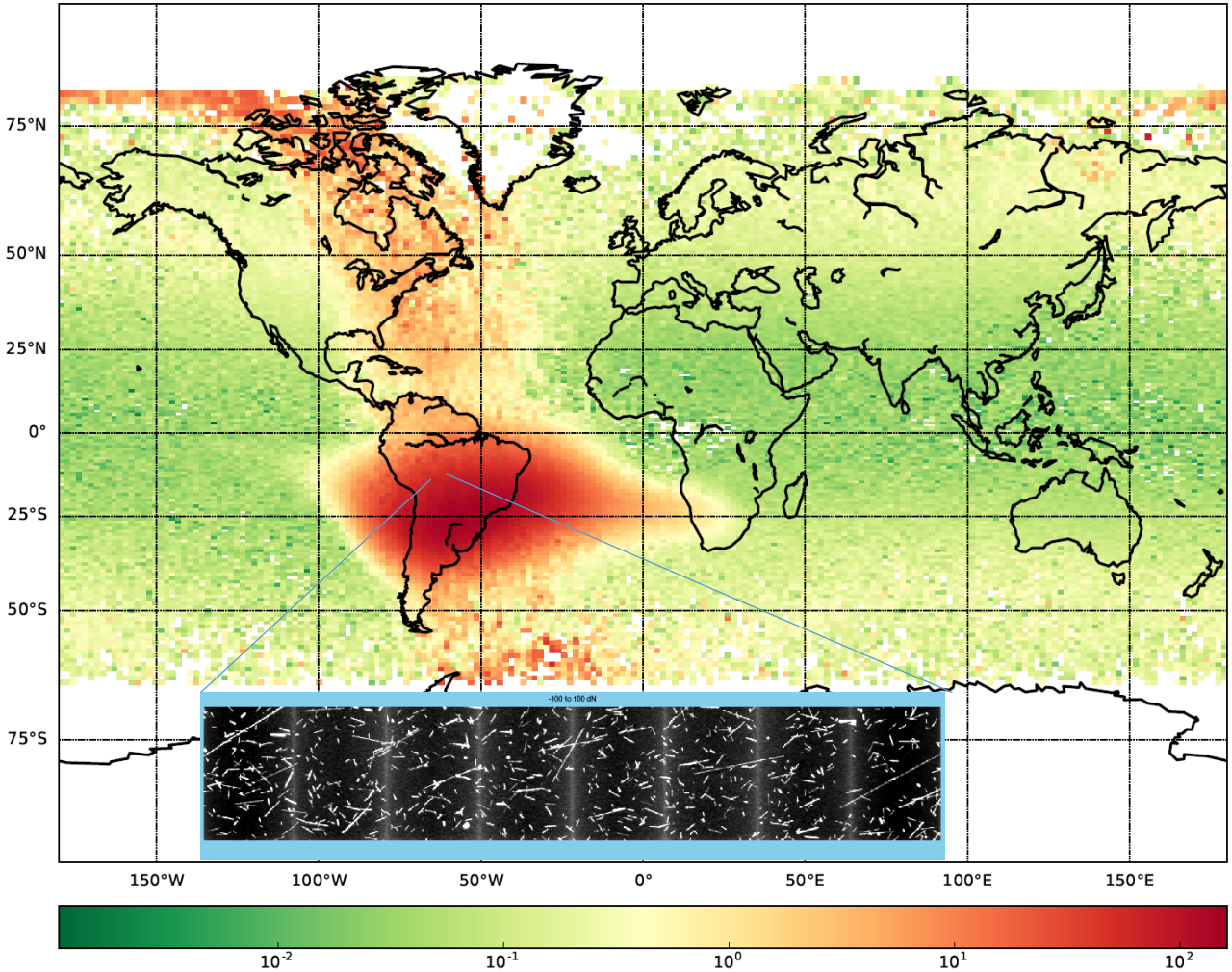
- No threat to mission life -

Long-term Degradation of the Lamps and Their Diffuser



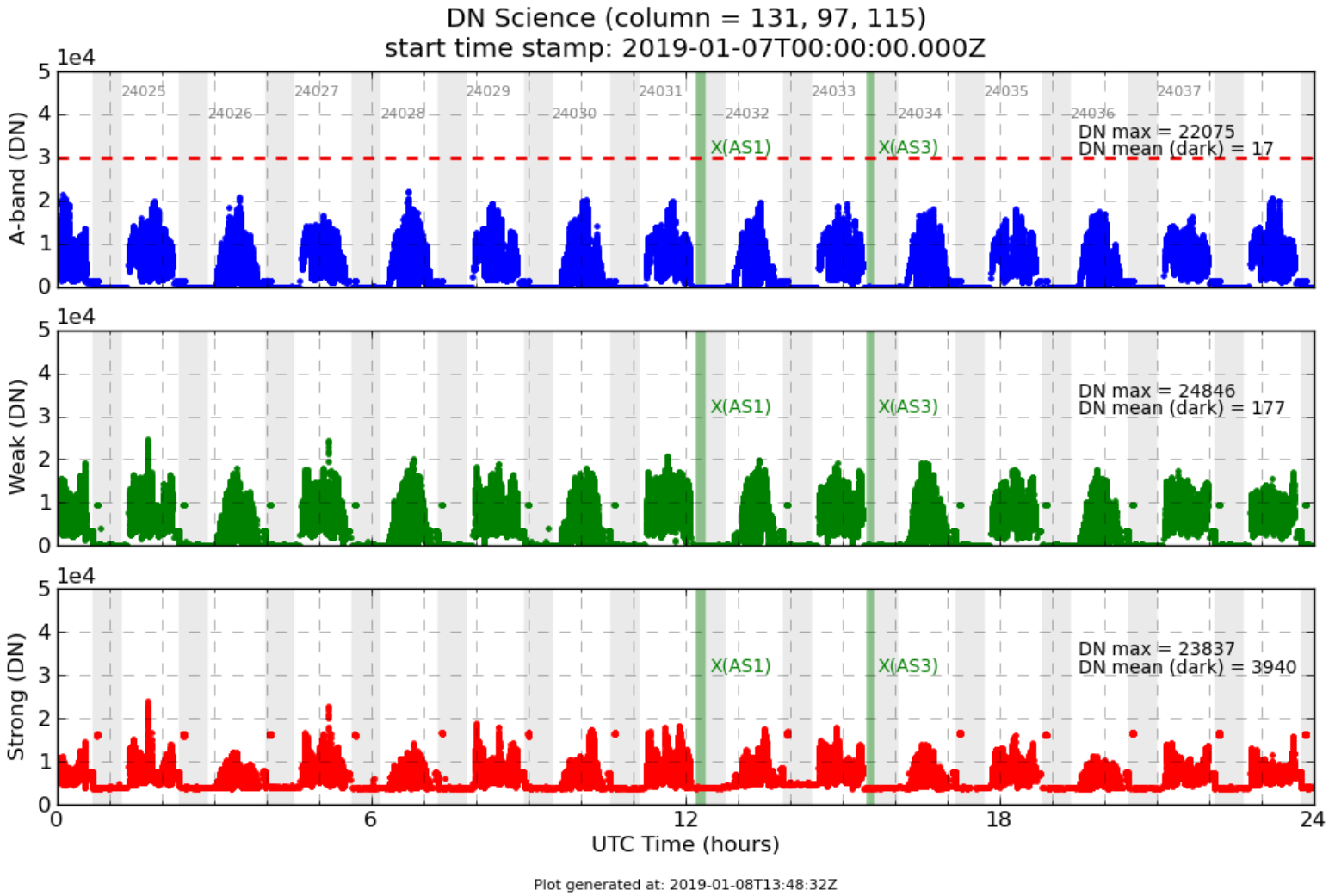
The OCO-2 instrument uses 3 lamps to illuminate a diffuser for tracking pixel-to-pixel gain variations. Lamp 1 is used on every orbit, and is cross-checked against lamps 2 and 3. All 3 lamps are still working, but the lamp diffuser has degraded more rapidly than the solar diffuser. Its rate of degradation is decreasing over time.

Cosmic Rays

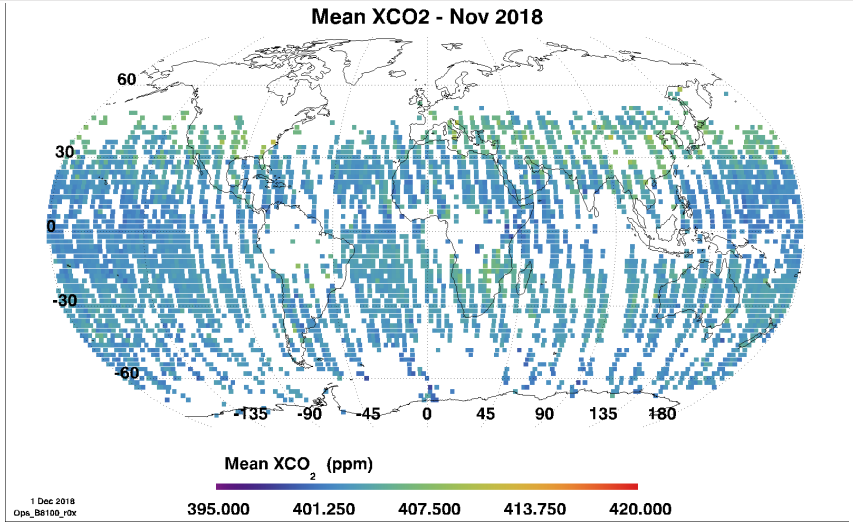


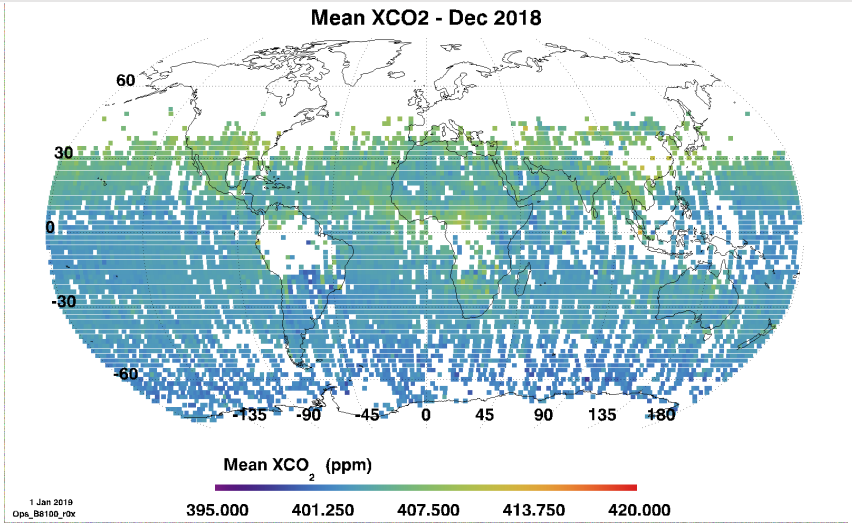
- OCO-2 continues to record large numbers of cosmic ray hits
  - Mostly over the South Atlantic Anomaly (SAA).
  - The apparent "persistence" in the cosmic ray impacts on SAA orbits north of the SAA are under investigation.
- Contaminated samples are tracked and removed prior to use in calibration or L2 retrievals.
- Few pixels are permanently lost due to cosmic ray damage.

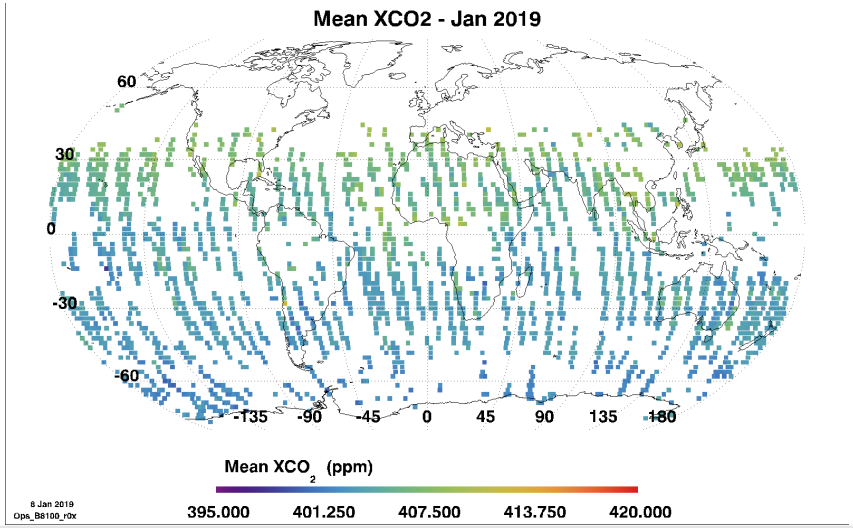
Routine Trending Shows Reduced Frequency of Saturation by Ocean Glints in this Season



L2 V8 Forward Product

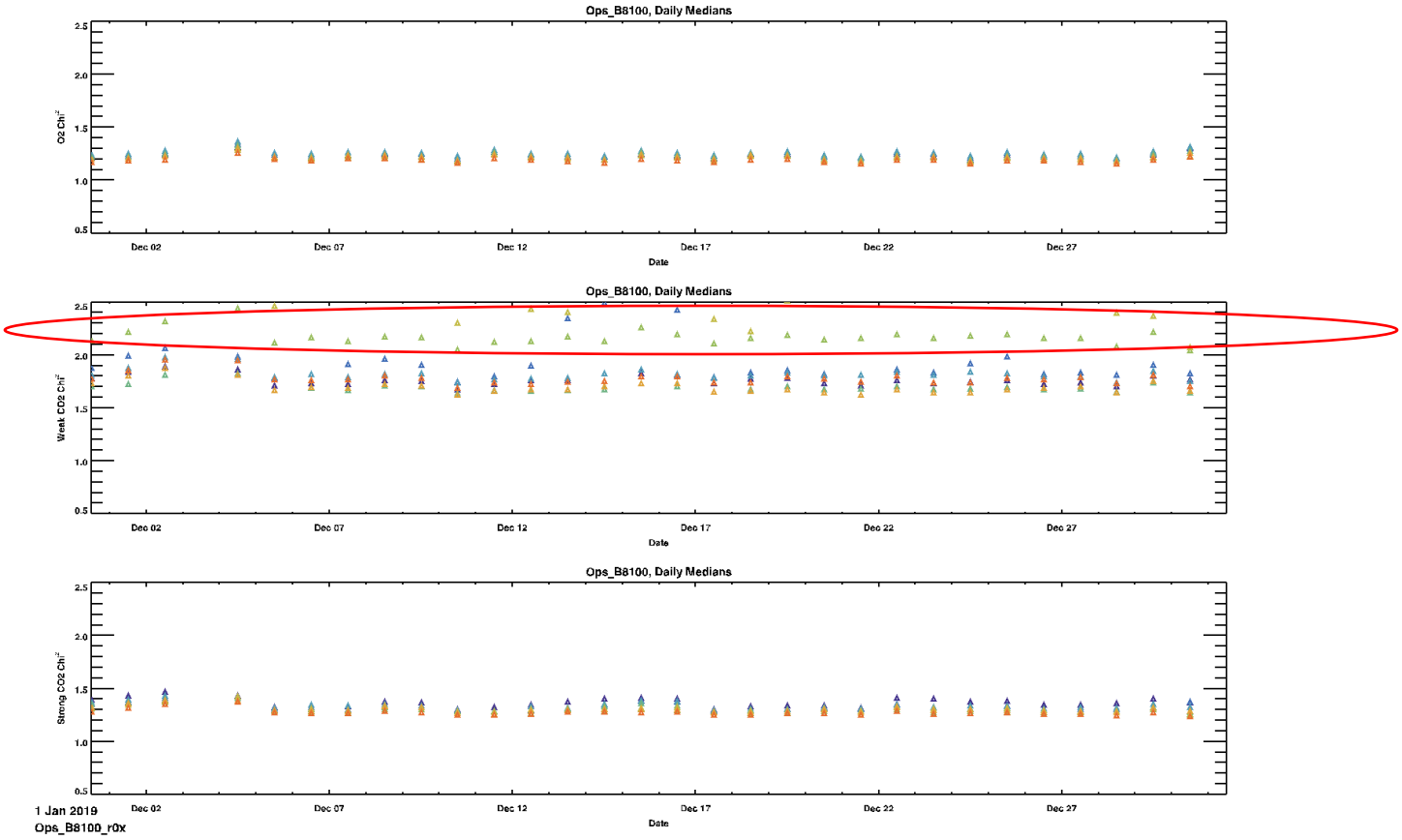






The coverage of the November L2 product was reduced by the Decon cycle.
December and January (so far) L2 products look normal

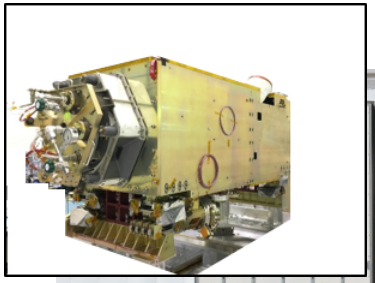
Tracking Bad Samples



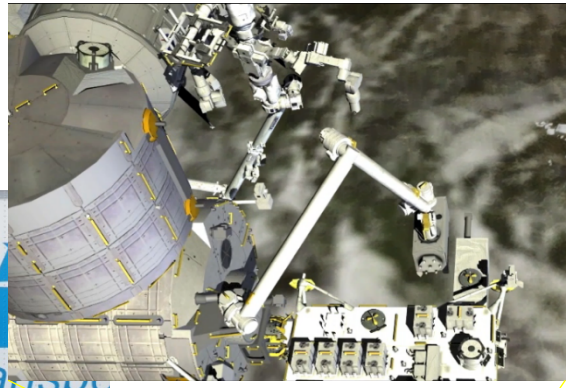
The Calibration Team is continuing to identify and eliminate bad samples that are increasing the χ^2 of the fits in footprints 5 and 6 of the WCO2 channel

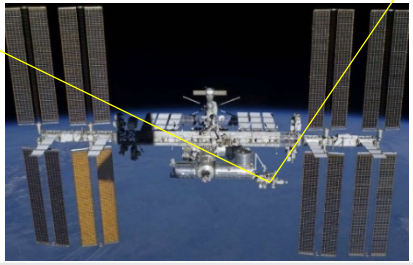
OCO-3 Status Summary

- OCO-3 shipped to Cape Canaveral on November 30
  - Almost finished with the check out and preparations for launch.
  - In storage until February 8 when it will go to Dragonland for integration into the Dragon trunk and deployment on the Falcon 9 launch vehicle.
  - Current launch date: March 16, 2019 from the Space-X launch pad
    - Impact of partial Government shutdown unknown



The OCO-3 Team





Recent Publications (1)

- O'Dell, C. W., Eldering, A., Wennberg, P. O., Crisp, D., Gunson, M. R., Fisher, B., Frankenberg, C., Kiel, M., Lindqvist, H., Mandrake, L., Merrelli, A., Natraj, V., Nelson, R. R., Osterman, G. B., Payne, V. H., Taylor, T. R., Wunch, D., Drouin, B. J., Oyafuso, F., Chang, A., McDuffie, J., Smyth, M., Baker, D. F., Basu, S., Chevallier, F., Crowell, S. M. R., Feng, L., Palmer, P. I., Dubey, M., García, O. E., Griffith, D. W. T., Hase, F., Iraci, L. T., Kivi, R., Morino, I., Notholt, J., Ohyama, H., Petri, C., Roehl, C. M., Sha, M. K., Strong, K., Sussmann, R., Te, Y., Uchino, O., and Velazco, V. A.: Improved Retrievals of Carbon Dioxide from the Orbiting Carbon Observatory-2 with the version 8 ACOS algorithm, Atmos. Meas. Tech., 11, 6539-6576, 2018, doi:10.5194/amt-11-6539-2018.
- Wey, X., Wang, X., Wei, W. , and Wan, W.: Use of Sun-Induced Chlorophyll Fluorescence Obtained by OCO-2 and GOME-2 for GPP Estimates of the Heihe River Basin, China, Remote Sens. 2018, 10(12), 2039, doi:10.3390/rs10122039.
- Lu, X. C. Cheng, X ., Li, X. L., Chen, J. Q., Sun, M. M., Ji, M., He, H., Wang, SY, Li, S., Tang, J. W., Seasonal patterns of canopy photosynthesis captured by remotely sensed sun-induced fluorescence and vegetation indexes in mid-to-high latitude forests: A cross-platform comparison, Science of the Total Environment, 664, 439-451, DOI: 10.1016/j.scitotenv.2018.06.269, 2018.
- Frédéric Chevallier: Comment on “Contrasting carbon cycle responses of the tropical continents to the 2015–2016 El Niño”, Science 362, eaar5432, 2018. doi:10.1126/science.aar5432

Recent Publications (2)

- Liu, J., K. Bowman, D. Schimel, N. Parazoo, Z. Jiang, M. Lee, A. Bloom, D. Wunch, K. Gurney, D. Menemenlis, M. Girerach, **D. Crisp**, and A. Eldering: Response to Comment on “Contrasting carbon cycle responses of the tropical continents to the 2015–2016 El Niño”. *Science 362,* DOI: 10.1126/science.aat1211, 2018.
- Wu, D., Lin, J.C., Fasoli, B., Oda, T., Ye, X., Lauvaux, T., Yang, E. G., and Kort, E. A.: A Lagrangian approach towards extracting signals of urban CO2 emissions from satellite observations of atmospheric column CO2 (XCO2): X-Stochastic Time-Inverted Lagrangian Transport model ("X-STILT v1"). Geosci. Model Dev., 11, 4843-4871, 2018 doi:10.5194/gmd-11-4843-2018
- Buchwitz, M., Reuter, M., Schneising, O., Noël, S., Gier, B., Bovensmann, H., Burrows, J. P., Boesch, H., Anand, J., Parker, R. J., Somkuti, P., Detmers, R. G., Hasekamp, O. P., Aben, I., Butz, A., Kuze, A., Suto, H., Yoshida, Y., Crisp, D., and O'Dell, C.: Computation and analysis of atmospheric carbon dioxide annual mean growth rates from satellite observations during 2003–2016, Atmos. Chem. Phys., 18, 17355-17370, https://doi.org/10.5194/acp-18-17355-2018, 2018.
- Yin, S., Wang, X. F., Tani, H., Zhang, X. R., Zhong, G. S., Sun, Z. Y., Chittenden, A. R., Analyzing temporo-spatial changes and the distribution of the CO2 concentration in Australia from 2009 to 2016 by greenhouse gas monitoring satellites, Atmospheric Environment, 192, 1-12, DOI: 10.1016/j.atmosenv.2018.08.043, 2018.
- Others …

Publications in Review

- Kiel, M., O'Dell, C. W., Fisher, B., Eldering, A., Nassar, R., MacDonald, C. G., and Wennberg, P. O.: How bias correction goes wrong: Measurement of XCO2 affected by erroneous surface pressure estimates, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2018-353, in review, 2018.
- Nelson, R. R. and O'Dell, C. W.: The Impact of Improved Aerosol Priors on Near-Infrared Measurements of Carbon Dioxide, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2018-366, in review, 2018.
- Kulawik, S. S., O'Dell, C., Nelson, R. R., and Taylor, T. E.: Validation of OCO-2 error analysis using simulated retrievals, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2018-368, in review, 2018.
- Eldering, A., Taylor, T. E., O'Dell, C. W., and Pavlick, R.: The OCO-3 mission; measurement objectives and expected performance based on one year of simulated data, Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2018-357, in review, 2018.
- Wang, H., Jiang, F., Wang, J., Ju, W., and Chen, J. M.: Differences of the inverted terrestrial ecosystem carbon flux between using GOSAT and OCO-2 XCO2 retrievals, Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2018-1175, in review, 2018.

Presentations at AMS (1)

- R. Nassar, T. G. Hill, C. MacDonald, C. McCracken, C. McLinden, D. Wunch, D. B. A. Jones, and D. Crisp: Quantifying Asian Power Plant CO_2 Emissions from Space, Monday, January 07, 2019 02:15 PM - 02:30 PM North 126A
- Xiao-Ming Hu, Q. Wang, S. Crowell, Y. Zhang, M. Xue, X. Xiao, B. Moore III, J. Digangi, and K. J. Davis: CO_2 Dynamical Downscaling in 2016 over the Contiguous United States Using WRF-VPRM, a Weather-Biosphere-Online-Coupled Model, Monday, January 07, 2019 09:15 AM - 09:30 AM, North 126A
- Sean Crowell, Q. Wang and X. M. Hu: Frontal Gradients in CO2 as Seen from OCO-2. Monday, January 07, 2019 09:00 AM - 09:15 AM North 126A
- Sean Crowell: The OCO-2 Level 4 Flux Product and Associated Uncertainties. Monday, January 07, 2019 11:00 AM - 11:15 AM North 126A
- Berrien Moore III and S. Crowell: the GeoCarb Mission. Tuesday, January 08, 2019 09:30 AM - 09:45 AM West 212BC
- W.F.J. Evans and P. W. J. Evans, Geological Leaks of Methane in Natural Gas Extraction. Monday, January 07, 2019 04:00 PM - 06:00 PM Hall 4

Presentations at AMS (2)

- Richard Roy, M. Lebsock, L. F. Millan, R. Rodriguez Monje, and K. Cooper: Boundary-Layer Humidity Sounding in Cloudy and Clear Skies Using Differential Absorption Radar, Thursday, January 10, 2019 08:45 AM - 09:00 AM North 131C
- Nickolay A. Krotkov, L. N. Lamsal, A. Vasilkov, S. Marchenko, W. Qin, E. S. Yang, Z. Fasnacht, D. P. Haffner, W. H. Swartz, E. Bucsela, R. Spurr, D. Streets, Z. Lu, D. Goldberg, D. Griffin, C. McLinden, V. Fioletov, F. Liu, T. Oda, L. D. Oman, B. Duncan, and J. Joiner: Inferring Fossil Fuel NO_x and CO_2 Emissions: Combining Bottom-Up Inventories with Improved OMI NO_2 Data. Thursday, January 10, 2019 11:00 AM - 11:15 AM North 124A
- Tomohiro Oda, L. N. Lamsal, N. A. Krotkov, S. Maksyutov, D. Goldberg, Z. Lu, D. Streets, R. Pavlick, T. Kurosu, A. Eldering, T. Lauvaux, and B. Duncan: Exploring the Synergistic Use of OMI NO2 Data with CO_2 Data Collected from GOSAT and OCO-2: Current Status, Challenges and Implications for Upcoming Carbon Missions. Thursday, January 10, 2019 02:45 PM - 03:00 PM North 124A
- Everything in the Inez Fung Symposium

Call for Contributions to a Special Issue on Remote Sensing of CO_2 and CH_4

remote sensing

IMPACT FACTOR 3.406

Special Issue

Remote Sensing of Carbon Dioxide and Methane in Earth's Atmosphere

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Carbon dioxide (CO_2) and methane (CH_4) are the two most important greenhouse gases that have led to a significant fraction of the increase in earth's surface temperature in the past 100 years. This Special is dedicated to the past progress and new developments in satellite remote sensing of long-lived greenhouse gases, with a focus on CO and CH_4.

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Near Term Key Planned Activities

Planned Date	Activity Description
6-10 Jan 2019	99th Annual AMS Meeting, Phoenix, AZ
16 Mar 2019	OCO-3 Launch, Cape Canaveral, FL (TBD)
14-17 Mar 2019	OCO-2/OCO-3 Spring Science Team Meeting, Coco Beach, FL (TBD)
7-12 Apr 2019	EGU General Assembly, Vienna
13-17 May 2019	ESA Living Planet Symposium, Milan, Italy
21-22 May	NOAA ESRL GMD Annual Conference, Boulder
4-6 Jun 2019	IWGGMS-15, Sapporo, Hokkaido
30 Jun-5 July 2019	2019 RRV Campaign
26-29 Aug 2019	Chapman Conference: Carbon-Climate Feedbacks, San Diego

Blue text indicates items that have been updated since the last report on 17-Oct-2018