

# OCO-2 Status

## September 5, 2017

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# Overview

- **Observatory Status:**
  - Currently running a “command-only” sequence – **no Science Ops**
- **Instrument Status:**
  - **Recovery from the July 30 instrument reset was suspended to address an anomaly with the baffle calibration position sensor**
  - **Opportunistic science observations initiated but suspended when the fault detection system caused the instrument entered safe mode**
  - **Opportunistic science will recommence no earlier than 7 September**
- **V8 production is proceeding**
  - Level 2 B8r production continues to go smoothly
  - Data filtering and bias correction efforts are ongoing
- **OCO-2 Flux Inversion Progress and Plans (David Baker et al.)**



## Instrument Status – **Still Offline**

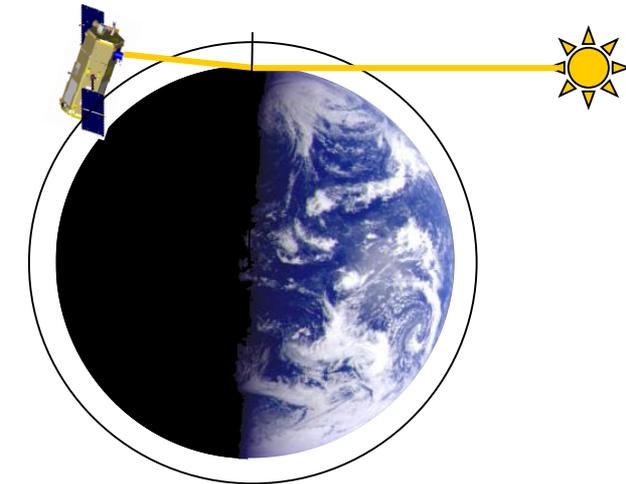
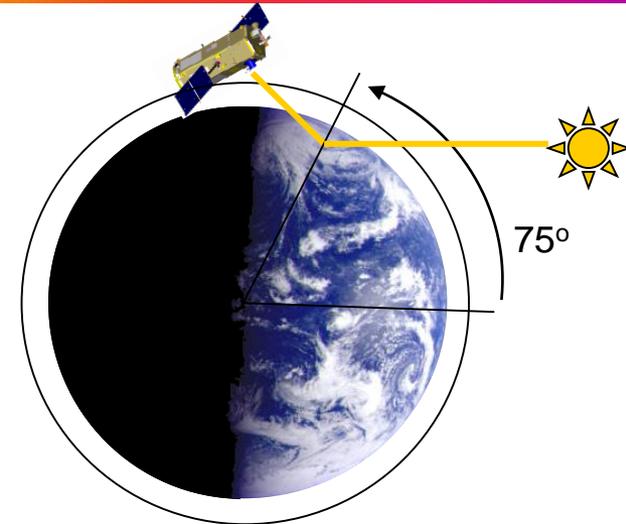
- The instrument controller was reset on July 30 to reload a corrupted memory location
- The reset restored the corrupted memory, but the instrument reported that the potentiometer monitoring the calibration door position indicated that the door was in the wrong position
  - An investigation indicated that the potentiometer was failing
  - There is an alternate method for determining the door position, but flight software change is needed to implement this change
  - The flight software change will take ~4 weeks to implement and test
- While this flight software change is being implemented a “human in the loop” approach was developed to safely collect a limited amount of science and calibration data
  - While testing this approach, the solar fault detection system was tripped, putting the instrument in safe mode
  - The instrument was never in danger, but observations were suspended while the Operations team revised the command sequence





# The Latest Safing Issue

- For routine glint mode operations, OCO-2 stops acquiring data and transitions to Solar Cal or Downlink mode as it approaches the northern terminator
- For the “Opportunistic Science”
  - Solar Calibration operation was skipped
  - The calibration door was closed/lamp position and OCO-2 stayed in Glint longer than usual
  - The Fault Detection System safed the instrument when the boresight was within 12.5 degrees of the sun because the calibration door was not in **Solar Cal** position
  - The instrument was never in danger (aperture door was closed)
- The “Opportunistic Science” sequence is being modified to go from Glint to Nadir when Solar Cal is skipped



# Status of V8 Processing





# V8 data product development

- **V8r processing is ongoing!**
  - Using OCO-2 cluster, NASA supercomputer, and Amazon cluster
- **Bias Correction and Screening nearly complete**
  - Finalizing the v8a bias correction and overall land-ocean biases.
  - Bias corrected land and ocean results are reasonably consistent using different truth metrics, but have differences of up to 0.3 ppm depending on which truth metric is used (land-ocean crossings vs. models vs. TCCON overpasses)
  - The overall statistics should be better than b7, but this hasn't been verified yet
  - There are some residual biases related to aerosols, but no clear way to correct these biases has been indentified, and they will likely remain in v8a and will be a topic for further study.



# V8 Reprocessing: L2Std Production Progress

L2Std Production												
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
2014	x	x	x	x	x	x	x	x				
2015												
2016												
2017												

Color Legend:

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>50% complete	100% complete

Status as of September 5, 2017





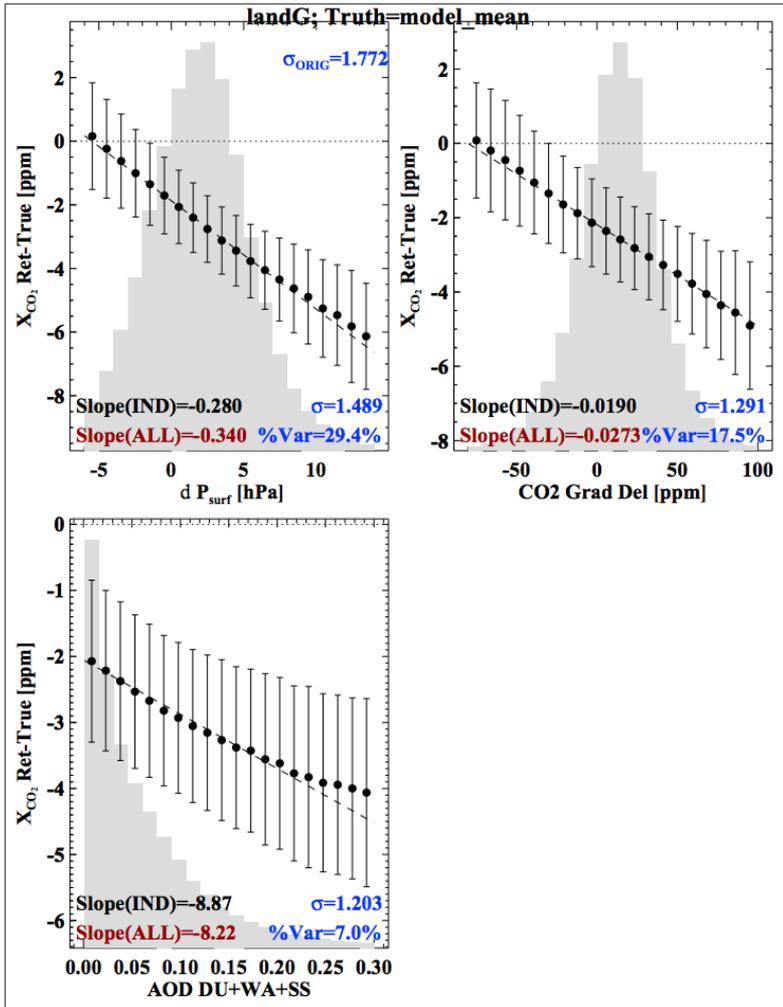
## B8(a) filtering & Bias Correction Status

- Warn Levels complete (created plots showing WL thresholds alongside QF thresholds, online at [http://reef.atmos.colostate.edu/~odell/oco2/b8\\_tests/qts/20170828/](http://reef.atmos.colostate.edu/~odell/oco2/b8_tests/qts/20170828/))
- Quality Flag nearly complete
  - Finalizing a few aerosol-related variables over land
- BC parameters nearly complete
  - Deciding if additional parameters over land related to aerosols are necessary
- Footprint biases complete
  - Currently static with time. Time dependence appears less than in B7, and will be examined in more detail later.
- Global divisors for land and ocean nearly fixed.
  - Many different ways to get at these have been explored; consistent results to within about 0.3 ppm

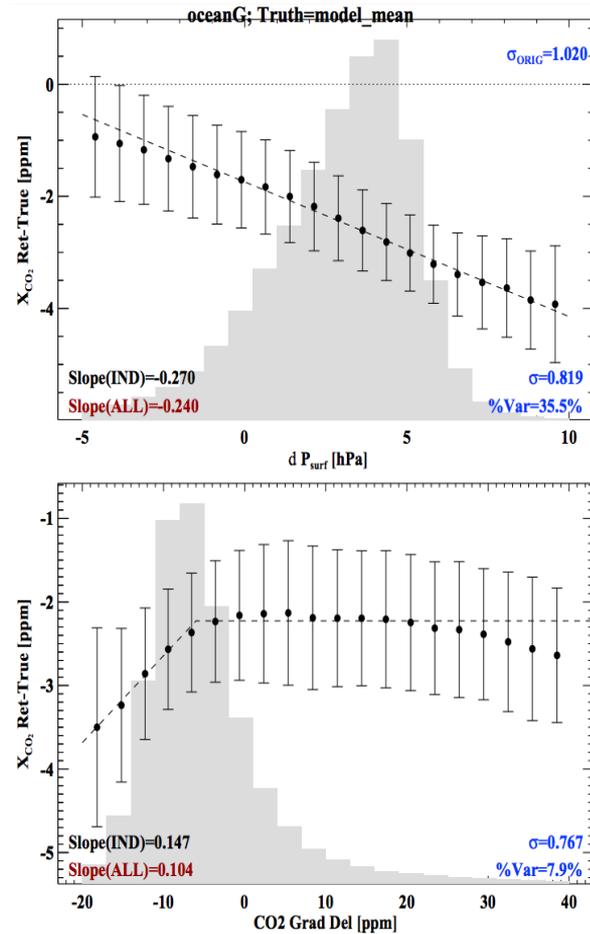


# Nominal parametric Bias Correction:

## Land glint vs. models



## Ocean glint vs. models





# Parameter Coefficients: Reasonable consistency across truth metrics

## Land Bias Correction

		N	Sigma [ppm]	dP	Co2_grad_del	DWS
TCCON:	LandN	106K	1.81 → 1.28	-0.37 (31%)	-0.027 (16%)	-8.0 (4%)
	LandG	76K	1.91 → 1.34	-0.38 (36%)	-0.026 (13%)	-5.1 (2%)
	LandT	314K	1.60 → 1.18	-0.26 (16%)	-0.025 (24%)	-6.9 (5%)
MODELS:	LandN	336K	1.70 → 1.17	-0.34 (27%)	-0.029 (19%)	-8.5 (7%)
	LandG	372K	1.77 → 1.20	-0.34 (29%)	-0.027 (18%)	-8.2 (7%)
SAA:	LandN	275K	1.58 → 0.87	-0.34 (34%)	-0.031 (24%)	-9.9 (11%)
	LandG	286K	1.67 → 0.90	-0.37 (45%)	-0.029 (20%)	-7.9 (6%)
SHA_Mod:	LandN	98K	1.54 → 0.96	-0.35 (29%)	-0.031 (25%)	-8.5 (8%)
	LandG	99K	1.63 → 0.97	-0.36 (30%)	-0.029 (22%)	-9.8 (12%)
Ensemble Statistics		-	-	-0.346 ± 0.035 (-0.356 ± 0.016)	-0.028 ± 0.002 (-0.029 ± 0.002)	-8.1 ± 1.5 (-8.2 ± 1.5)
B70		-	-	-0.30	-0.028	-7 to -11

Excluding land Target →

## Ocean Bias Correction

		N	Sigma [ppm]	dP	Co2_grad_del<-6
TCCON:	WL<=2	71K	0.96 → 0.82	-0.24 (24%)	0.063 (1.8%)
	Chris	73K	0.96 → 0.82	-0.23 (25%)	0.066 (3%)
MODELS:	WL<=2	607K	1.00 → 0.78	-0.23 (33%)	0.106 (6%)
	Chris	647K	1.02 → 0.77	-0.24 (36%)	0.104 (8%)
SAA:	WL<=2	324K	0.77 → 0.44	-0.22 (60%)	0.094 (7%)
	Chris	368K	0.80 → 0.44	-0.23 (61%)	0.088 (9%)
SHA_Mod:	WL<=2	155K	0.83 → 0.68	-0.11 (14%)	0.155 (18%)
	Chris	164K	0.83 → 0.67	-0.11 (14%)	0.135 (21%)
Ensemble Stats (Chris) (No SHA_Mod)		-	-	-0.20 ± 0.06 -0.233 ± 0.01	0.098 ± 0.029 0.086 ± 0.019
B70		-	-	-0.08 (there was evidence this was too weak)	0.077



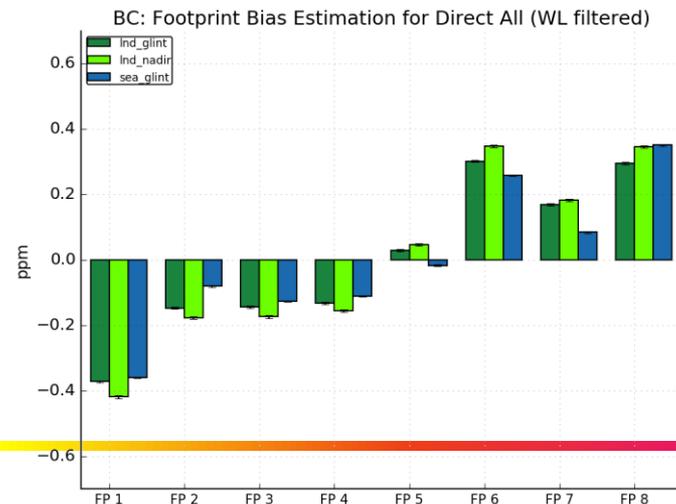


# Footprint Biases

- Rough average of Lukas Unified & Chris Unified Biases
- Force summation to 0.00 ppm (over 8 FPs)
- No Time Dependence (Lukas analysis implies only a minimal time dependence of the FP biases. This should be rechecked for version 8b)
- *These are the biases. Subtract them for each footprint to remove the bias*

Mode	FP1	FP2	FP3	FP4	FP5	FP6	FP7	FP8
Lukas Unified	-0.38	-0.14	-0.15	-0.13	0.02	0.30	0.15	0.33
Chris Unified	-0.35	-0.17	-0.16	-0.16	0.02	0.36	0.11	0.35
<b>B8 Accepted</b>	<b>-0.36</b>	<b>-0.15</b>	<b>-0.16</b>	<b>-0.14</b>	<b>0.02</b>	<b>0.33</b>	<b>0.13</b>	<b>0.34</b>

Example: *Lukas-derived values for different modes*





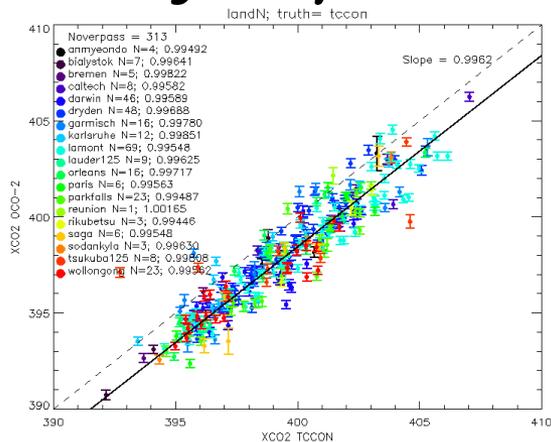
# Global Divisors Summary/Status

- **Adopt 0.9958 for land?**
  - Agrees with TCCON Target (both Matt & Chris)
  - High by 0.0003 (0.12 ppm) rel to TCCON direct
  - Low by 0.0008 (-0.32 ppm) rel to Models
- **Adopt 0.9950 for sea?**
  - Low by 0.0004 (-0.16 ppm) for Lukas Coastlines
  - High by 0.0003 (0.12 ppm) for Chris Coastlines
  - High by ~0.0006 (0.25 ppm) relative to TCCON direct
  - Low by 0.0004 (-0.16 ppm) relative to Models
  - High by 0.0004 (0.16 ppm) rel to Model Bootstrap

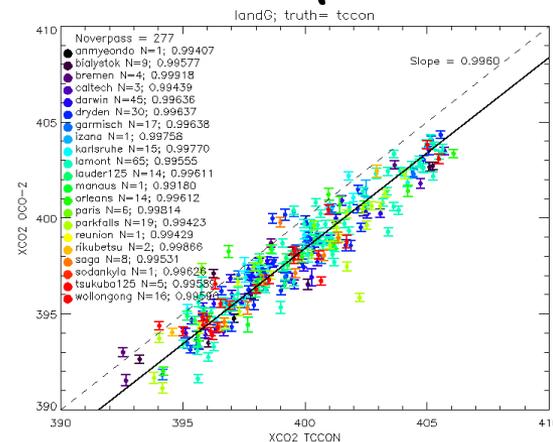


# Global Divisor (Land)

- Set Land Divisor = 0.9958 for Target.
- Direct TCCON overpasses given ~ same value for Nadir and Glint:
  - 0.9960 GL, 0.9962 ND, +/- 0.0005 (approximately) due to scatter, individual station biases, etc.
- Direct MODEL comparisons give:
  - 0.9951 GL, 0.9950 ND +/- 0.0005 (approximately)
  - Models appear to have a high bias of 0.4 ppm relative to TCCON. Is this known? Am I wrong?
- ***Nominally adopt Global Land Divisor = 0.9958 (all modes)***



Land ND Overpasses



Land GL Overpasses



# Flux Inversion Progress

