

OCO-2 Status

10 April 2018

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Jet Propulsion Laboratory,
California Institute of Technology
for the OCO-2 Science Team



Overview

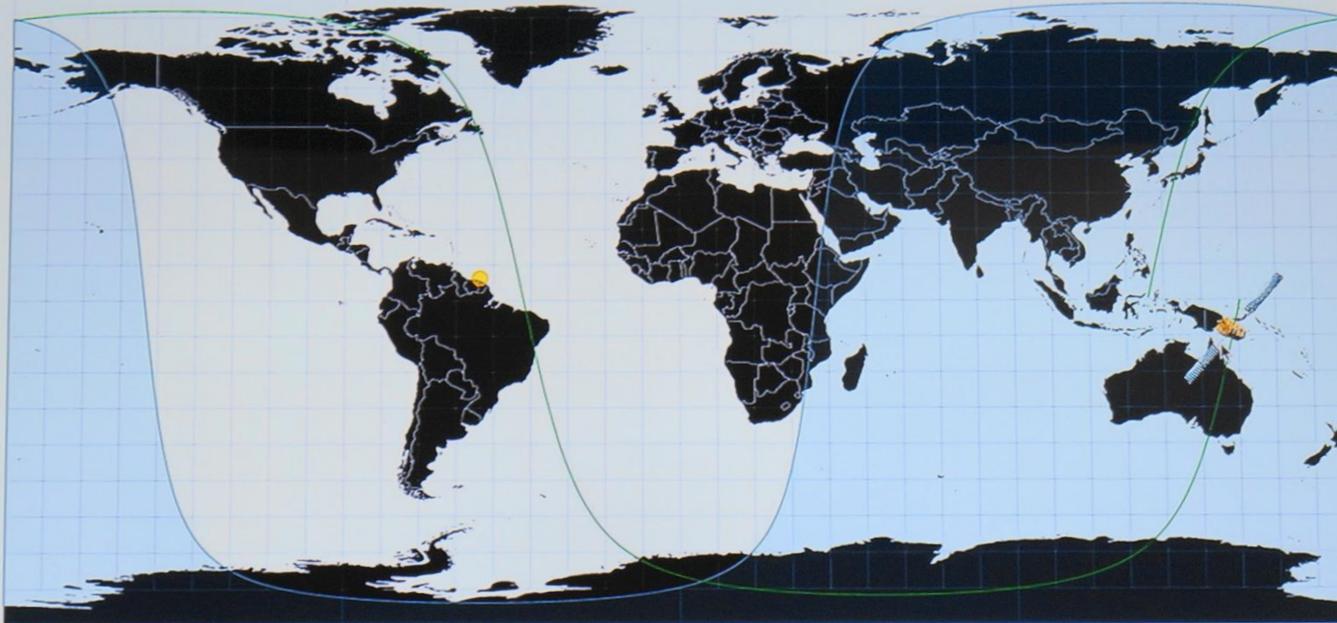
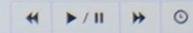
- **Observatory Status: Nominal**
 - 20,000 Orbit!
 - Formation flying overlap expected to 100% through 18 June 2018
 - 2018 Inclination Adjust Maneuvers: 3 down, 1 to go (12 April)
- **Instrument Status: Nominal**
 - Most recent Decontamination Cycle conducted 13-20 February
- **Progress analyzing the V8 Product**
 - Radiometric Trends
 - Surface pressure bias investigation
- **Upcoming meetings**
 - EGU, CEOS SIT and AC-VC, IWGGMS-14, JpGU, AOGS, COSPAR



Spacecraft Status

Orbit #: 20000

UTC: 2018-04-05 15:37:03 (DoY 095)



Current State

ACS Mode:	NADIR
S/C Illumination:	In Eclipse
Science Data Mode:	standby
BCA Position:	SOLAR
Lamps:	Lamps OFF

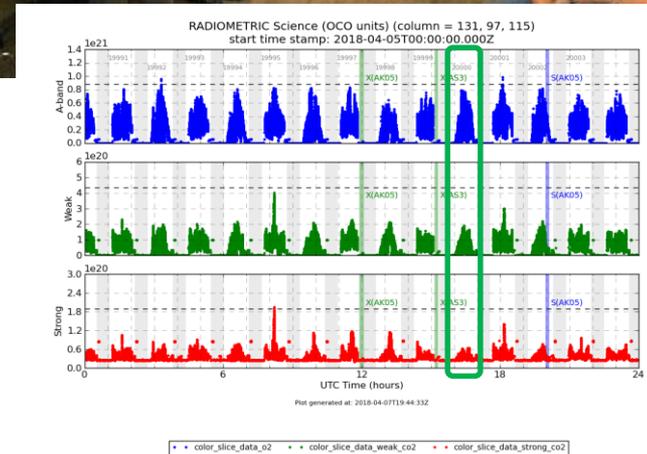
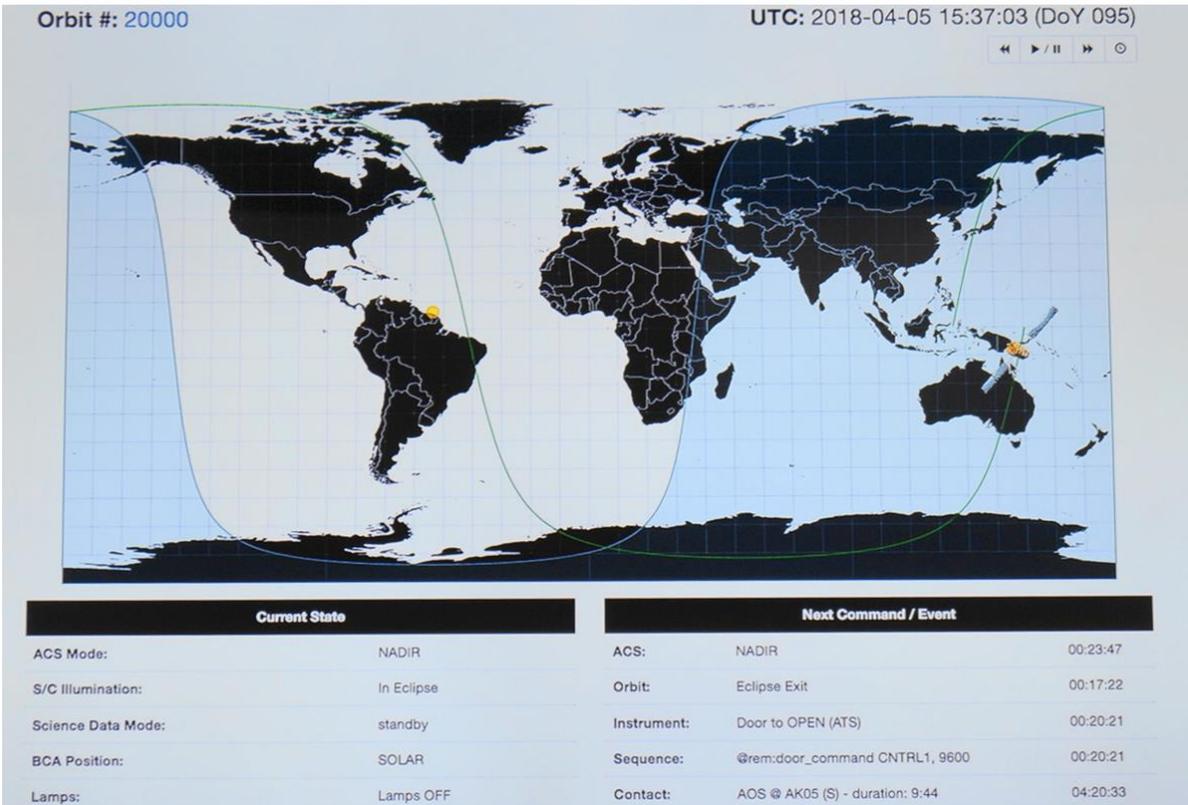
Next Command / Event

ACS:	NADIR	00:23:47
Orbit:	Eclipse Exit	00:17:22
Instrument:	Door to OPEN (ATS)	00:20:21
Sequence:	@rem:door_command CNTRL1, 9600	00:20:21
Contact:	AOS @ AK05 (S) - duration: 9:44	04:20:33



20,000th Orbit Celebration

- On 5 April 2018 between 15:33:53.015Z and 17:12:46.062Z, OCO-2 completed its 20,000th orbit
- A few of the JPL team members gathered in the cafeteria to celebrate this milestone



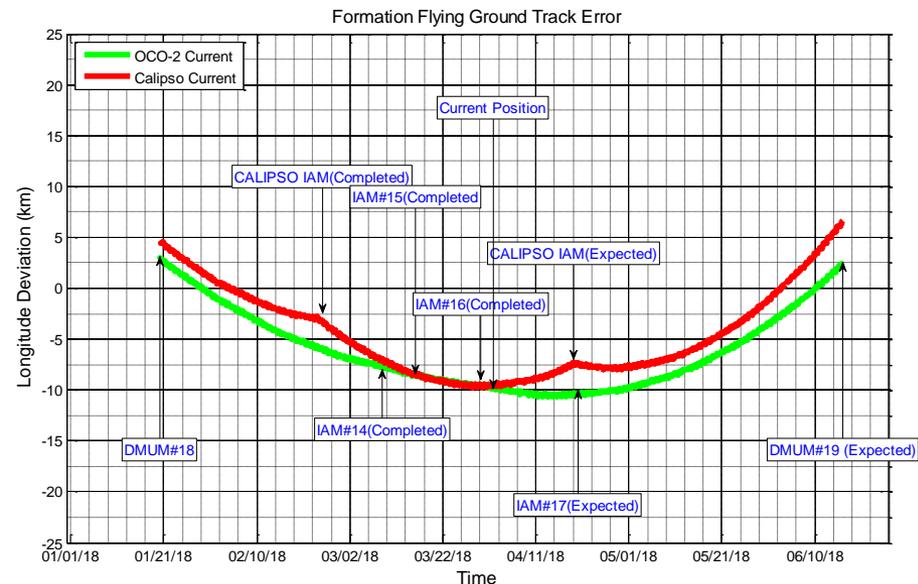


OCO-2/CALIPSO Ground Track Overlap

Annual A-Train Inclination Adjust Maneuver campaign ongoing through 12 April.

- 01 March maneuver was cancelled due to orbital debris concerns
- 8, 15, 29 March maneuvers successful
- Campaign designed to maintain excellent overlap with CALIPSO ground track
- We lose 1-2 orbits of data for each maneuver.

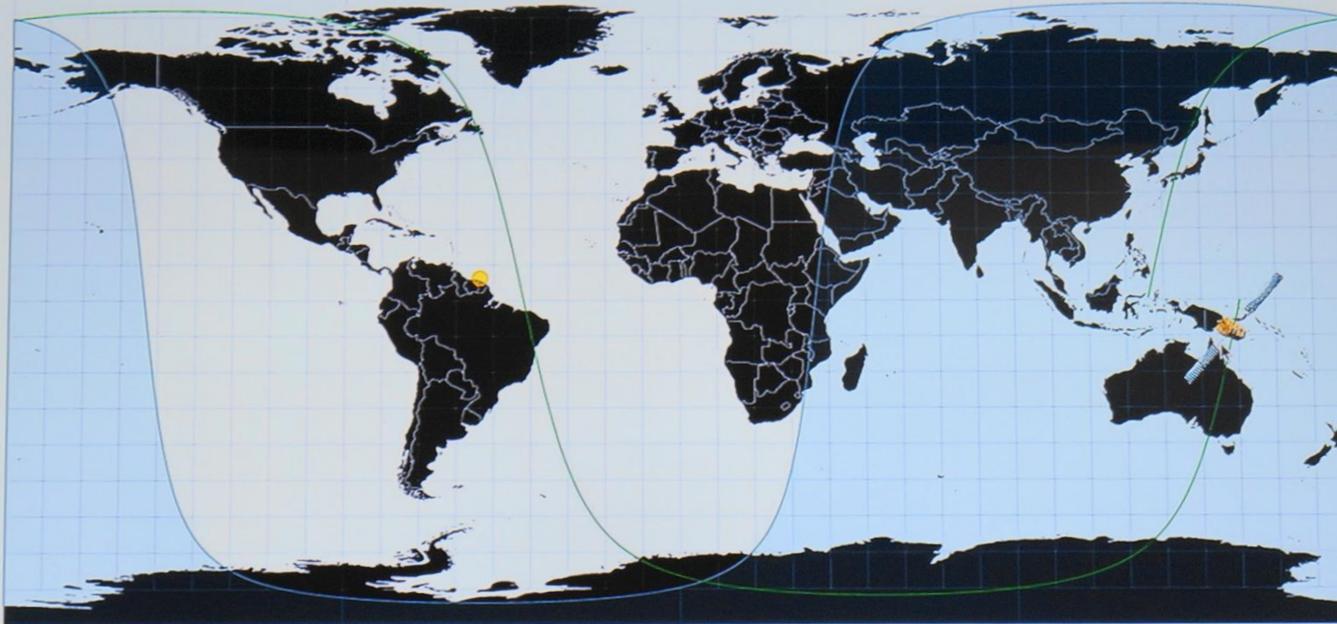
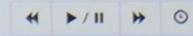
Start Time (UTCG)	Stop Time (UTCG)
01 Mar 2018 21:37:36	01 Mar 2018 21:40:56
08 Mar 2018 21:43:56	08 Mar 2018 21:47:10
15 Mar 2018 21:50:02	15 Mar 2018 21:53:32
29 Mar 2018 22:02:33	29 Mar 2018 22:05:47
12 Apr 2018 22:14:41	12 Apr 2018 22:18:21





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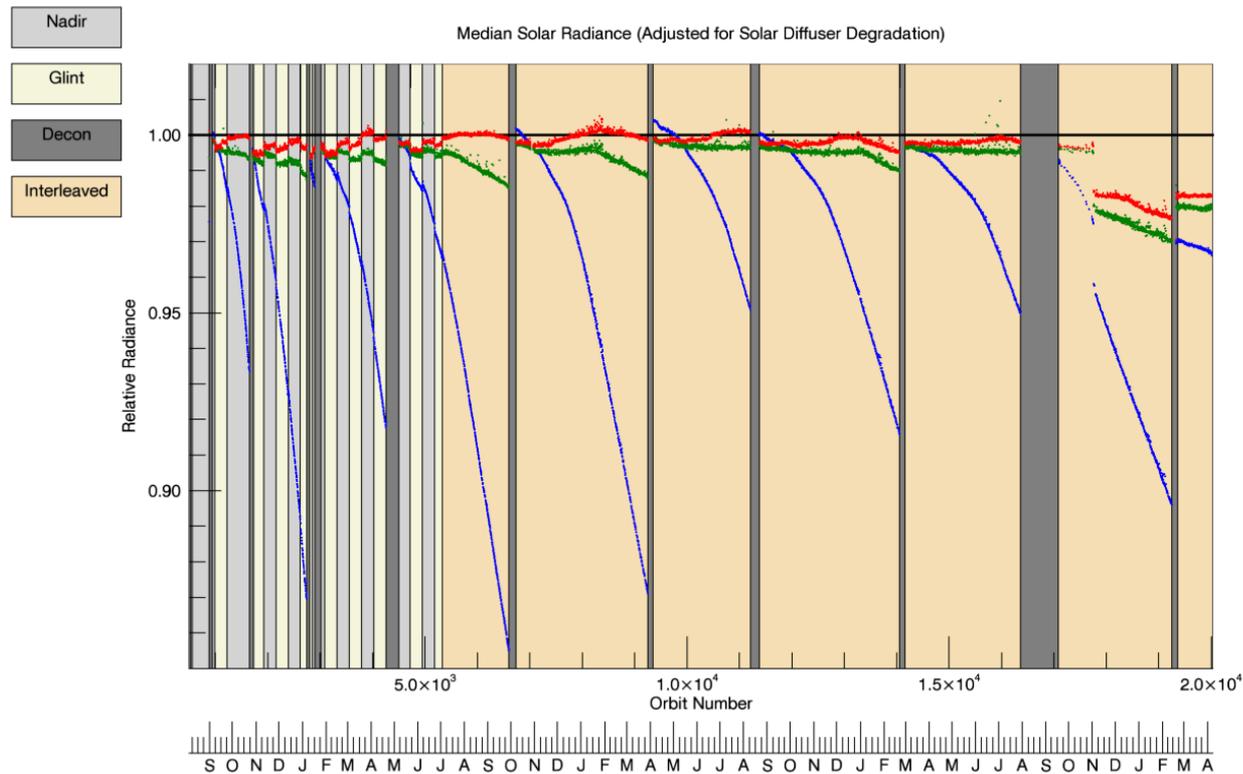
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Instrument Status



Instrument Status

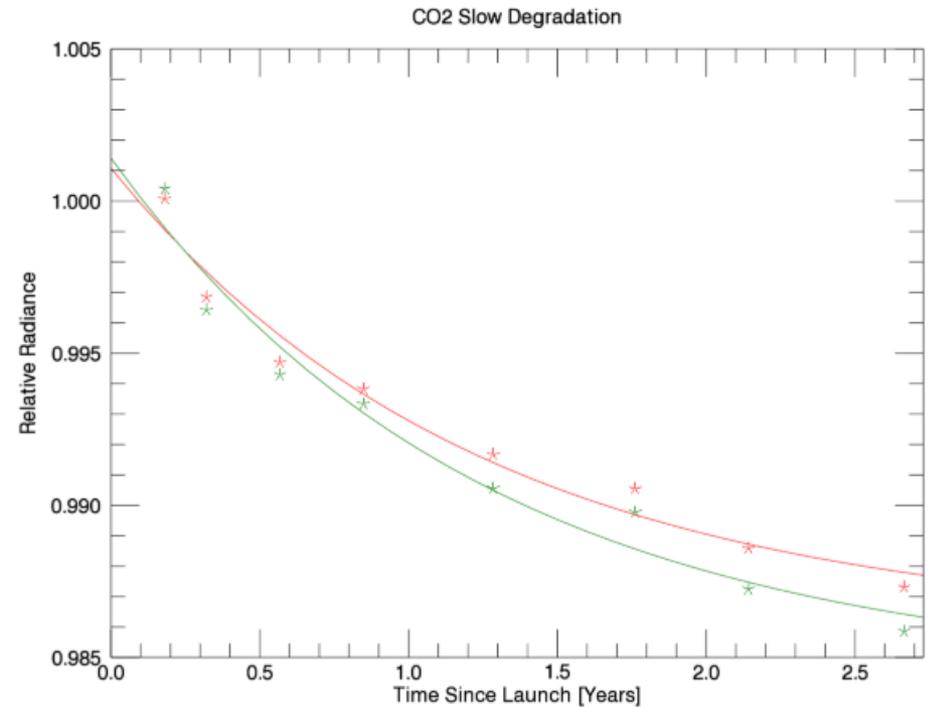
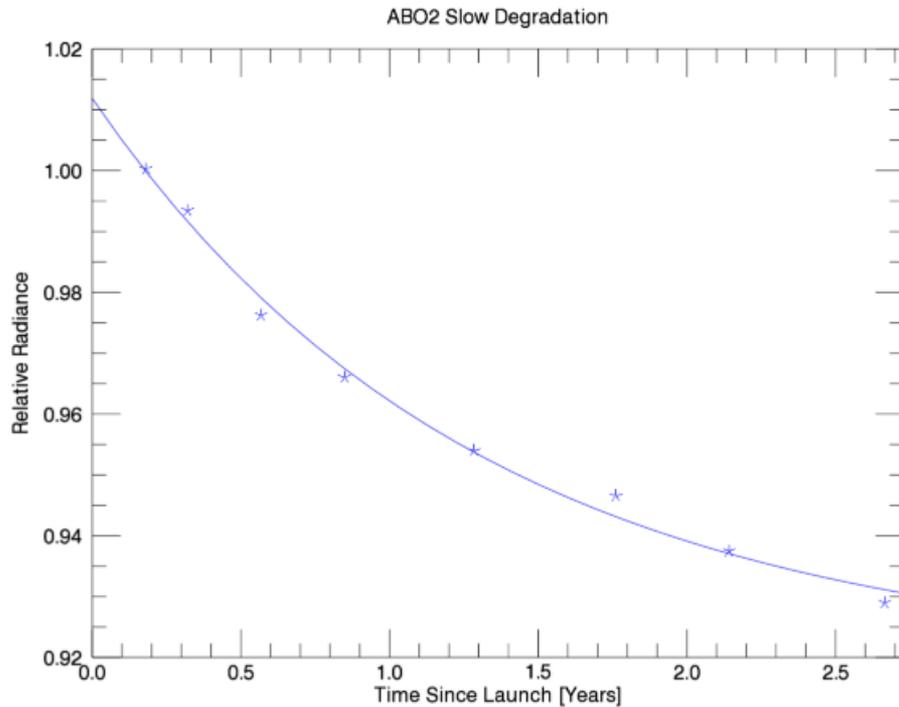


The OCO-2 instrument continues to operate nominally. The change in November 2017 resulted from the 2.5° solar-off-pointing adopted to prevent accidentally looking right at the sun during solar calibration. This change introduced a 1.5% reduction in the throughput of the solar diffuser that is being compensated as part of the calibration process. The latest decon was performed on **13-20 February 2018**.





Instrument Status: Slow Degradation



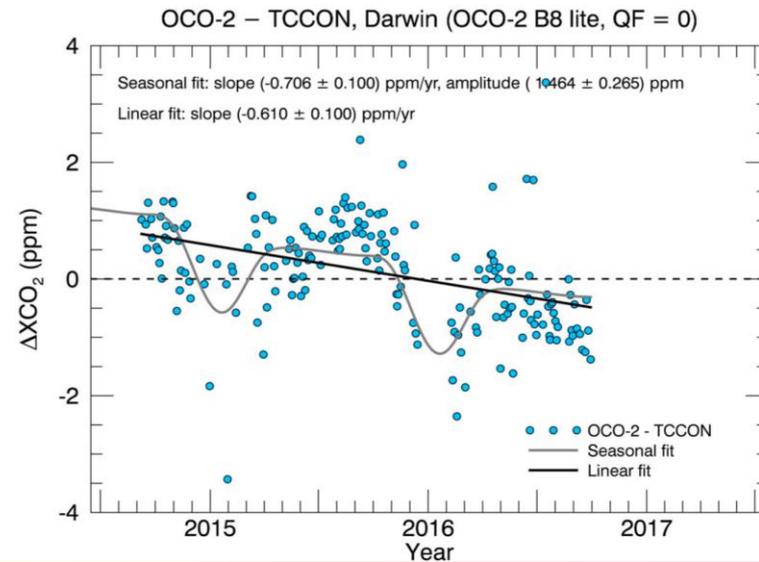
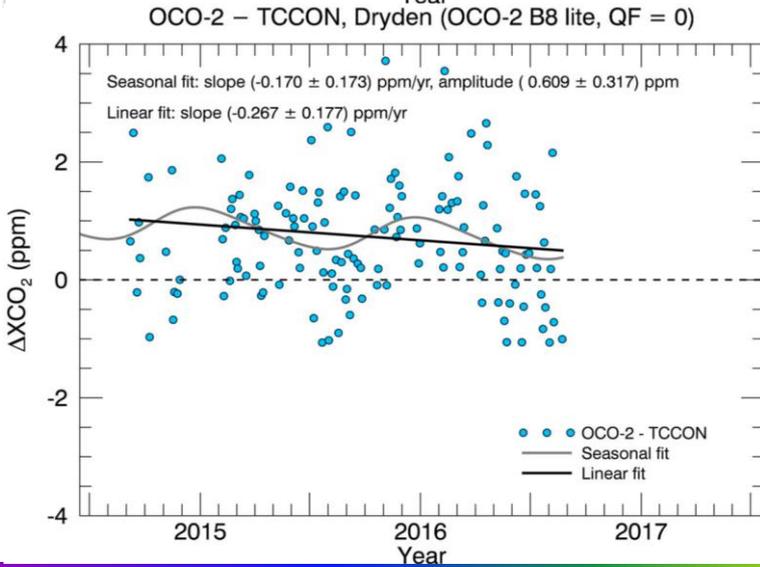
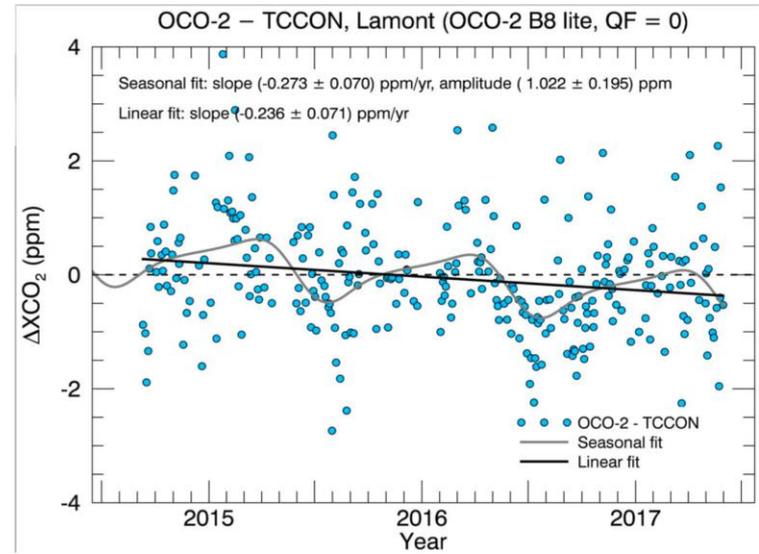
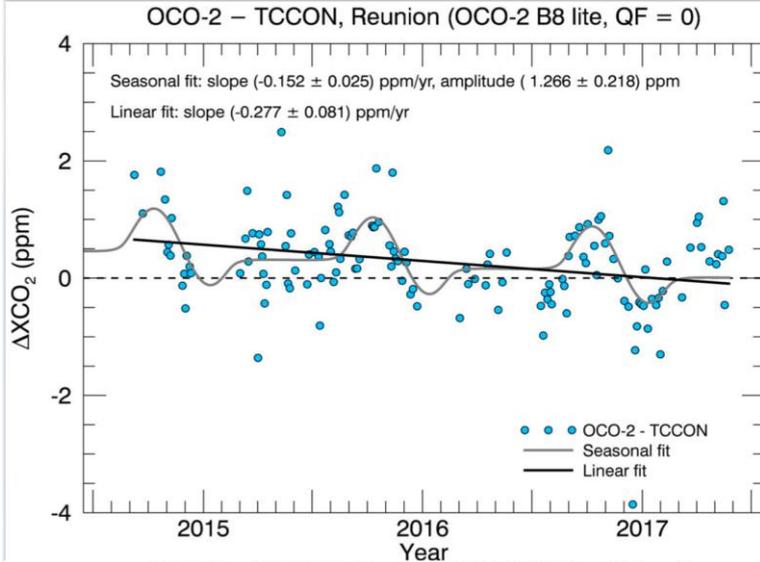
Lunar radiometric observations show that the slow degradation of the optical system is increasing smoothly at a decreasing rate.





Issue: Long term Drift in OCO-2 X_{CO_2}

Hannakaisa Lindqvist

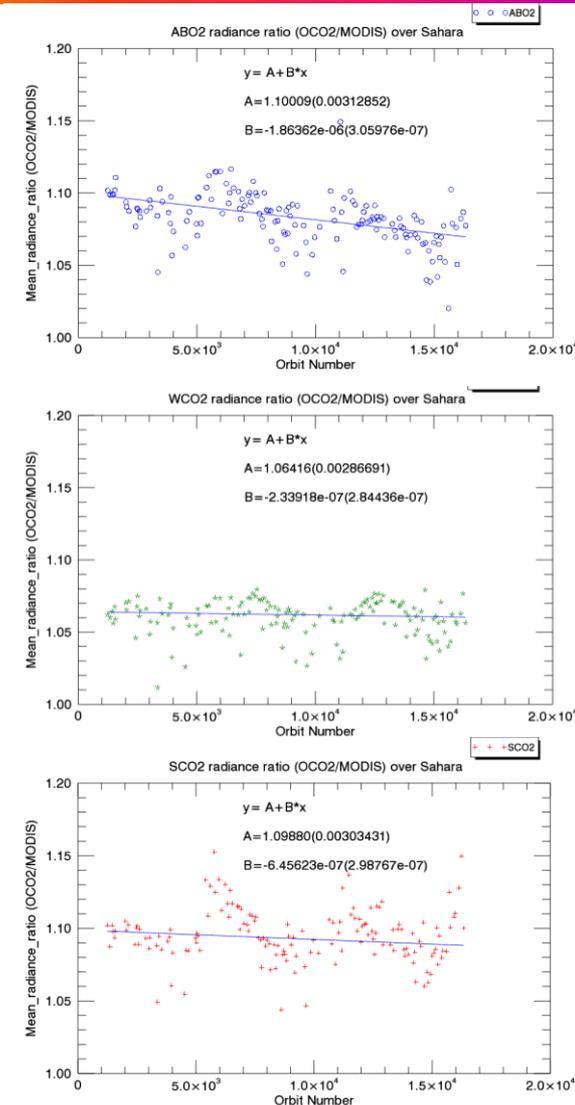




Long Term Radiometric Drifts

Shanshan Yu

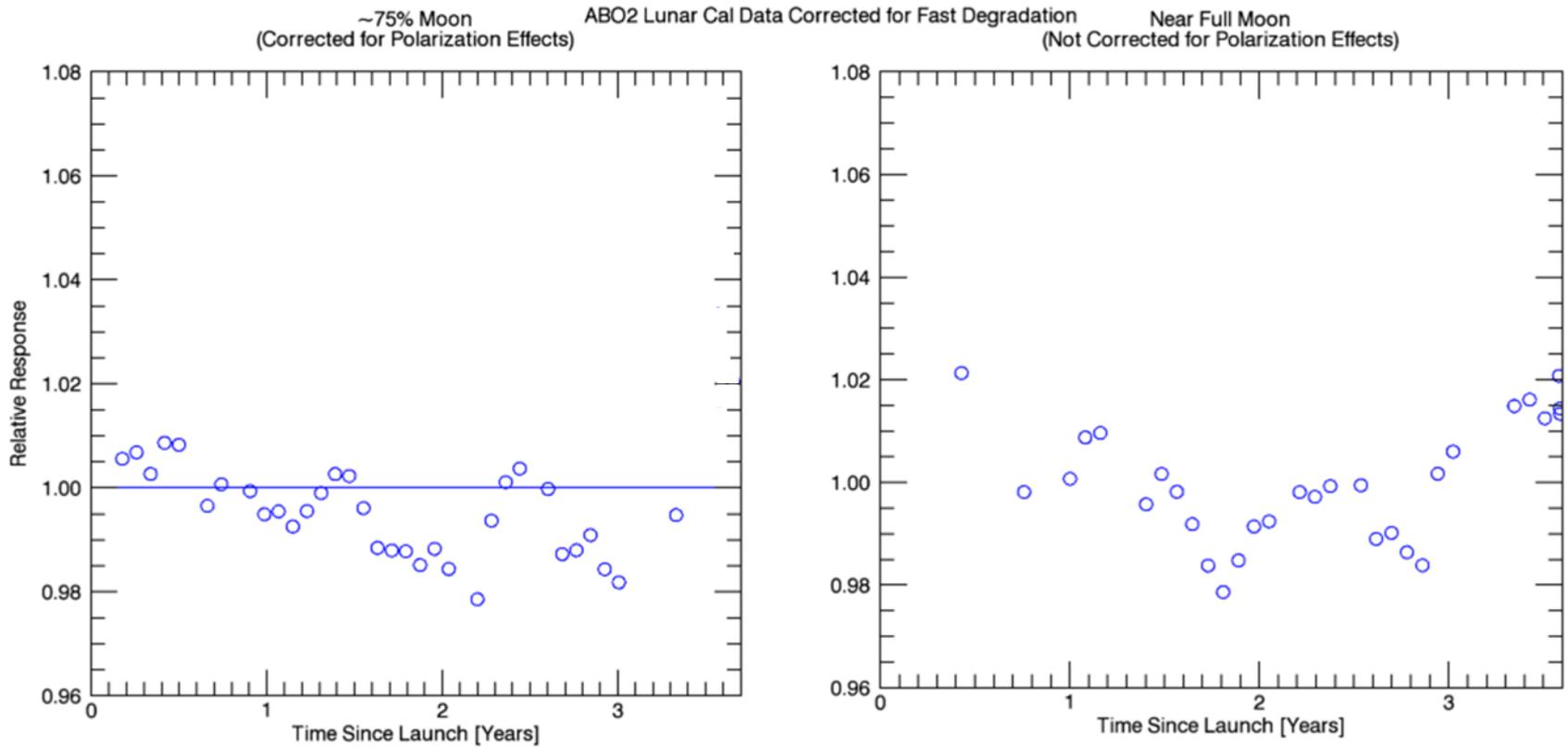
- **OCO-2 was cross calibrated against MODIS Aqua over the Sahara**
 - Location box: 15° -23° N, 5° -17.5° E
 - OCO-2 radiances are fph values from V8 L2Dia
 - 151 (of 242) orbits with $\sigma < 0.03 \times$ Mean radiance or ratio in each orbit is plotted
 - Spectral interpolation done using **SORCE** top-of-atmosphere spectrum
 - Differences in viewing geometry (BRDF) and spectral interpolation may account for overall biases (based on RRV experience)
- Comparisons indicate **ABO2 (O₂ A-band)** channel has a drift of **-0.9% / year**
- Much smaller changes seen in the **CO₂** channels
- **Did we overcorrect for the slow degradation?**





Long-Term Radiometric Trending: ABO2

Lars Chapsky

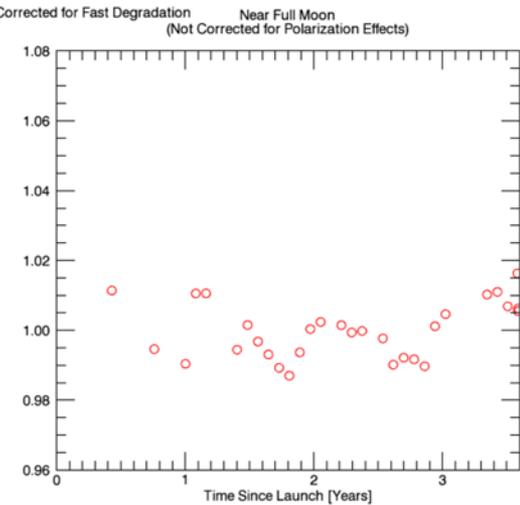
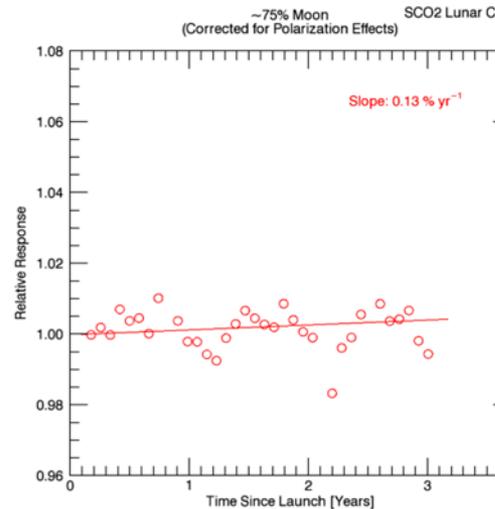
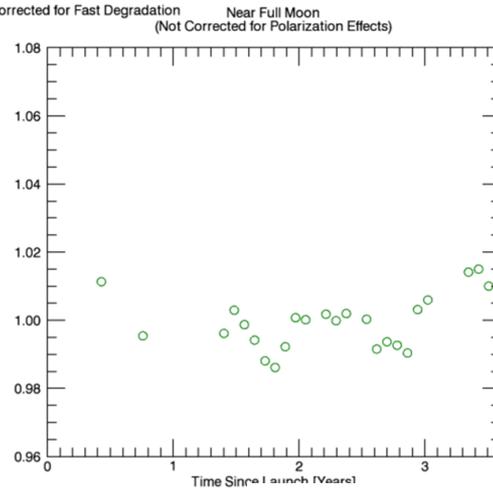
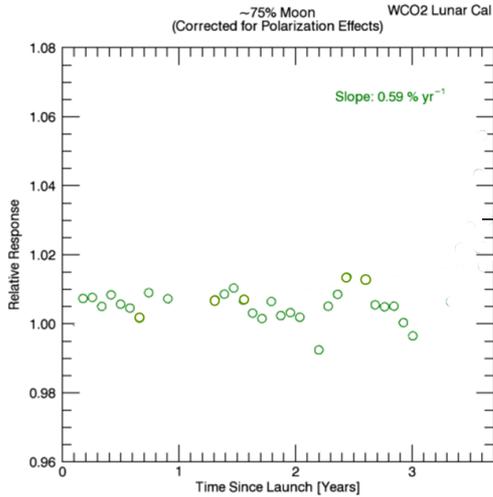


Looks like it. A negative trend of $\sim 1\%/year$ also seen in the ABO2 Lunar Calibration data.



Long-Term Radiometric Trending: WCO2 and SCO2

Lars Chapsky



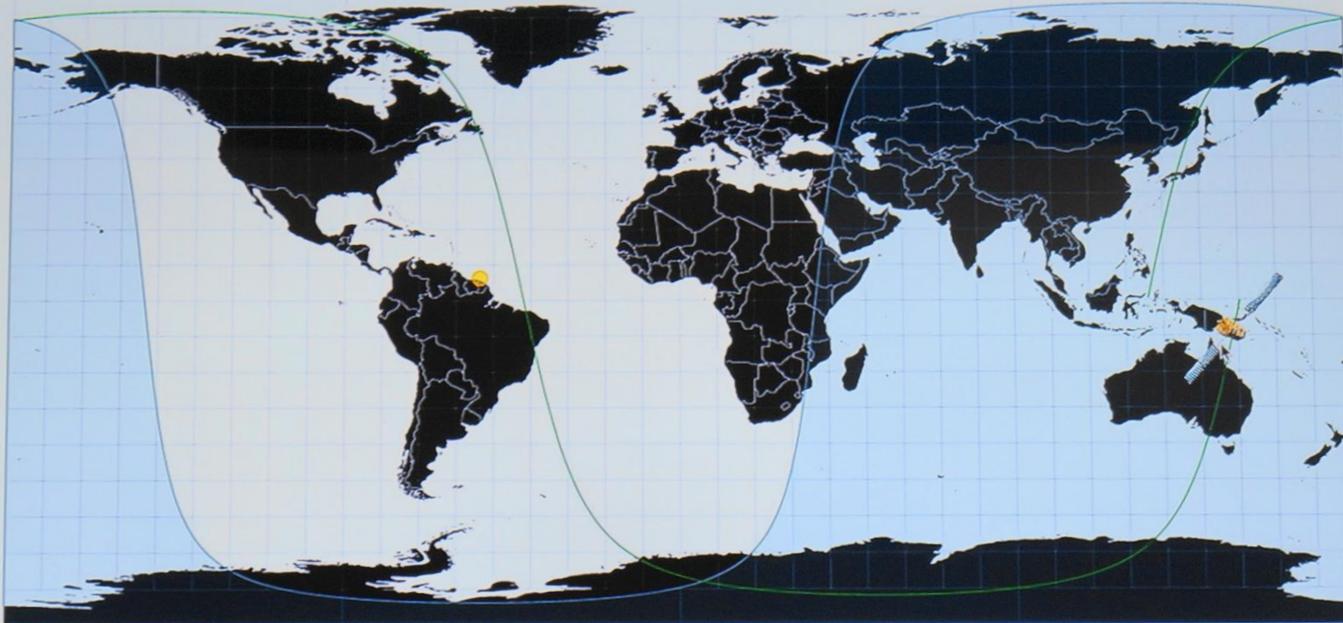
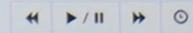
No significant trends are seen in the WCO2 and SCO2 Lunar data.



Surface Pressure Bias

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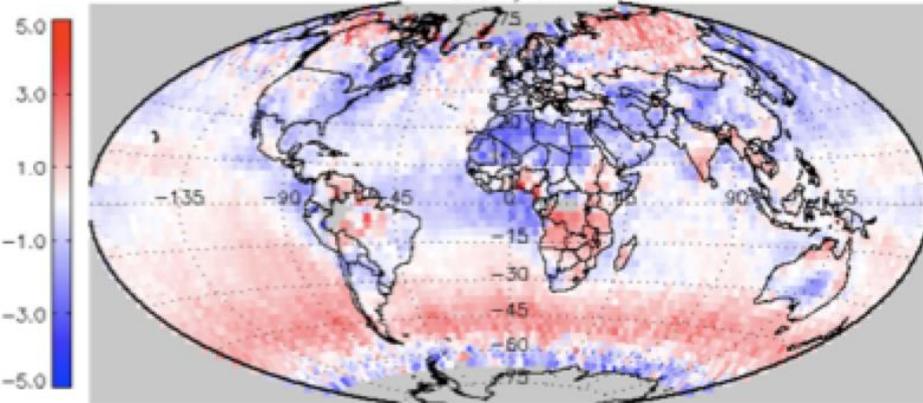
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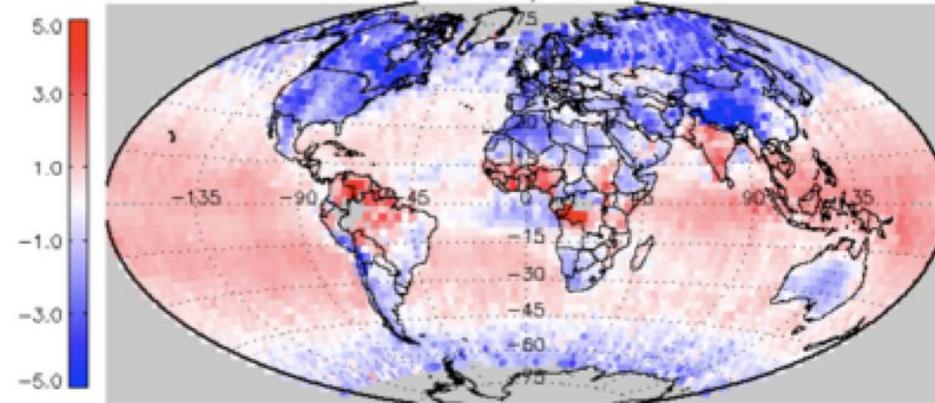
The V8 Psurf Bias

Chris O'Dell

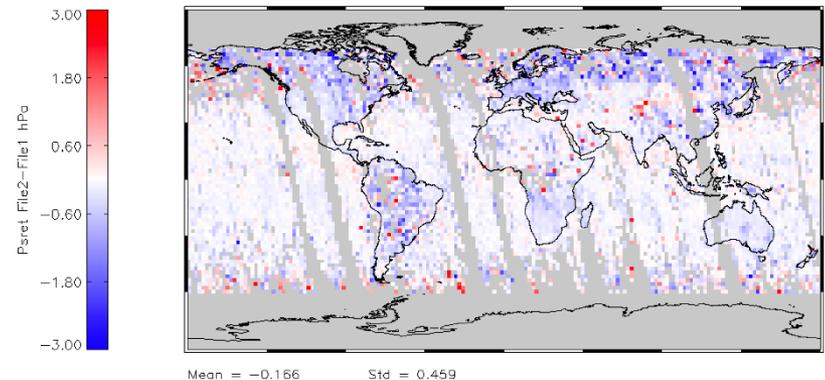
PretB7 - PaB7 -2.2 [hPa]
Mn=-0.05; sd=1.08



PretB8 - PaB7 -2.2 [hPa]
Mn=-0.34; sd=1.55



- L2-Retrieved Psurf got worse in B8 in most places.
 - Low bias over NH lands.
 - High bias in much of tropical oceans.
 - Got better in southern oceans.
- We determined that most of the L2 development steps had only small effects on Psurf:
 - StratAer, CirrusPrior, TCCON Prior.
- Some of it (not shown) due to bug in GEOS5 resampler.
- What is causing the rest?

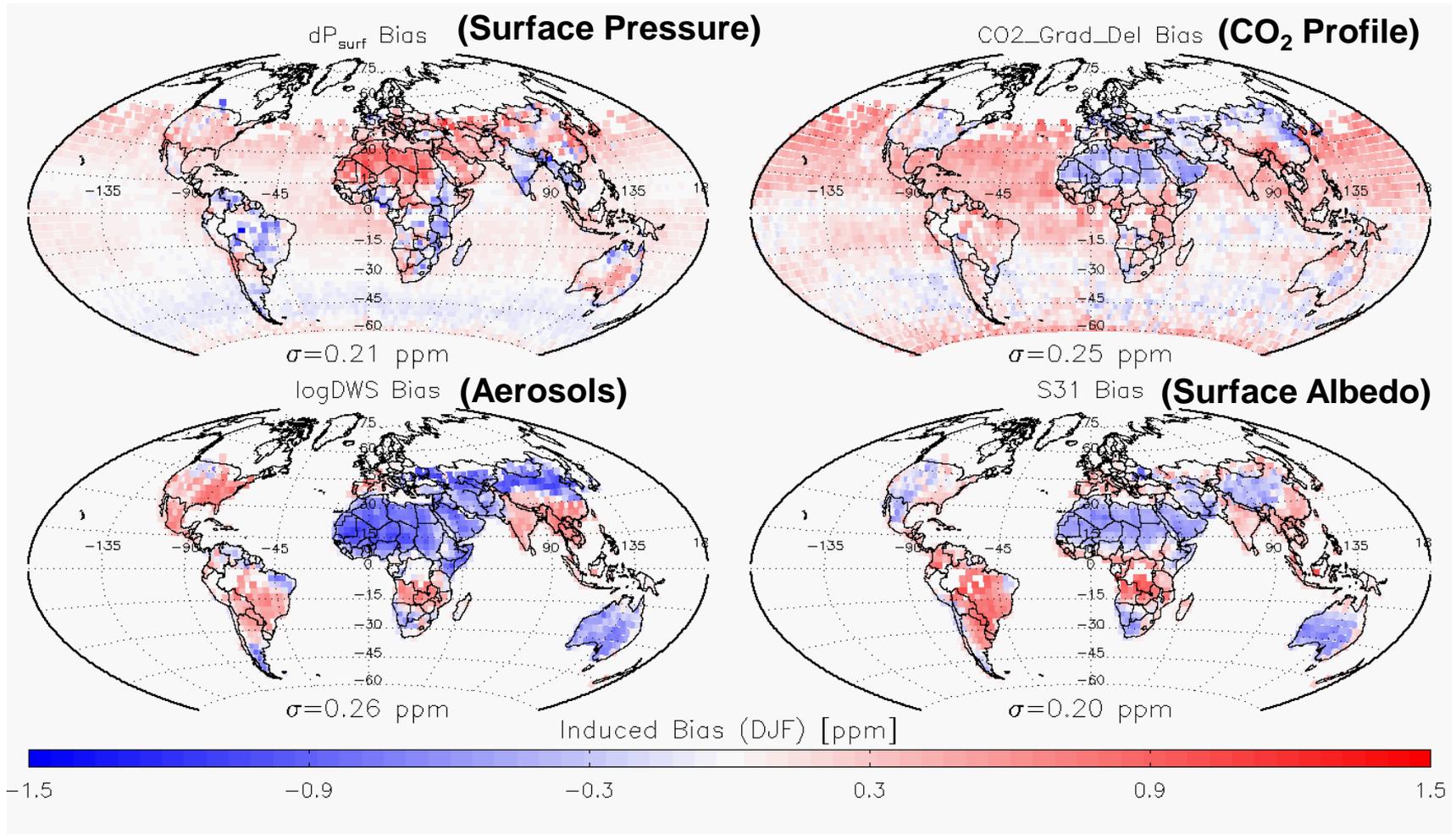


Change in retrieved Psurf due to StratAer



B7 Bias Correction Patterns

Chris O'Dell

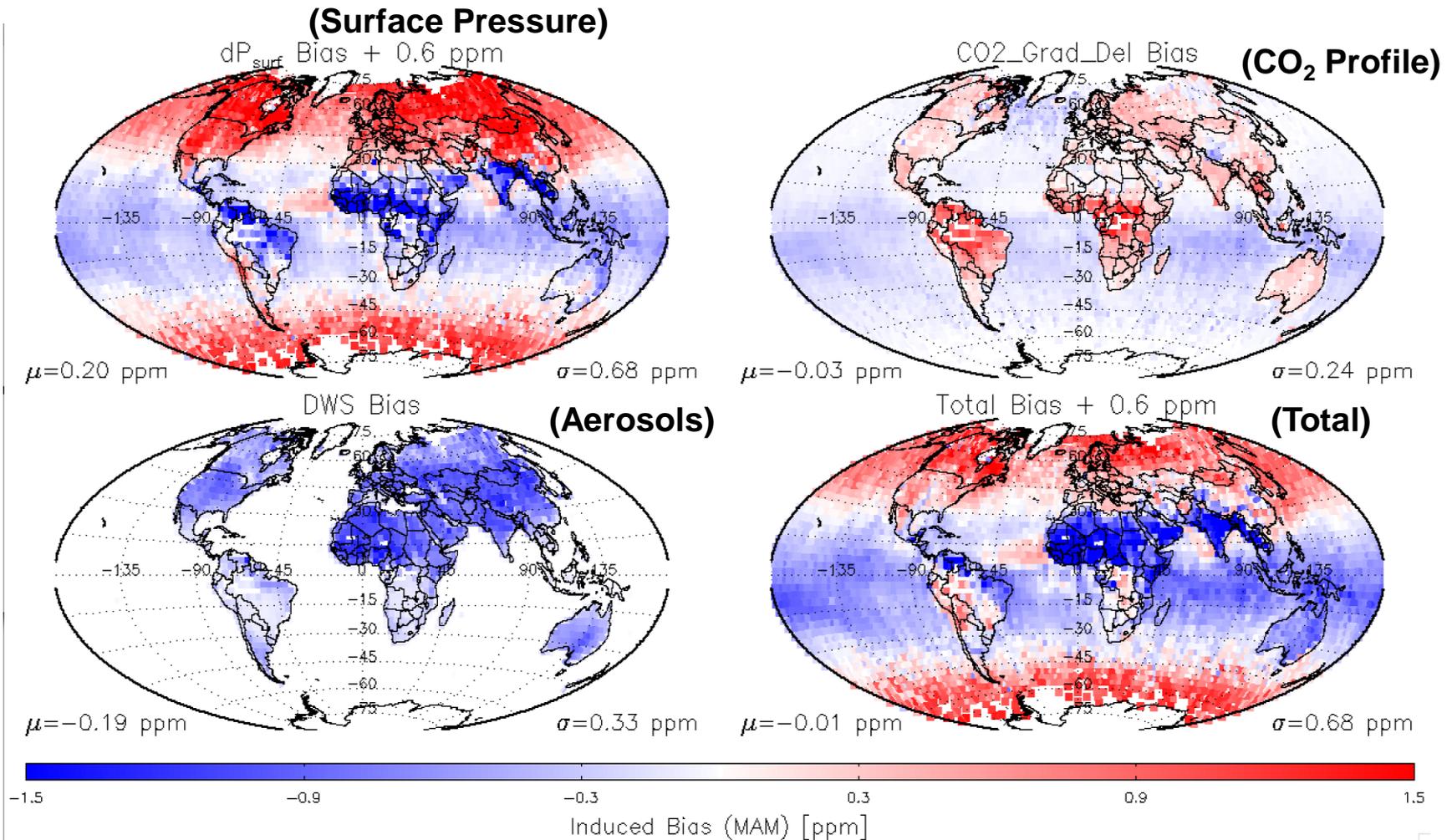


In B7, P_{surf} was a +/- 0.5 ppm component of the bias correction.



B8 Bias Correction Patterns

Chris O'Dell

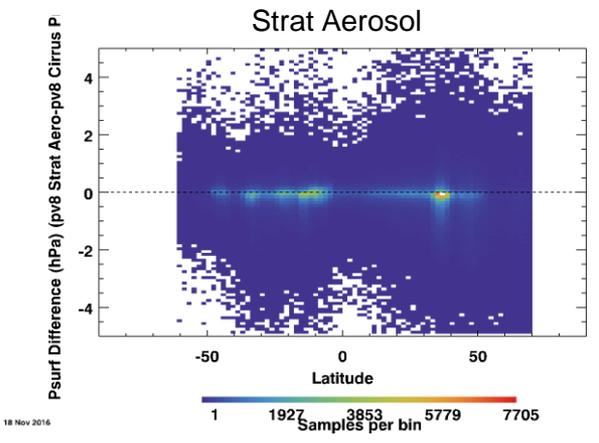
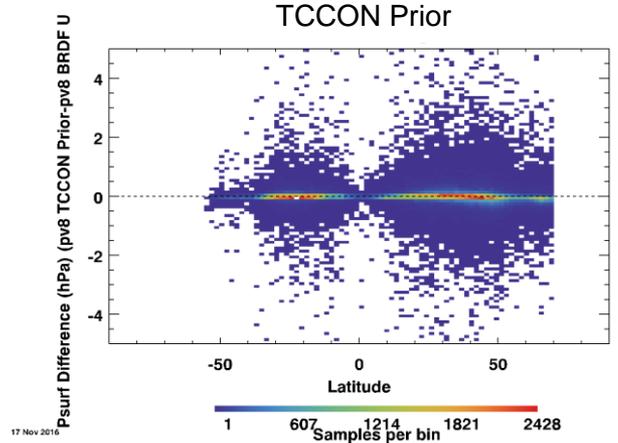
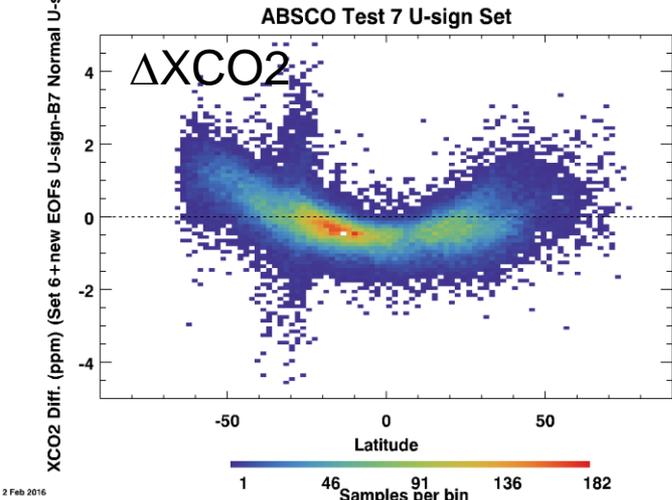
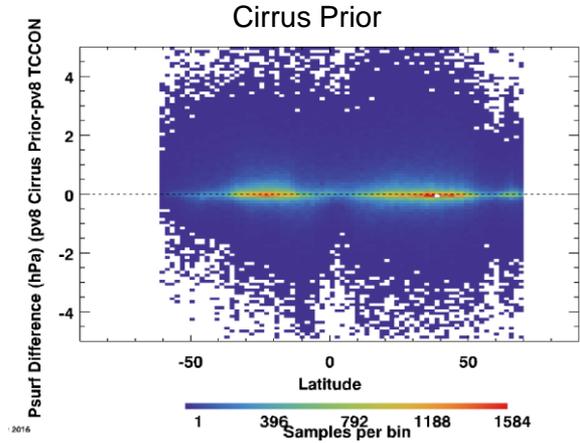
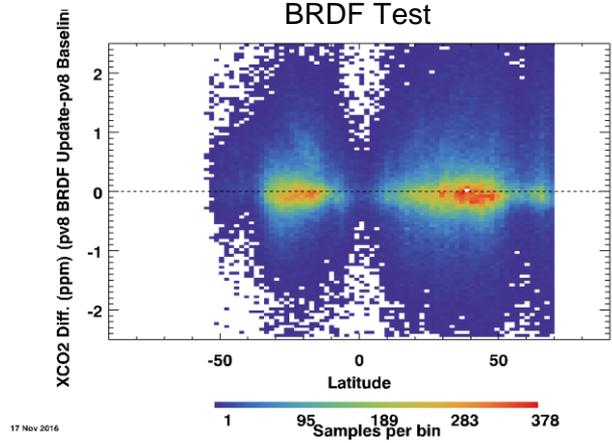
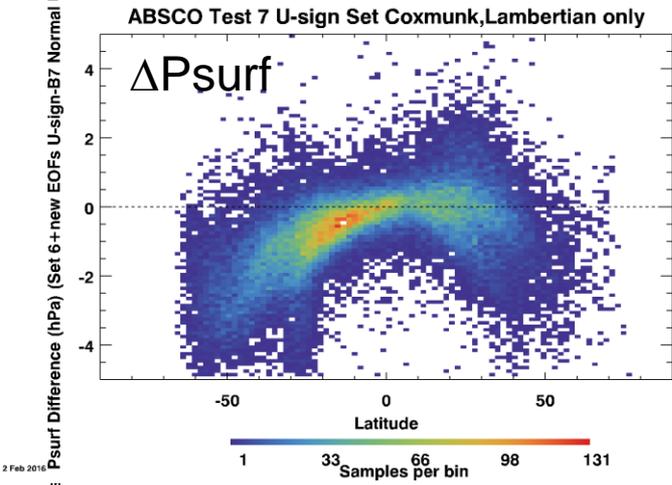


Psurf now dominates the bias correction (+/- 1.5 ppm).



ABSCO v4.2 to v5 O2 Tests

Brendan Fisher



The V8 development step that produced the largest changes in surface pressure was the change from ABSCO 4.2 to ABSCO 5.0. Other tests produce little change.

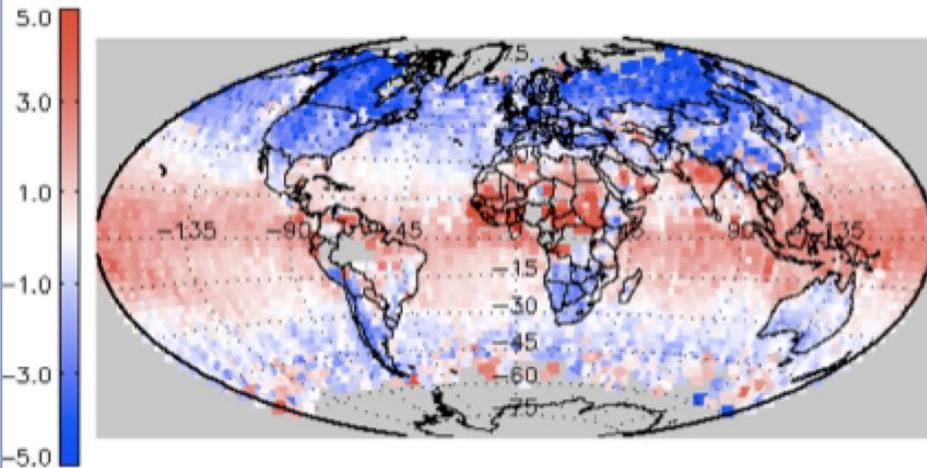




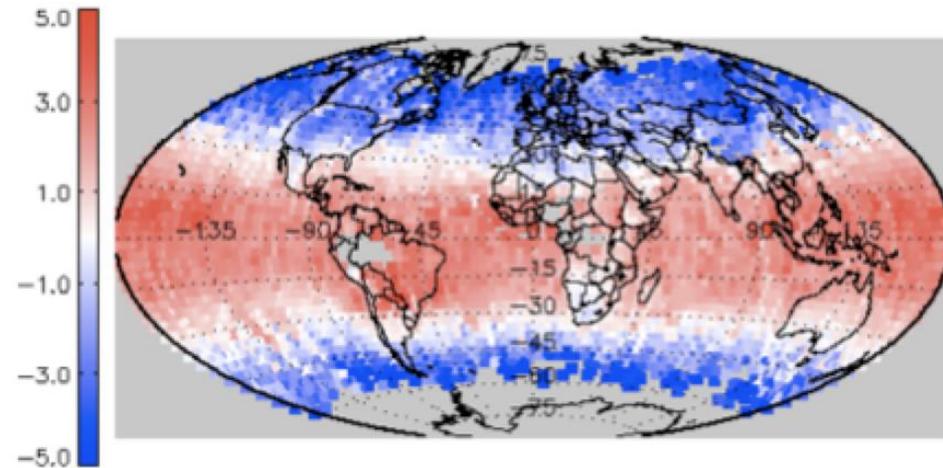
ABP is a Proxy for L2

Chris O'Dell

Pret (B8-B7) [hPa] MAM
Mn=-0.25; sd=1.92



P_abp(B8-B7) [hPa] MAM
Mn=-0.09; sd=2.39



- ABP change in P_{surf} from B7 to B8 structurally similar to L2. → suggests some of the same underlying causes!
- Changes in ABP from B7 to B8
 - Cosmic ray screening
 - Solar Line List update
 - ABSCO 4.2 → 5.0 (O2A only)
 - L1B update (calibration)
 - GEOS5 (w/bug) instead of ECMWF
- Can Test Sequentially

Tests Ongoing





Timeline for Next ABO₂ ABSCO Update

Brian Drouin

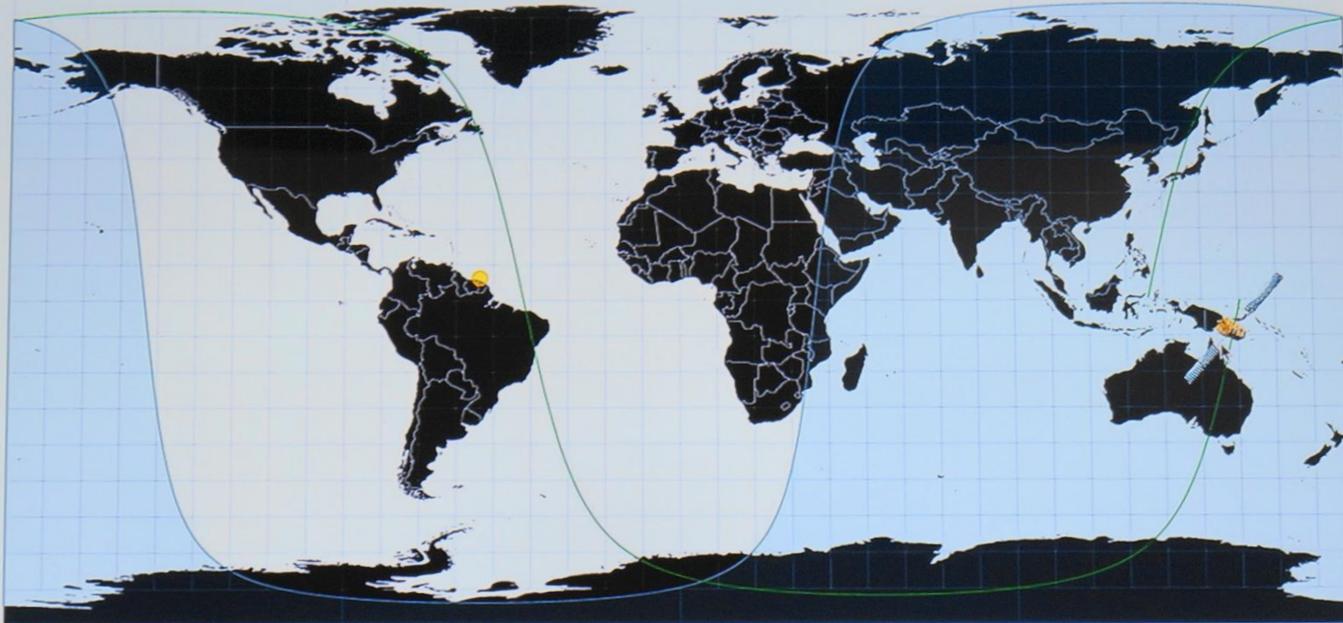
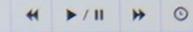
- **NIST O₂ measurements from FS-CRDS**
 - 4 temperatures, multiple pressures and mixing ratios
 - Measurements complete
 - Foreign-broadening, line mixing, CIA
 - Delivery of calibrated spectra in Labfit format: May 2018
- **Caltech O₂ measurements from PAS**
 - Room-temperature only
 - Self-broadening, line mixing, CIA
 - Spectra delivered, under evaluation
- **Labfit multispectrum fit**
 - Advanced lineshapes
 - Expanded LM
 - Self-consistent CIA from experiment
 - Iterations involving validation against TCCON spectra (July 2018)
 - Delivery: August 2018
- **Check consistency of CIA with atmospheric spectra (AER): September 2018**
- **O₂ ABSCO delivery to L2 algorithm team: October 2018**



Upcoming Events

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Planned Date	Activity Description
April 12	Annual Inclination Adjust Maneuver (IAM) campaign complete
8 –13 Apr	European Geosciences Union (EGU) Meeting, Vienna
2 – 4 May	CEOS AC-VC Annual Meeting, College Park, MD
8 –10 May	IWGGMS (International Workshop on Greenhouse Gas Measurements from Space) in Toronto, Canada
20-24 May	Japan Geosciences Union (JpGU) Meeting in Chiba, Japan
22-24 May	46th Global Monitoring Annual Conference (GMAC), Boulder
3 – 8 Jun	AOGS (Asia Oceania Geosciences Society) in Honolulu, HI
11–15 Jun	2018 NDACC-IRWG & TCCON Annual Meeting, Mexico City
26 Jun – 2 Jul	2018 Railroad Valley Campaign, Railroad Valley, NV, USA
14 – 22 Jul	42nd COSPAR Scientific Assembly, Pasadena, CA, USA

