TCCON Station Update for the NASA Armstrong* Site

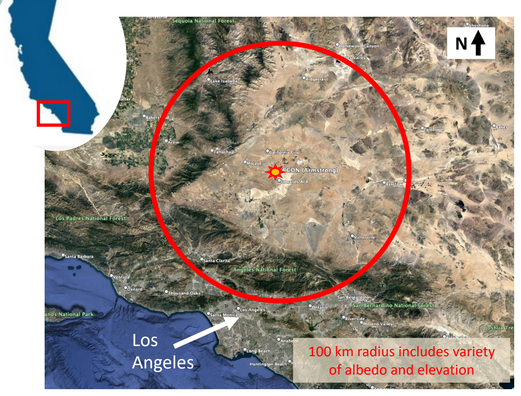
*also known as Edwards/Dryden

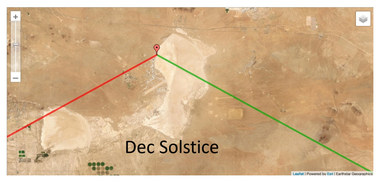
Laura Iraci[1], Jim Podolske[1], Coleen Roehl[2], Jean-Francois Blavier[3], Tegan French[4], Susan Kulawik[1], Harrison Parker[2], Josh Laughner[3], Norton Allen[5], Paul Wennberg[2]

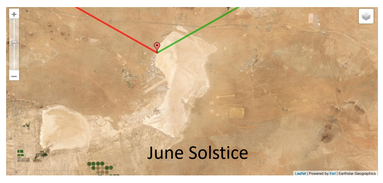
[1]NASA Ames Research Center, [2]Caltech, [3]Jet Propulsion Lab, [4]NASA Armstrong Flight Research Center, [5]Harvard Univ.



Site Details







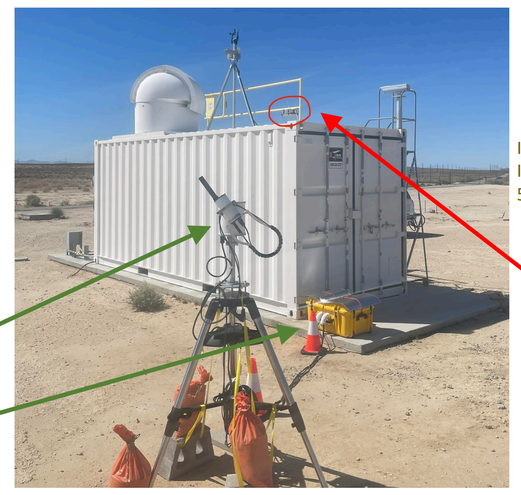
Viewing angles at SUNRISE and SUNSET (https://gml.noaa.gov/grad/solcalc/)

- Located in southern California at the NASA Armstrong Flight Research Center, adjacent to Edwards Air Force Base
- Dates of Operation: July 2013 – June 2017; May 2018 - present
- 34.96 N, 117.88 W, 690 masl
- Bruker 125HR; InGaAs + Si detectors
- CO_2, CH_4, CO, N_2O, HF, H_2O, HDO
- NASA Armstrong was formerly known as NASA Dryden
- No current plans to move

In Situ Vertical Profiles: CO_2 and More

Date	Campaign
2023 June 26	SARP /AEROMMA
2022 June 23	SARP
2021 Dec 6	SARP
2019 Jul 17	SARP
2019 Jul 16	SARP
2018 Jun 27	SARP
2017 Jan 24	ATom (2)
2016 Aug 23	ATom (1)
2016 Jun 18	SARP
2016 Apr 21	KORUS-AQ
2016 Feb 10	ASCENDS
2015 Oct 2	Methane sounder
2015 June 2	AJAX #160
2014 Nov 6	AJAX #148
2014 Aug 22	ASCENDS
2014 Jun 23	SARP
2014 Jun 18	AJAX #129
2014 Apr 3	AJAX #119
2014 Feb 5	AJAX #113
2013 Dec 4	AJAX #111
2013 Nov 4	AJAX #107
2013 Sep 27	AJAX #104
2013 Sep 23	SEAC4RS
2013 Aug 5	SEAC4RS

Co-Located Measurements



Pandora: UV/Vis Column Measurements

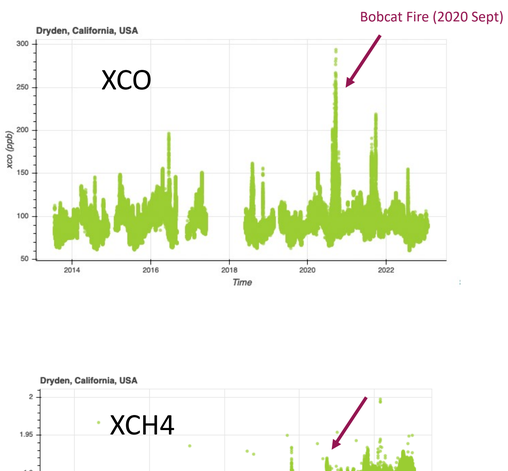
- Small, ground-based Sun/Sky/Lunar observing spectrometer
  - Pandora 1S: 290 – 530 nm, 0.6 nm
- NRT Standard Products at ~ 90 sec
  - Tot. Column O_3 (+/-15 DU, ~5%)
  - Tot. Column NO_2 (+/-0.05 DU, ~10%)
- Additional non-validated products
  - HCHO - Total column, trop. & near sfc
  - NO_2, O_3, SO_2 – trop. & near sfc
- Operates autonomously

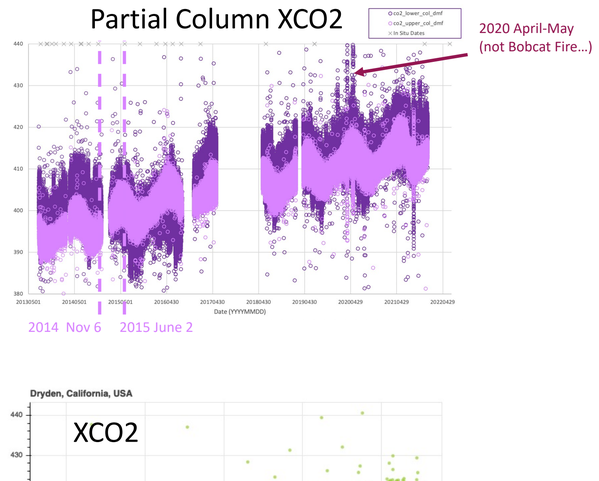
INSTEP: Inexpensive Network Sensor Technology Exploring Pollution



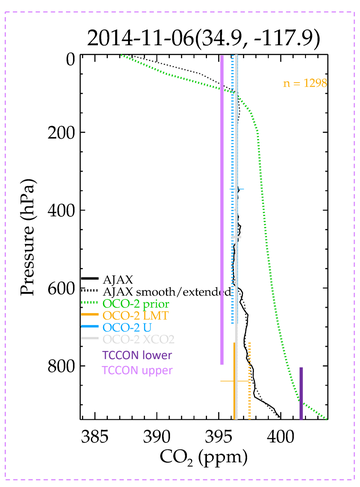
- Designed by Hannigan Lab at CU Boulder
- Measures CO, CO_2, NO_2, O_3, VOCs (CH_4, HCHO), temperature, humidity
- Powered by standard 120V outlet
- Rooftop or tripod placement
- Lunchbox-sized

Time Series: All Species

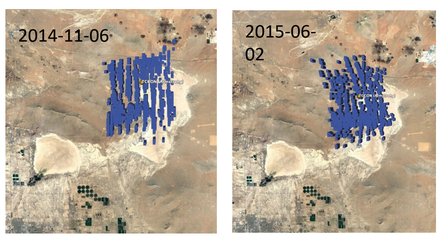


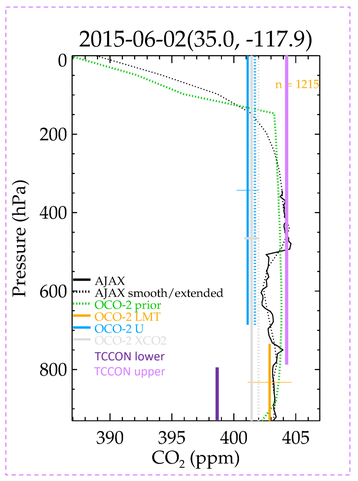


OCO-2 and TCCON Partial Column Comparisons to AJAX In Situ Measurements



OCO-2 Footprints





	TCCON lower	TCCON upper	OCO-2 LMT	OCO-2 U
	sfc to ~800 hPa		sfc to ~750 hPa	
2014-11-06	401.9	395.2	396.2	396.3
2015-06-02	398.8	404.2	402.8	401.0
	Parker et al. (2023) doi: 10.5194/amt-16-2601-2023		Kulawik et al. (2017) doi: 10.5194/acp-17-5407-2017	

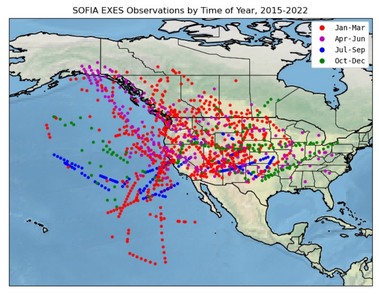
See the details of the TCCON partial column approach (TARDISS) at poster #2 (Josh Laughner).

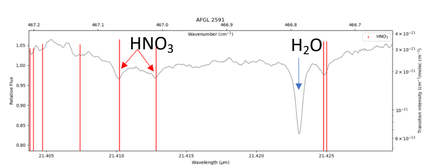
Water Vapor Columns above the Tropopause Measured from SOFIA

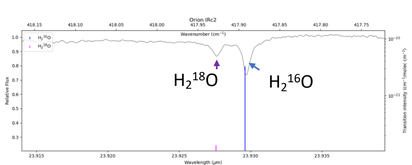
Naseem Rangwala, Doug Hoffman, Laura Iraci
NASA Ames Research Center



- 2015 – 2022, all seasons
- Location: Northern Hemisphere, US based, nighttime only
- Cruise nominally 38-44 kft, looking up
- Observing angle above the horizon typically 30 – 60°
- Instrument: EXES (4.5 – 28.3 µm)
- High signal, high spectral resolution atmospheric spectra of water, nitric acid, and possibly other molecules
- Water: $H_2{}^{16}O$, $H_2{}^{17}O$, $H_2{}^{18}O$
- HNO_3 on a subset of flights due to specialized operating mode
- FIFI-LS and GREAT instruments have also detected water and could be used to extend to the Southern Hemisphere







FELLOWSHIP OPPORTUNITY at NASA Ames Research Center (San Francisco Bay Area, California, USA)
through the NASA Postdoctoral Program

Ground-Based Remote Sensing of Atmospheric Trace Gases

NASA Ames Research Center is looking for a postdoctoral assistant to support the operation of a solar tracking high resolution Fourier Transform Spectrometer located at NASA Armstrong Flight Research Center as part of TCCON. The successful candidate will support daily operations, hardware maintenance, data processing and analysis, as well as develop scientific studies of data from this and other TCCON sites, coupled with satellite and other data sets. Candidates with interest in carbon cycle science and/or urban emissions and experience in one or more of the following measurement foci are encouraged to apply:

- greenhouse gas flux measurements and analysis
- high-resolution infrared spectroscopy, both hardware and data analysis
- remote sensing of atmospheric trace gases
- analysis of satellite observations of greenhouse gases

https://npp.orau.org Opportunity 0055-NPP-JUL23-ARC-EarthSci
Application deadlines: 1 July 2023, 1 Nov 2023, 1 March 2024

NASA Ames continues its commitment to provide equal employment opportunity for all applicants for employment, regardless of race, color, national origin, religion, sex, age, mental or physical disability, genetic information, or gender identity. **Information for Non-U.S. Citizens:** Non-U.S. citizens with the Exchange Visitor J-1 status (research scholar only), lawful permanent resident (LPR) status, or employment authorization document (EAD) with adjustment of status (AOS) are eligible to receive an NPP Fellowship. The immigration status must allow participation in the program for at least two years. An H1-B status is not acceptable, because that status is for employment only. Non-U.S. citizens selected for an appointment must contact ORAU concerning their immigration status and provide evidence that they have a valid and appropriate authorization before they can begin an appointment.