

2019 FIREX-AQ Twin Otter, Mobile Labs & Ground Sites Teleconference

July 16, 2019



1. Fire activity outlook – week of July 15
2. Stan Kubota – U.S. Forest Service & FIREX Project Consultant
3. Russell Long / Matt Landis – EPA fixed sites and mobile labs
4. David Giles - AERNOET and DRAGON Sites
5. Nancy Johnston – Lewis & Clark State College (Boise Ground Site)
6. Toshi Kuwayama – California Air Resources Board
7. Twin Otter operations outlook / coordination with ground measurements

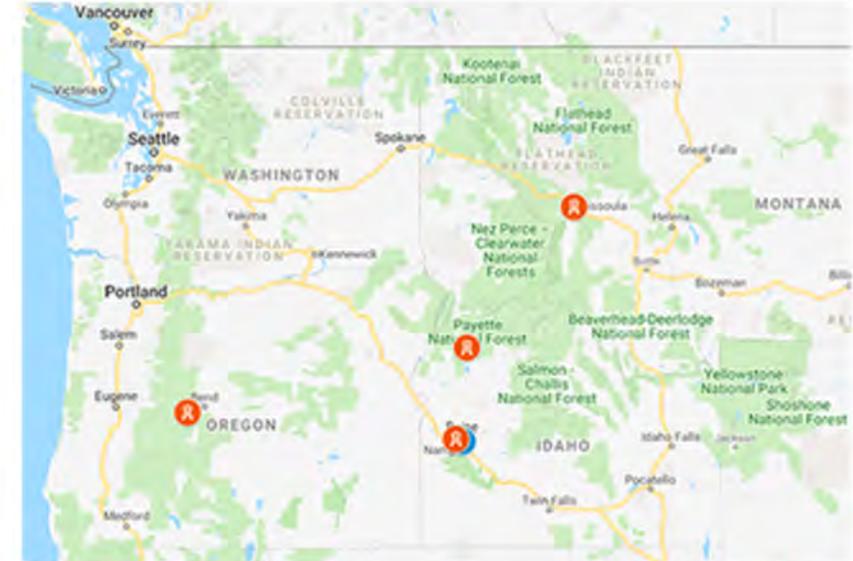
NOAA FIREX-AQ Ground Sites Web Page

<https://www.esrl.noaa.gov/csd/projects/firex-aq/groundsites/>

Platform: Ground Sites

Who: Investigators and mission support include Aerodyne Research Inc., University of Montana, Idaho Department of Environmental Quality, University of Washington; NASA Goddard; EPA Office of Research and Development, U.S. Forest Service; San José and San Francisco State Universities.

Ground-based measurements at multiple sites capture wildfire smoke and haze episodes impacting the surface. Smoke often settles into valleys at night where the Missoula, McCall and Boise ground sites can provide diurnal profiles to understand potential high exposures for residents at night. The Mount Bachelor Observatory is a high altitude site aimed at capturing long range transport of fire plumes. Instruments at these ground sites make observations during the FIREX-AQ study intensive July - September 2019:



Google® interactive map of project locations in the northwest U.S.

- **Boise, ID** - hosted by the Idaho Department of Environmental Quality
- **McCall, ID** - operated by Scott Herndon, Aerodyne Research Inc.
- **Missoula, MT** - hosted by Robert Yokelson, Department of Chemistry, University of Montana
- **Mount Bachelor, OR** - hosted by Dan Jaffe, University of Washington
- **Mission-deployed temporary AERONET (Aerosol RObotic NETwork) sites** - operated by NASA Goddard

Additional mobile ground-based measurement platforms can travel to wherever major fires burn, with higher priority given to fires that are impacting population centers (particularly the EPA MASIC sites in Boise, Missoula, and Reno). Mobile ground sites based from Missoula deploy **25 July - 15 August 2019** and are operated by:

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- EPA Office of Research and Development - platform focused on sensors and small form factor instruments in downwind communities.
- U.S. Forest Service - platform getting as close as possible to fires with Federal Reference Method (FRM) and Federal Equivalent Method (FEM) research instruments to assess compliance with US air pollution standards designed to protect human and ecosystem health.

Additional mobile ground-based activities are operated by:

- [California Air Resources Board](#) - Mobile Measurement Platform (MMP) to study the interaction of urban and wildfire emissions in California.
- [University of California Riverside](#) - Mobile laboratory isotope measurements in the environment / analysis vehicle for on-road capture of atmospheric data and observations (LIME/AVOCADO).

and

- San José and San Francisco State Universities - California State University-Mobile Atmospheric Profiling System (CSU-MAPS) platform optimized for rapid deployment and wildfire research; team is fire line qualified.
- San José State University - Mobile fire and fire weather monitoring; Wildfire Observing Facility platform carrying scanning Ka-band polarimetric Doppler radar.



Please contact Cathy Rasco with any additional information for these pages
C.Burgdorf.Rasco@noaa.gov

NOAA FIREX-AQ Planning / Calendar Page

<https://www.esrl.noaa.gov/csd/projects/firex-aq/planning/>

Schedules

NASA DC-8

20 May – 15 November 2019 Calendar includes instrument integration, test and transit flights.

[NASA DC-8 Daily Schedule](#)

NASA ER-2

Science flights **22 July – 19 August 2019** based from NASA AFRC, Palmdale, CA.

NOAA-CHEM Twin Otter

15 July – 12 September 2019 Calendar includes instrument integration, test and transit flights.

NOAA-MET Twin Otter

15 July – 15 August 2019 Calendar includes instrument integration, test and transit flights.

Aerodyne Mobile Laboratory

Observation period **7 - 29 August 2019** based from Boise, ID.

NASA Langley Mobile Laboratory

Observation period **22 July - 31 August 2019** based from Boise, ID.

Boise Deployment Calendar

| 2019 JULY | | | | | | |
|-------------|--------|---------|-----------|----------|--------|----------|
| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
| | 1 | 2 | 3 | 4 | 5 | 6 |
| 7 | 8 | 9 | 10 | 11 | 12 | 13 |
| 14 | 15 | 16 | 17 | 18 | 19 | 20 |
| 21 | 22 | 23 | 24 | 25 | 26 | 27 |
| 28 | 29 | 30 | 31 | | | |
| 2019 AUGUST | | | | | | |
| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
| | | | | 1 | 2 | 3 |
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■ NASA DC-8
■ NOAA-MET Twin Otter
■ NOAA-CHEM Twin Otter
■ Langley Mobile Lab
■ Aerodyne Mobile Lab
■ McCall Ground Site

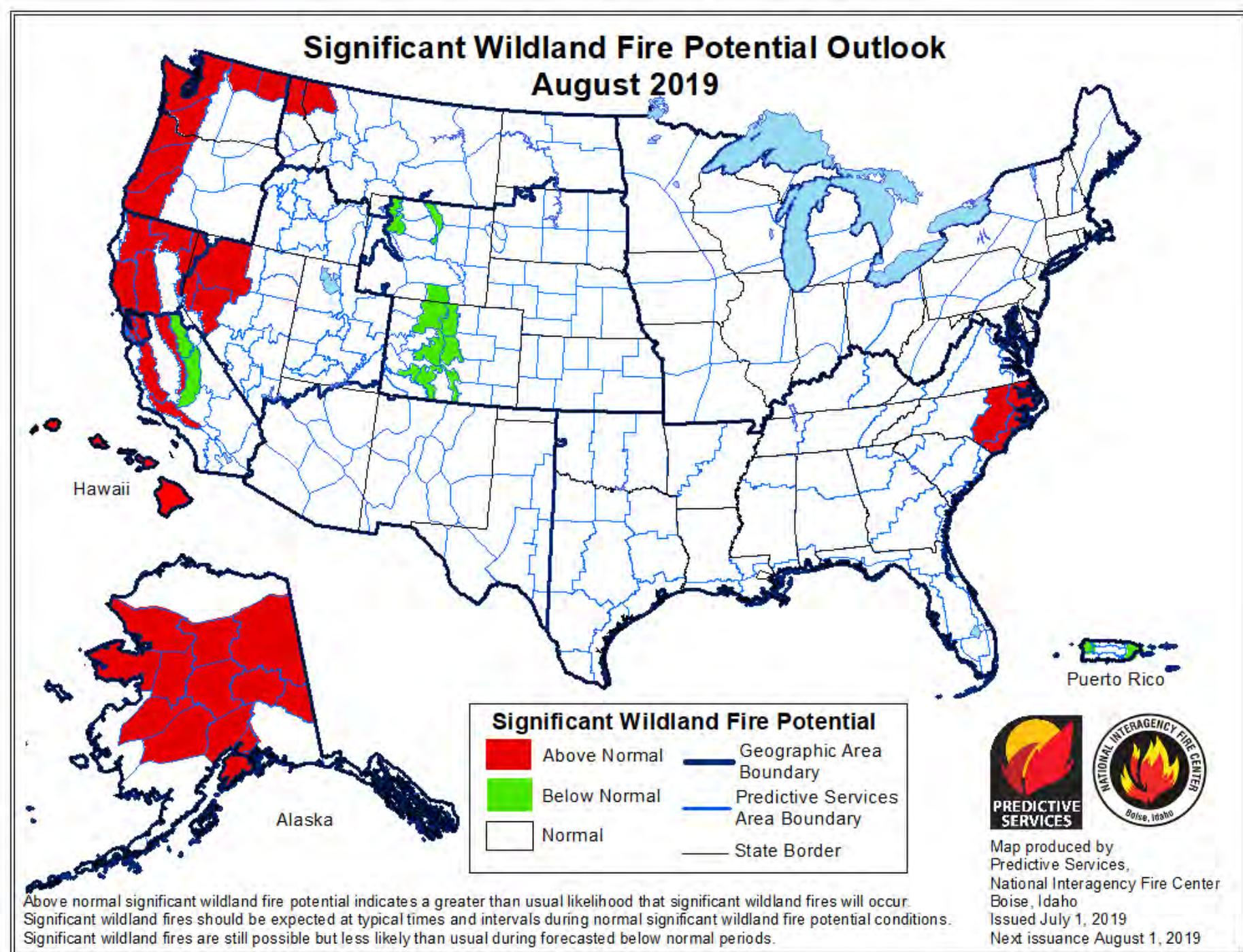
Logistics

United States Wildland Fire Outlook For August 2019

Released July 1, 2019

Notable changes
since June 1 release

- Expanded area of high risk in northwest Nevada
- Expanded area of low risk in northwest Wyoming



National 7 Day Significant Fire Potential

<https://psgeodata.fs.fed.us/forecast>

July 16

July 21

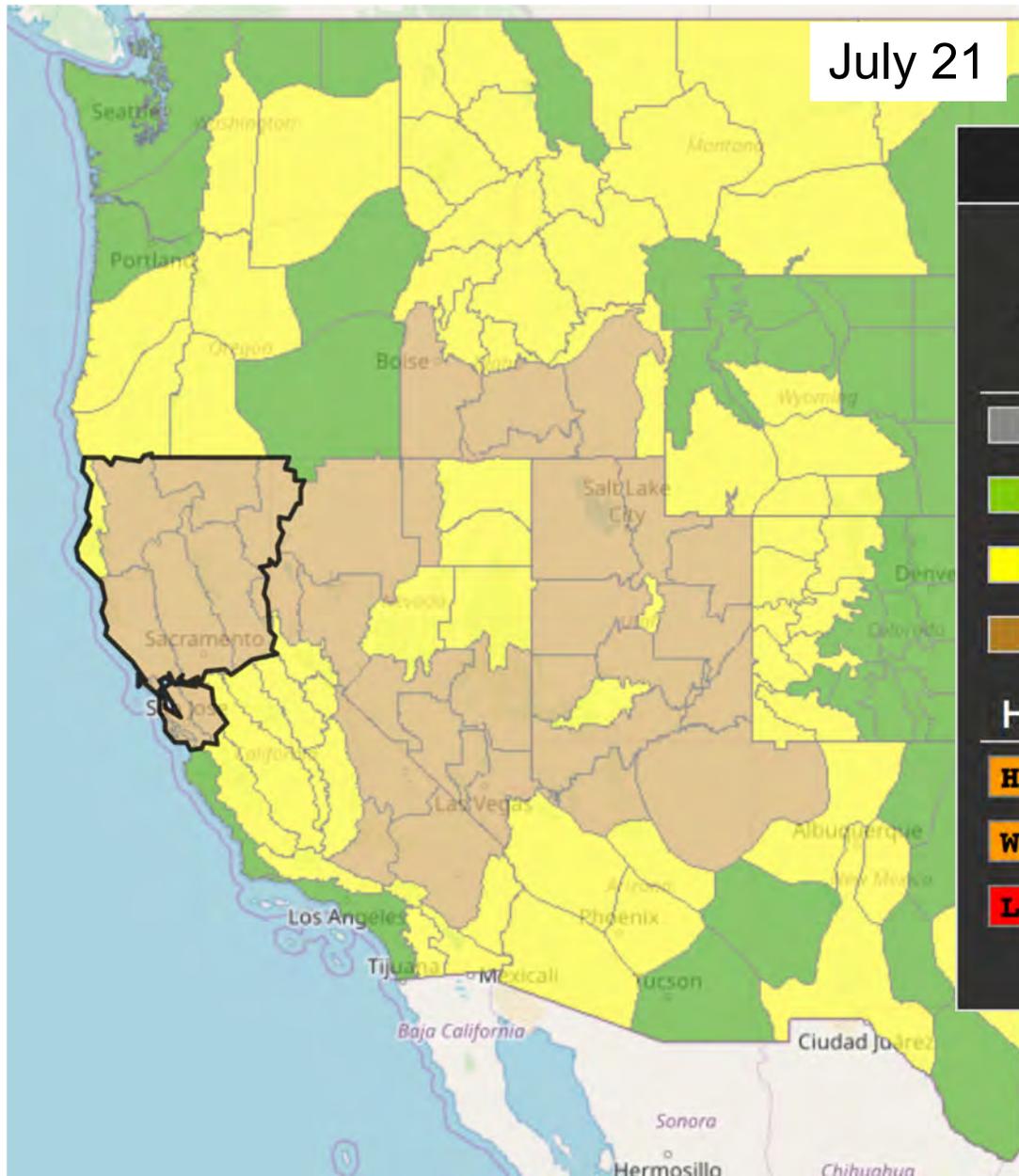
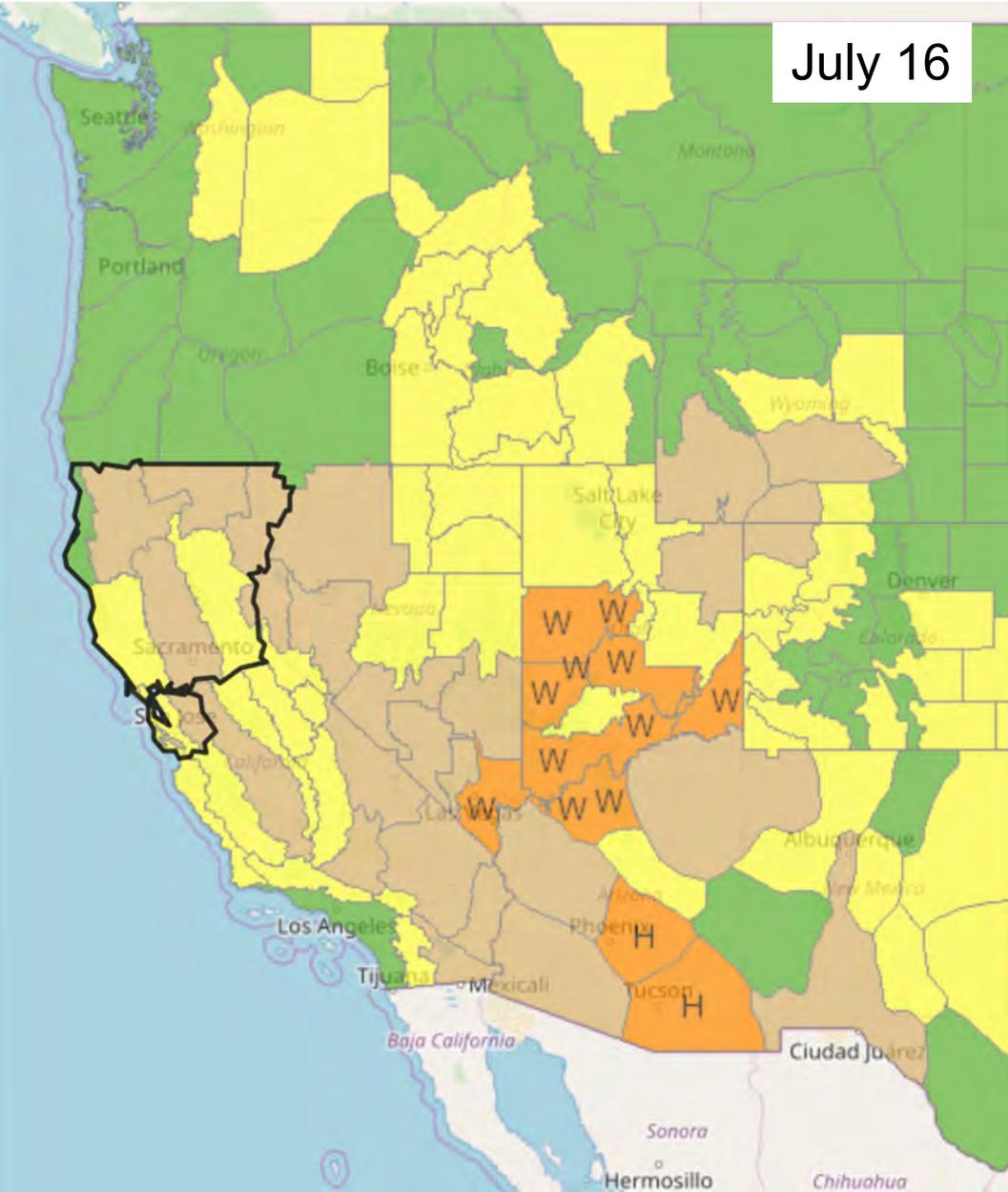
Legend

Significant Fire Potential

-  No Data
-  Little or no risk.
-  Low risk
-  Moderate risk

High Risk Triggers

-  H
-  W
-  L



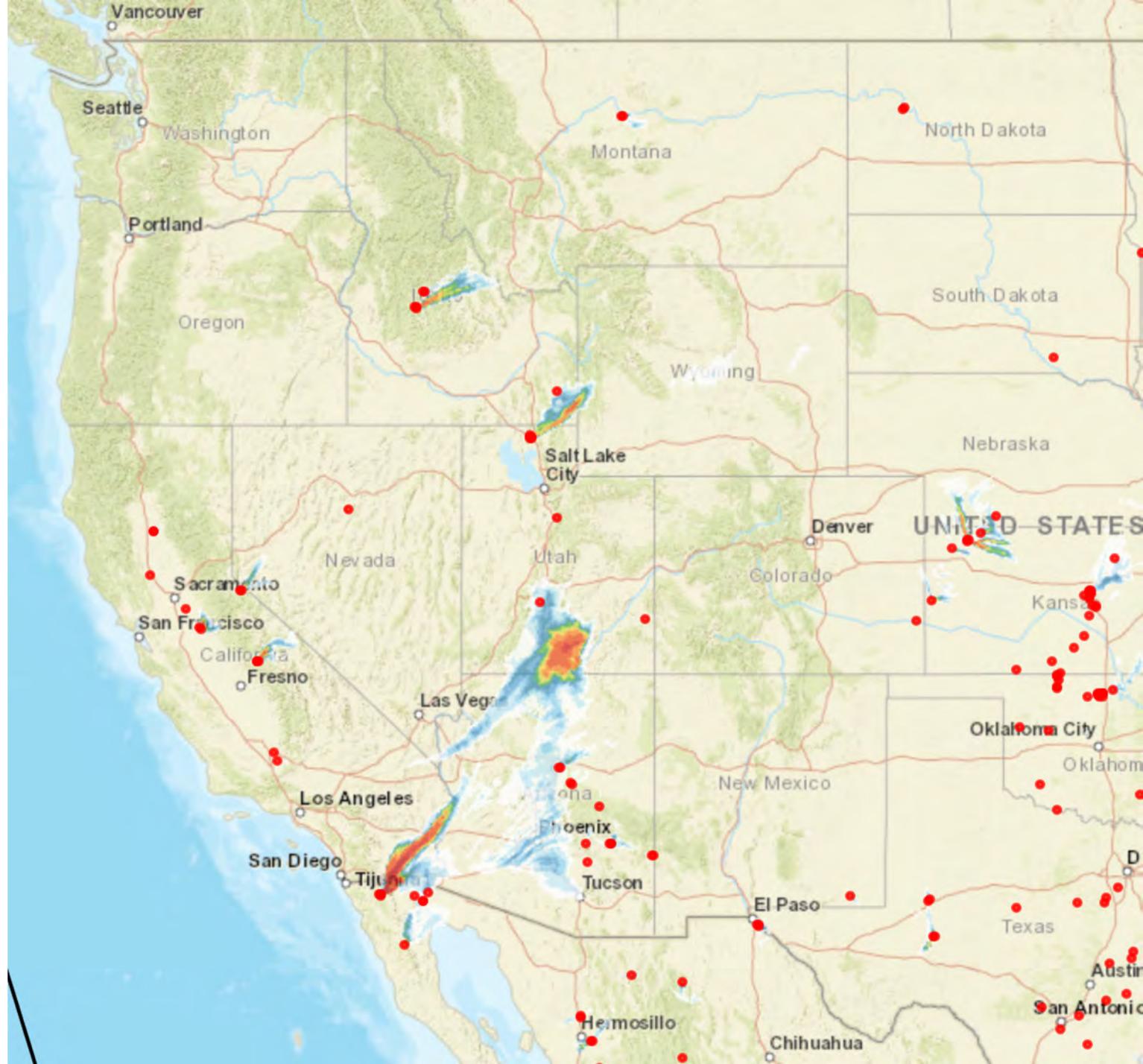
HRR Model Vertically Integrated Smoke

July 17, 2019, 0Z (6 PM local)

Very little fire activity in the west so far !

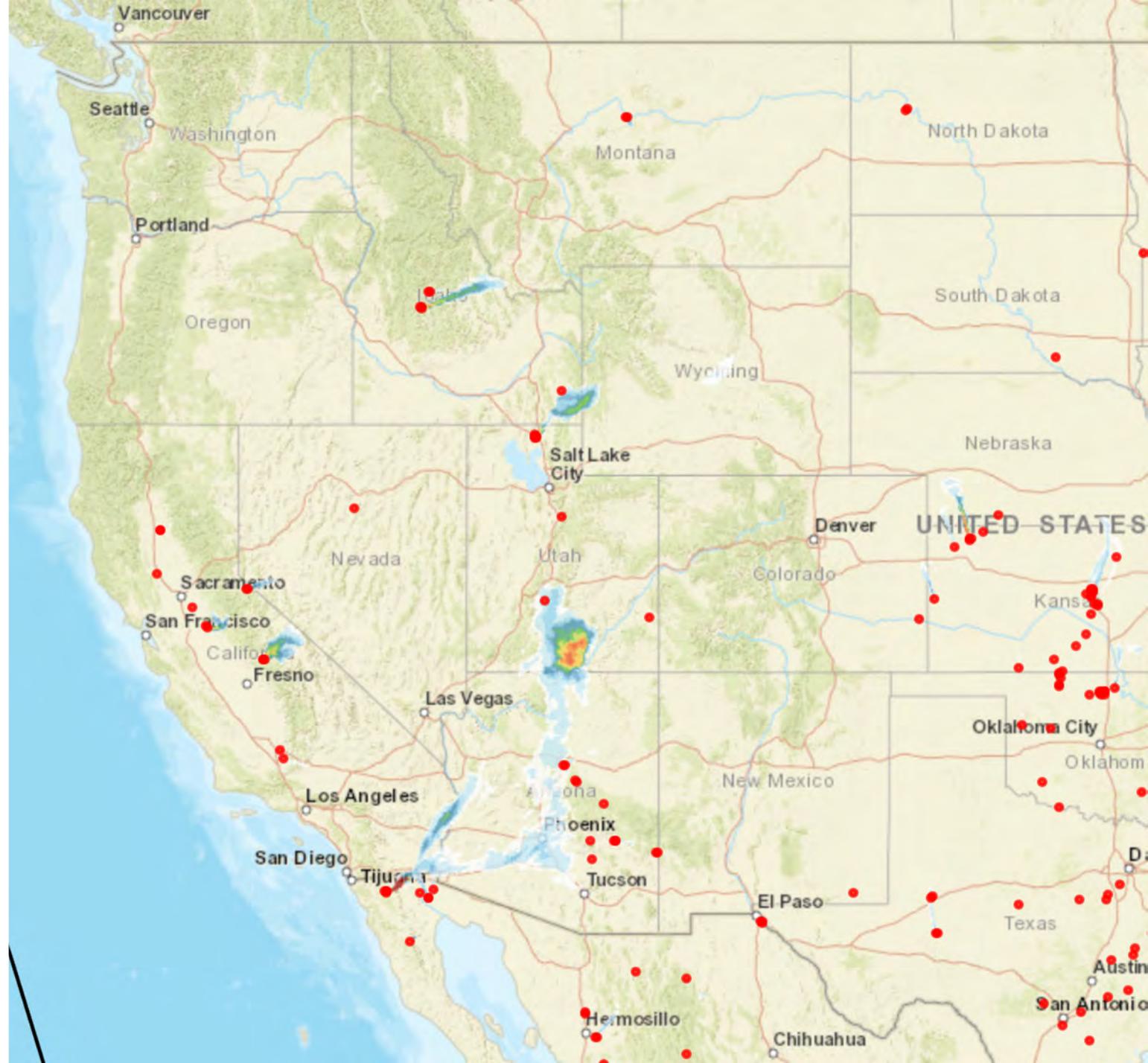
Totally different map of small fire incidents each week, no large fires

As of today, fly-able fires near Boise (very good for TO) and Salt Lake (accessible from Boise), but these will likely not persist into our observation period



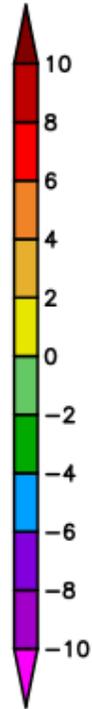
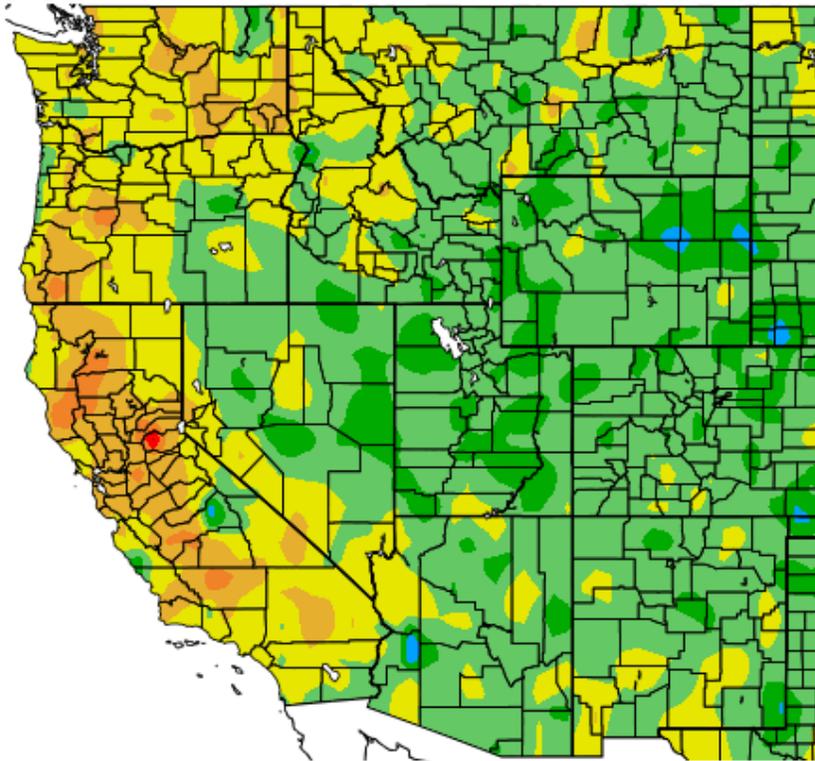
HRR Model Near Surface Smoke

July 17, 2019, 0Z (6 PM local)

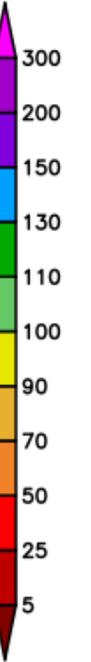
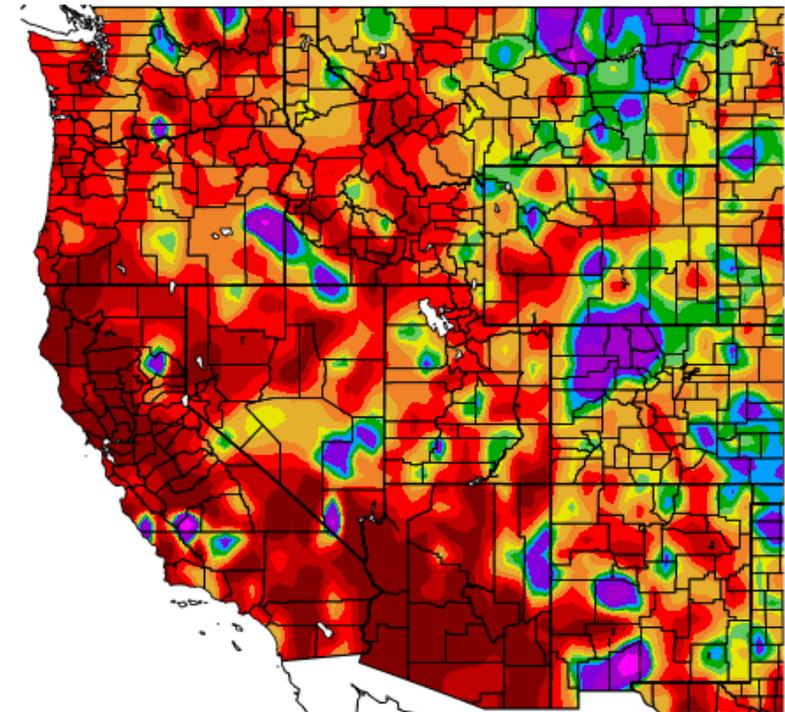


June 2019 Temperature and Precipitation

Departure from Normal Temperature (F)
6/1/2019 – 6/30/2019



Percent of Normal Precipitation (%)
6/1/2019 – 6/30/2019



Generated 7/1/2019 at HPRCC using provisional data.

NOAA Regional Climate Centers Generated 7/1/2019 at HPRCC using provisional data.

NOAA Regional Climate Centers

Bob Yokelson, linked from “Wildfire Today”

Bob’s characterization: “Drying out nicely”

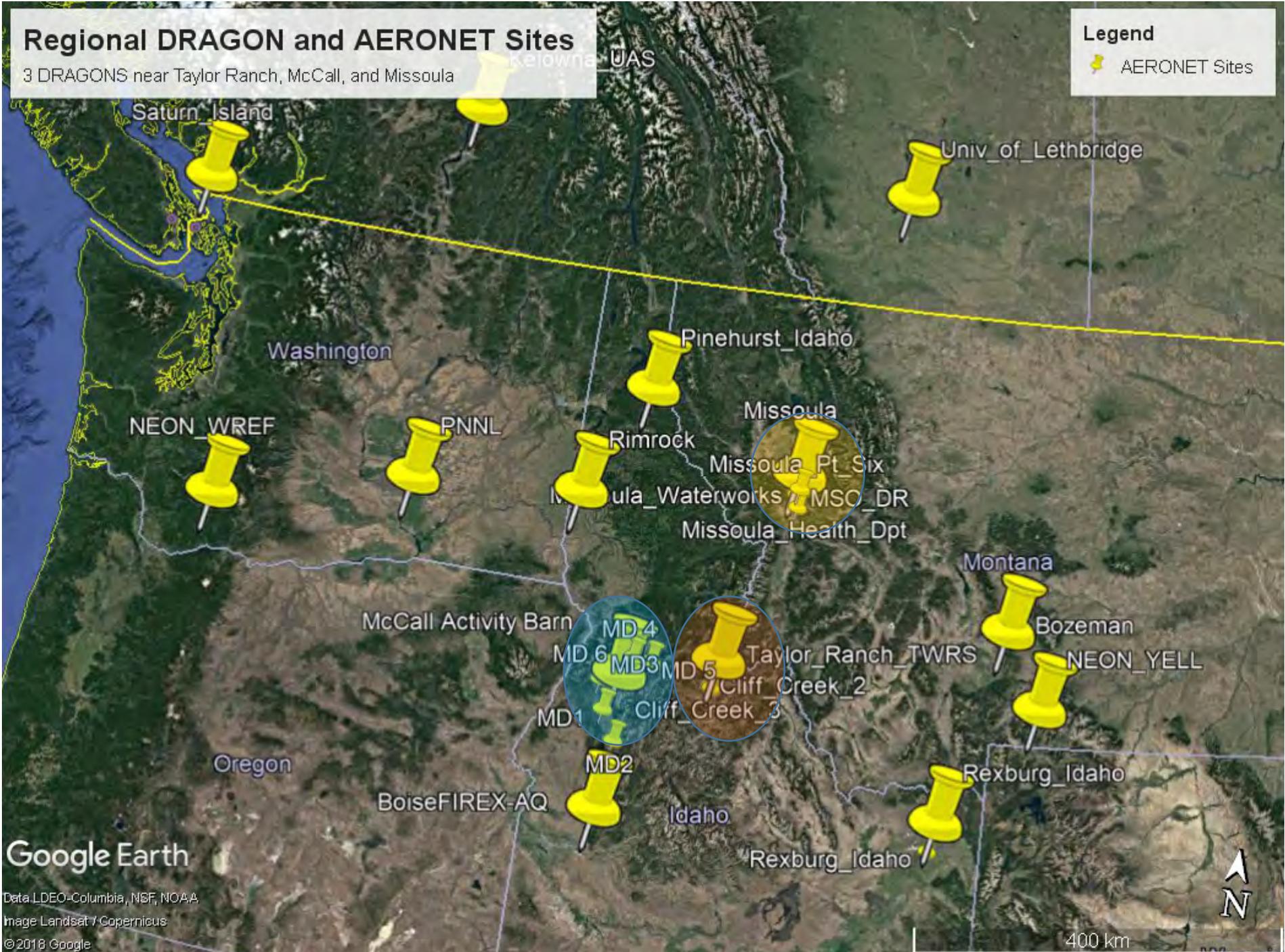
Stan Kubota – U.S. Forest Service and FIREX-AQ Project Consultant

Matt Landis / Russell Long – EPA Office of Research & Development

Regional DRAGON and AERONET Sites

3 DRAGONS near Taylor Ranch, McCall, and Missoula

Legend
AERONET Sites



- ~14 Regional AERONET Sites**
- 3 Distributed DRAGONS**
- 2 Mobile Deployment Teams**

Google Earth

Data LDEO-Columbia, NSF, NOAA
Image Landsat 7 Copernicus
© 2018 Google

400 km



Taylor Ranch DRAGON

8 DRAGON Sites + Taylor Ranch

Legend
📌 AERONET Sites

DRAGON sites up to 7 km from Taylor Ranch

| Site | Latitude | Longitude | Elevation (m) |
|-------------------|------------|--------------|---------------|
| Taylor Ranch TWRS | 45.103500 | -114.849950 | 1159 |
| Cliff Creek 1 | 45.108708° | -114.843318° | 1351 |
| Cliff Creek 2 | 45.115091° | -114.843248° | 1552 |
| Cliff Creek 3 | 45.115417° | -114.836824° | 1727 |
| Cliff Creek 4 | 45.123432° | -114.839380° | 2024 |
| Cliff Creek 5 | 45.129928° | -114.846827° | 2068 |
| Cliff Creek 6 | 45.144171° | -114.845318° | 2232 |



McCall DRAGON

7 DRAGON Sites + McCall Activity Barn

Legend

 AERONET Sites

McCall DRAGON:

- 100 km West of Taylor Ranch DRAGON
- ~110 km N-S transect
- Up to 7 DRAGON sites; site names and final coordinates TBD

| Site | Latitude | Longitude | Elevation (m) |
|----------------------|-----------|-------------|---------------|
| McCall Activity Barn | 44.870243 | -116.115560 | 1505 |
| MD1 | 44.767029 | -116.206320 | 1915 |
| MD2 | 44.491129 | -116.011586 | 1460 |
| MD3 | 45.038436 | -116.292825 | 1170 |
| MD4 | 45.277465 | -115.913950 | 1870 |
| MD5 | 45.266820 | -115.669899 | 1960 |
| MD6 | 45.385365 | -116.043053 | 1070 |
| MD7 | 45.423488 | -116.029646 | 795 |

Google Earth

Image Landsat / Copernicus
© 2018 Google

30 km

Missoula DRAGON

4 DRAGON Sites + Missoula

Legend

 AERONET Sites

Missoula DRAGON

- 15 km transect elevated terrain
- 9 km transect in urban region
- 4 regional sites

| Site | Latitude | Longitude | Elevation (m) |
|---------------------|-----------|-------------|---------------|
| Missoula (USDA FSL) | 46.916668 | -114.083336 | 976 |
| Missoula_Health_Dpt | 46.875753 | -113.995597 | 985 |
| Missoula_Waterworks | 46.880881 | -113.987222 | 1107 |
| Missoula_Midslope | 46.999861 | -114.025889 | 1613 |
| Missoula_Pt_Six | 47.041333 | -113.986306 | 2420 |

Google Earth

© 2018 Google

N

10 km

NASA GODDARD SPACE FLIGHT CENTER [+ Visit NASA.gov](#)

AERONET

AEROSOL ROBOTIC NETWORK

+ AEROSOL OPTICAL DEPTH + AEROSOL INVERSIONS + SOLAR FLUX + OCEAN COLOR + MARITIME AEROSOL

Web Site Feature [AERONET Data Synergy Tool](#) - Access Earth Science data sets for AERONET sites

+Home

Home

+ AEROSOL/FLUX NETWORKS

- CAMPAIGNS

+ COLLABORATORS

+ DATA

+ LOGISTICS

+ NASA PROJECTS

+ OPERATIONS

+ PUBLICATIONS

+ SITE INFORMATION

+ STAFF

+ SYSTEM DESCRIPTION

AERONET DATA ACCESS

DATA SYNERGY TOOL

+ Data Display

AEROSOL OPTICAL DEPTH (V3)- SOLAR

+ Data Display

FIELD CAMPAIGN - Distributed Regional Aerosol Gridded Observation Networks (DRAGON)- FIREX-AQ 2019

[Background](#) | [Objectives](#) | [Plan](#) | [Contacts](#) | [Data](#)

+ **FIREX-AQ**: Fire Influence on Regional to Global Environments Experiment - Air Quality

DRAGON FIREX-AQ

Interactive Maps

DRAGON-Missoula - [Today](#) | [Yesterday](#) | [2 Days Prior](#)

DRAGON-McCall - [Today](#) | [Yesterday](#) | [2 Days Prior](#)

DRAGON-Taylor Ranch - [Today](#) | [Yesterday](#) | [2 Days Prior](#)

DRAGON-Mobile 1 - [Today](#) | [Yesterday](#) | [2 Days Prior](#) | [Real-time Tracking](#)

DRAGON-Mobile 2 - [Today](#) | [Yesterday](#) | [2 Days Prior](#) | [Real-time Tracking](#)

DRAGON-FIREX-AQ Region - [Daily](#) | [Today](#) | [Yesterday](#) | [2 Days Prior](#)

Data (Top)

Aerosol Optical Depth Products (including Water Vapor and SDA)

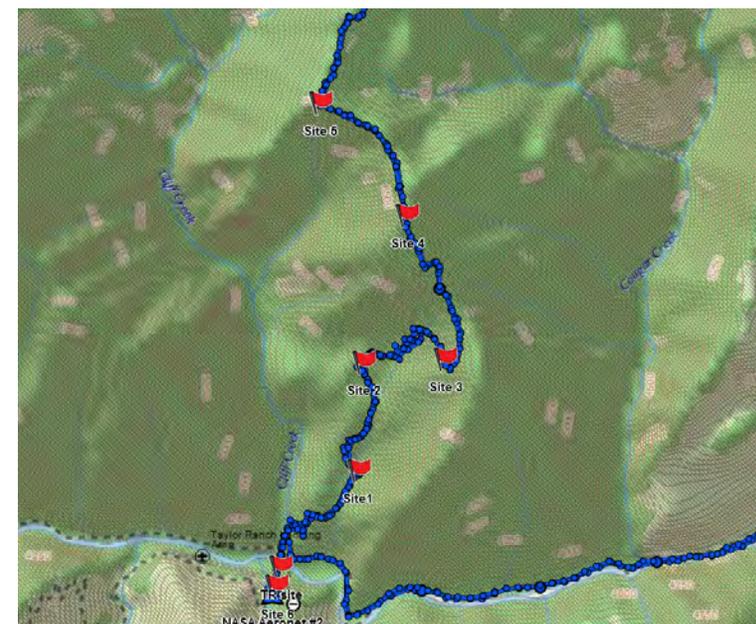
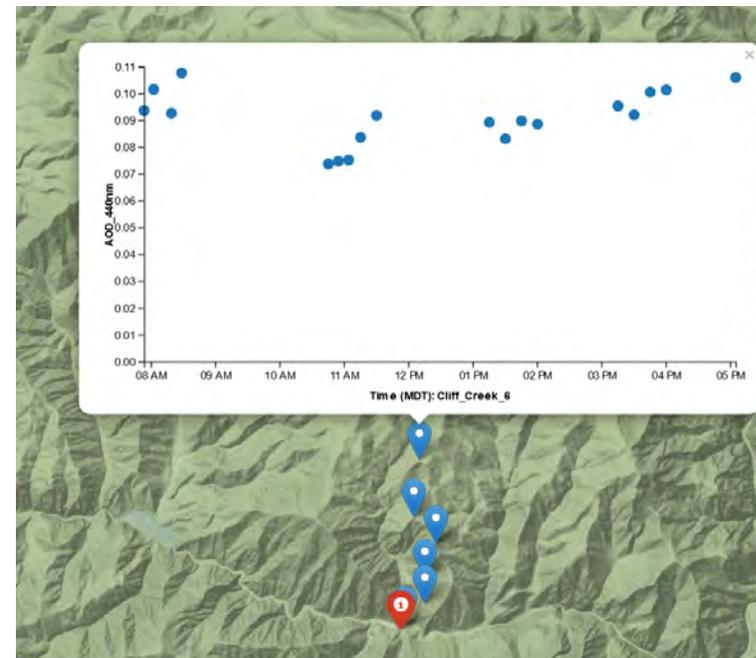
+ [DRAGON AOD Data Browser](#)

+ [DRAGON AOD Data Download Tool](#)

Almucantar Inversion Aerosol Properties (including Size Distributions, Complex Index of Refraction, Single Scattering Albedo, etc.)

+ [DRAGON Inversion Data Browser](#)

+ [DRAGON Inversion Data Download Tool](#)



Summary of proposed AERONET Contributions

- Permanent Northwest Regional Sites: Nine plus two campaign sites
- Three Fixed DRAGON: Taylor Ranch, Missoula, McCall
- Moveable DRAGON: 3-6 fire chasers semi-mobile sun photometer sites w/solar and lunar AOD
- Two mobile platforms with lidar and sun photometer
- Multiple microtops sun photometers
- Base of Operations in McCall: polar Cimel, MPL mini lidar, PANDORA, Filters
- NRT AOD for most AERONET sites, Daily summary of all sites at: (<https://aeronet.gsfc.nasa.gov>)
- Communication via cell phone, Iridium phone and coordination w/BY and JD at Boise
- Operational July 22 to Sept. 6 with night focus Aug. 7 to 21

LCSC Air Group – Ground Sampling during FIREX-AQ

- Dr. Nancy Johnston, Lewis-Clark State College
- Contact: najohnston@lcsc.edu
- Website: <https://lcsc-airheads.wixsite.com/airchemistryresearch>
- VOC and Sulfur analysis using sorbent tubes and GC-MS analysis
- Stationary Locations: Boise, McCall, Lewiston, Spokane, Missoula
 - Time averaged ground sampling (Daily to weekly)
 - Benzene, styrene, ethylbenzene, heptane, other VOCs
- Lewiston site –continuous SO₂ and Total reduced sulfur
- Mobile grab sampling during active fire events
 - VOCs/SVOCs/BVOCs: air toxics, hydrocarbons, terpenes, alcohols

Sorbent tube sample and TD/GC/MS system





CARB Ground-Based Monitoring Update

TOMLG Telecon
July 16, 2019

Toshihiro Kuwayama
Research Division



CARB Mobile Measurement Platform (MMP)

- Over 200+ hours of NH_3 , CH_4 , NO_x , O_3 , CO_2 , SO_2 , and H_2S
- Meteorology + GPS
- Collaboration with Bubbleology and Princeton to cover more areas for NH_3 monitoring in SJV



- Speciated $PM_{2.5}$ at 2-min time resolution
- 1-Hz NH_3 and CH_2O
- 7-wavelength BC at 5-sec time resolution
- Mini Micro Pulse LiDAR (MiniMPL)
 - 15 km range
 - Aerosol vertical backscattering profile
 - Aerosol Optical Depth (AOD)



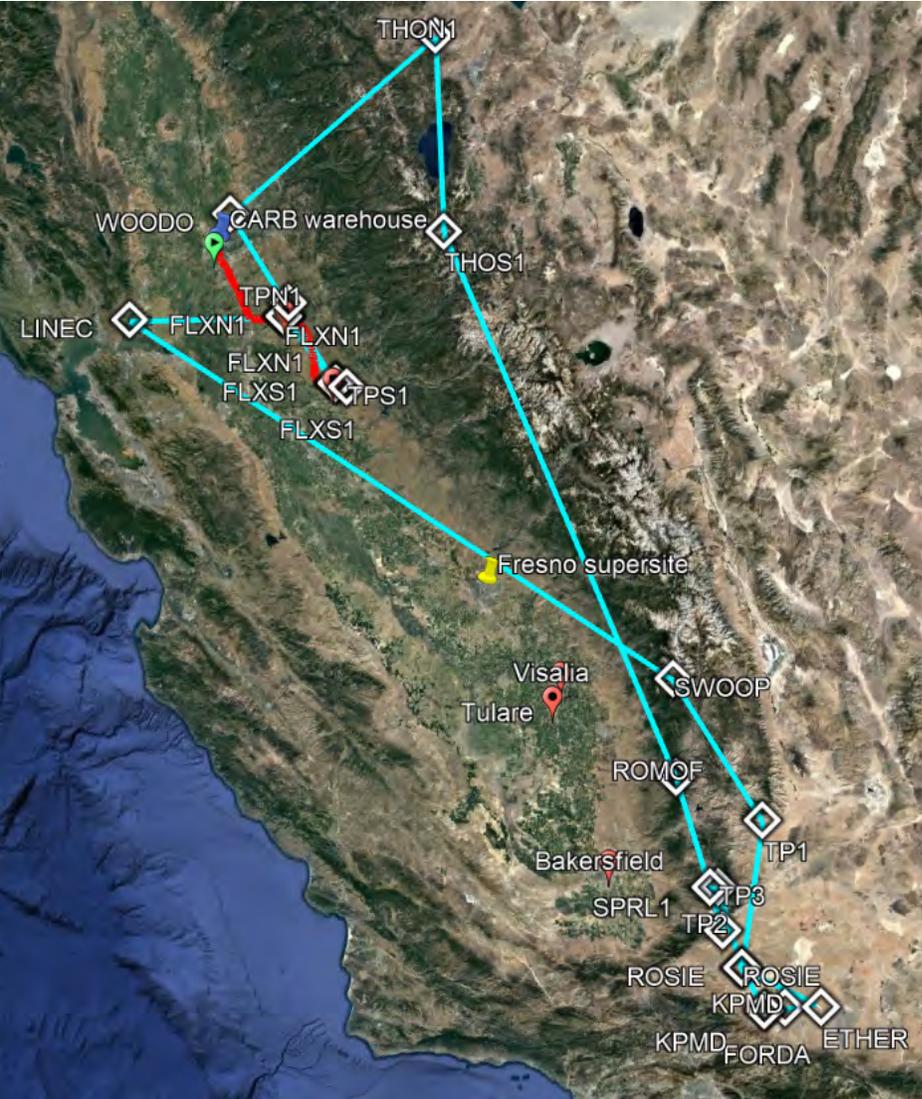
Fresno-Garland Rooftop
Winter (2018)

More Details on Instruments

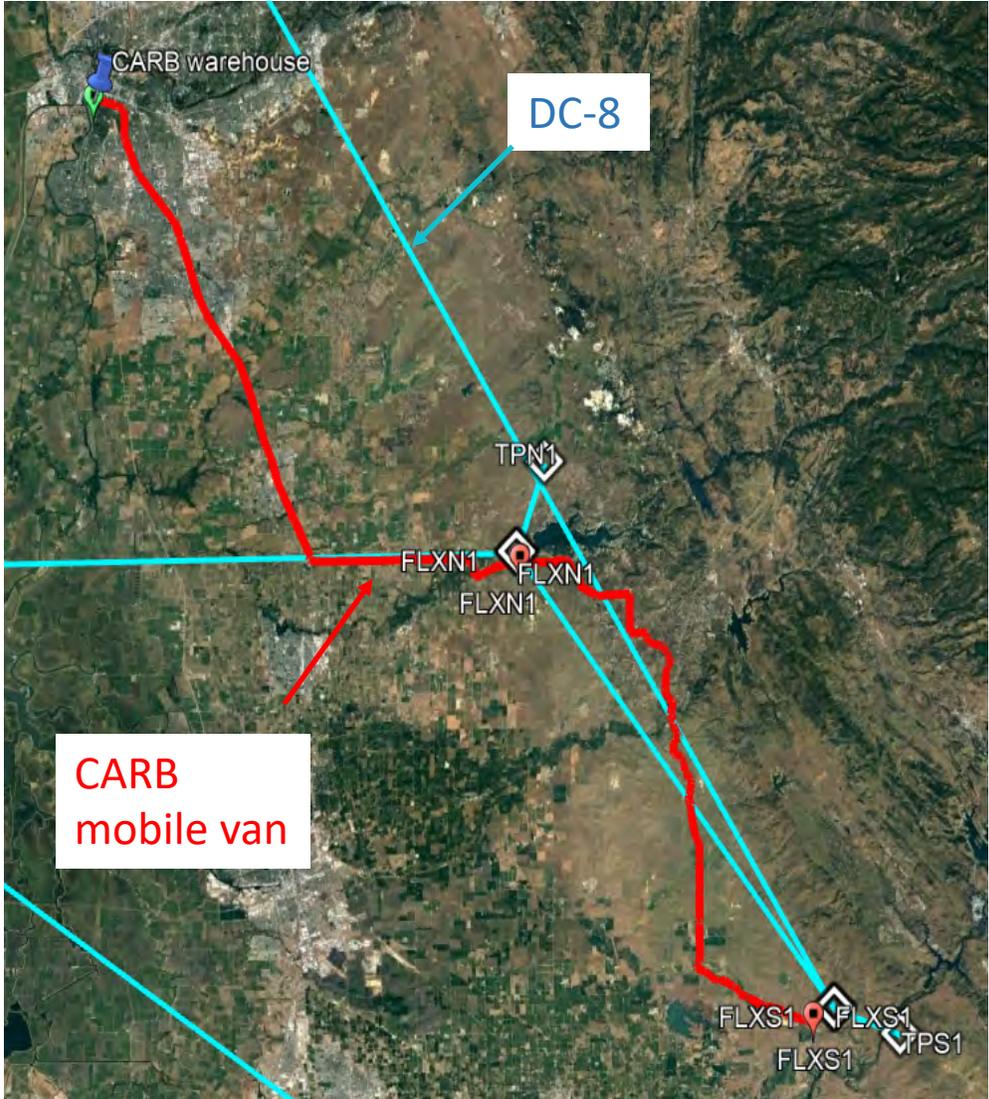
| Manufacturer | Model | Measurement Parameter(s) | Range | Time Resolution |
|-------------------------------|------------|-------------------------------------|--|------------------|
| PICARRO | G2307 | CH ₂ O/CH ₄ | CH ₂ O: 0-30 ppm CH ₄ : 0-20 ppm | 0.5 Hz |
| PICARRO | G2301 | CO ₂ /CH ₄ | CO ₂ : 0-1000 ppm CH ₄ : 0-20 ppm | 0.1 Hz |
| 2B Tech | Model 405 | NO/NO ₂ /NO _x | NO: 0-2 ppm NO ₂ : 0-10 ppm | 0.1 Hz |
| 2B Tech | Model 205 | O ₃ | 0-250 ppm | 0.5 Hz |
| Hexagon (formerly SigmaSpace) | MiniMPL | AOD/BLH | Min 100 m, max 15 km, resolution 5-75 m | 1 Hz – 15 min |
| Magee Scientific | AE33 | BC (7-wavelengths) | 0.01-100 µg m ⁻³ | 1 Hz |
| Ecotech | Serinus 51 | SO ₂ /H ₂ S | SO ₂ : 0-20 ppm H ₂ S: 0-2 ppm | 0.03 Hz – 0.5 Hz |
| Airmar | WS220 | WS/WD/T/RH | 0-40 m/s, 0-359 deg | 1 Hz |
| R.M. Young | 81000 | WS/WD | 0-40 m/s, 0-359 deg | 1 Hz – 32 Hz |

Note: Equipment listed above does not indicate CARB endorsement.

Test flight on July 15: Path

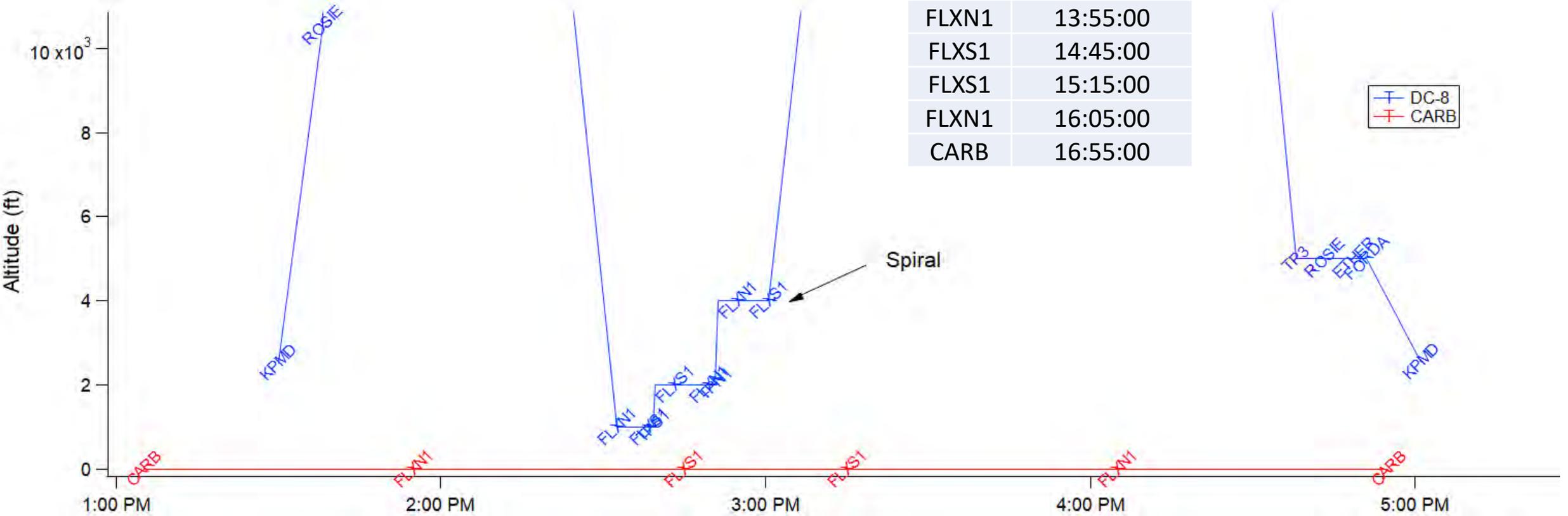


Zoom in



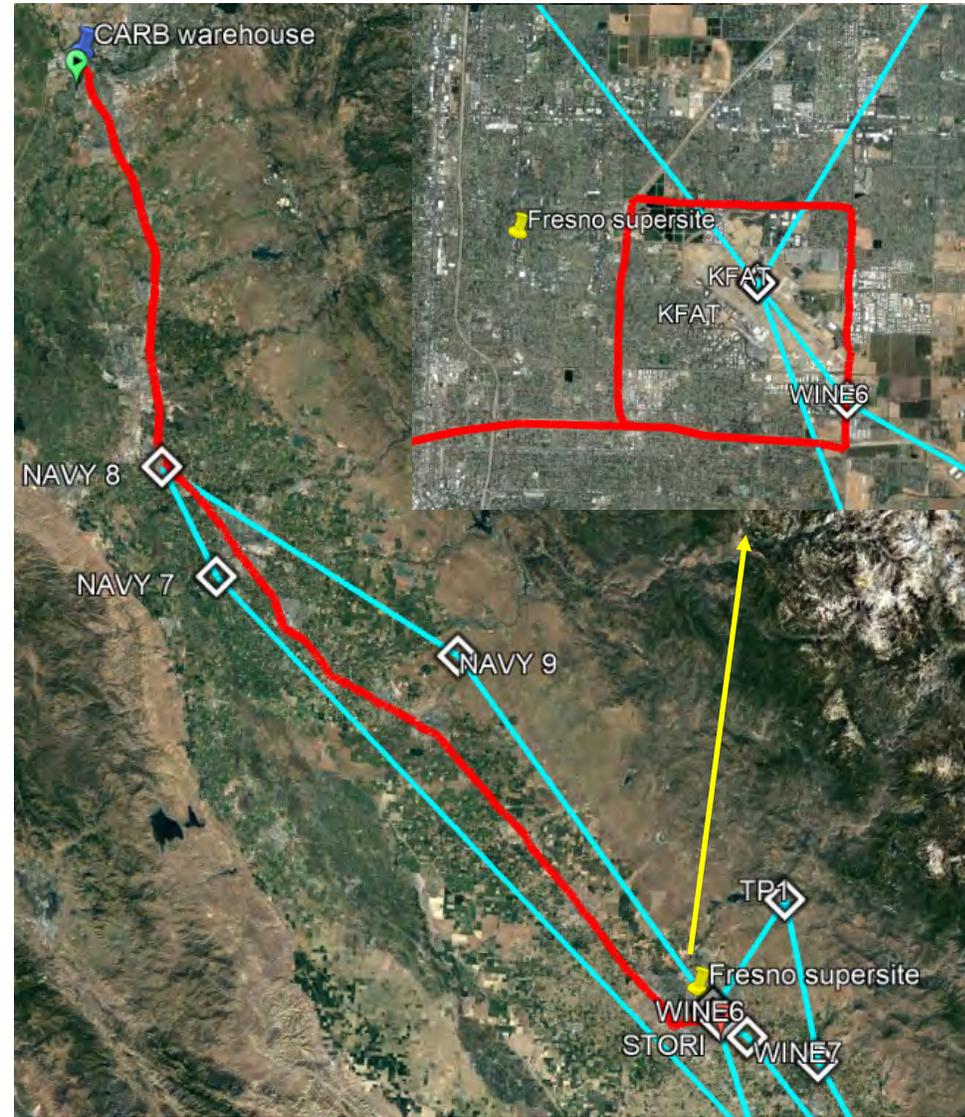
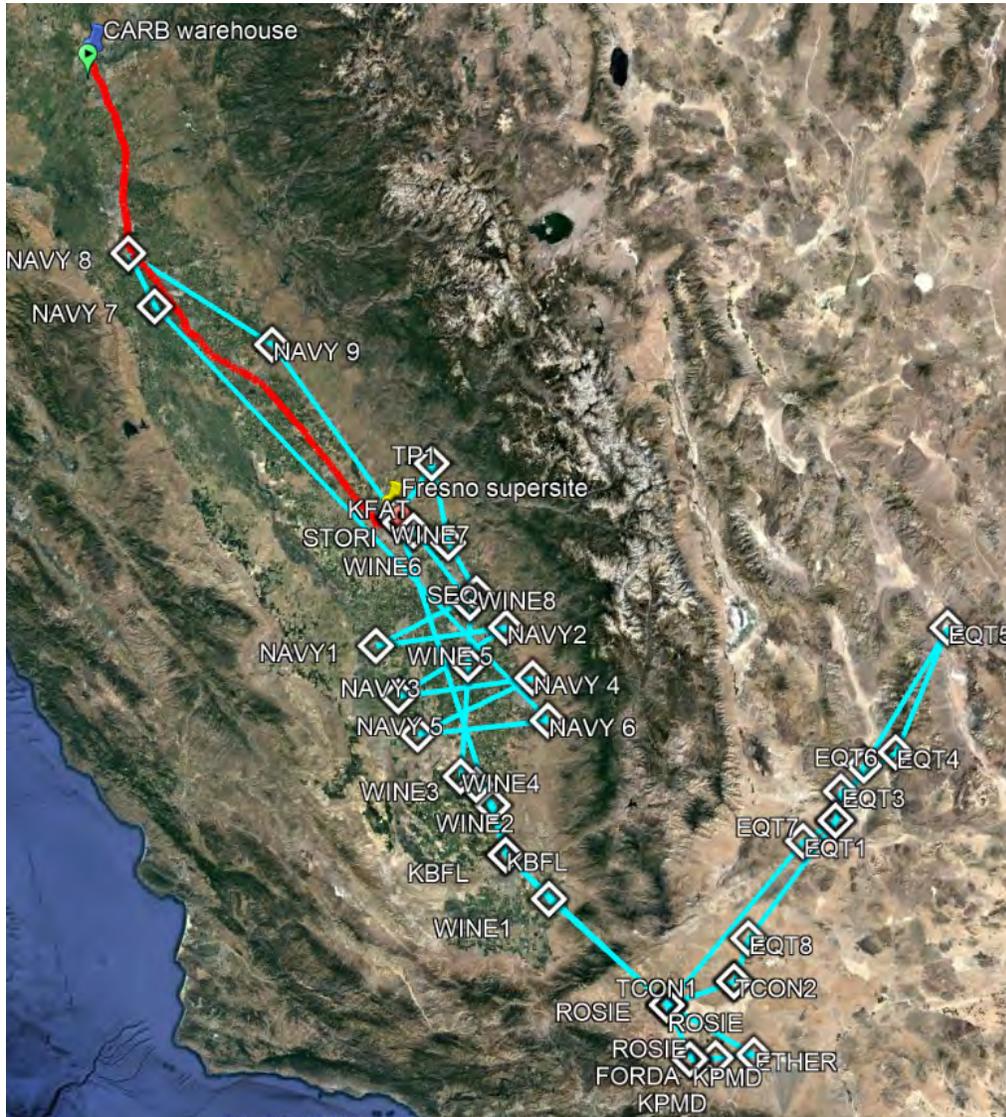
Test flight on July 15: Timeline

| Site | TimeLocal |
|-------|-----------|
| CARB | 13:05:00 |
| FLXN1 | 13:55:00 |
| FLXS1 | 14:45:00 |
| FLXS1 | 15:15:00 |
| FLXN1 | 16:05:00 |
| CARB | 16:55:00 |

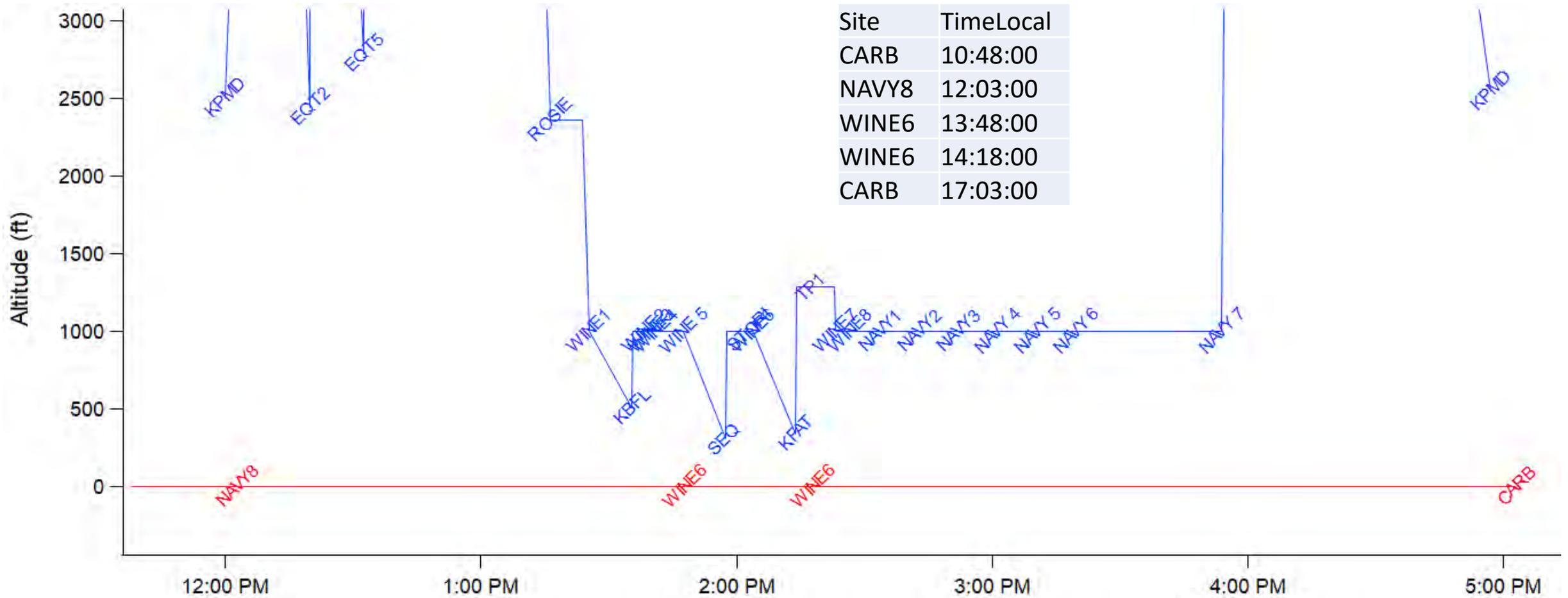


SARP flight on July 16: Path

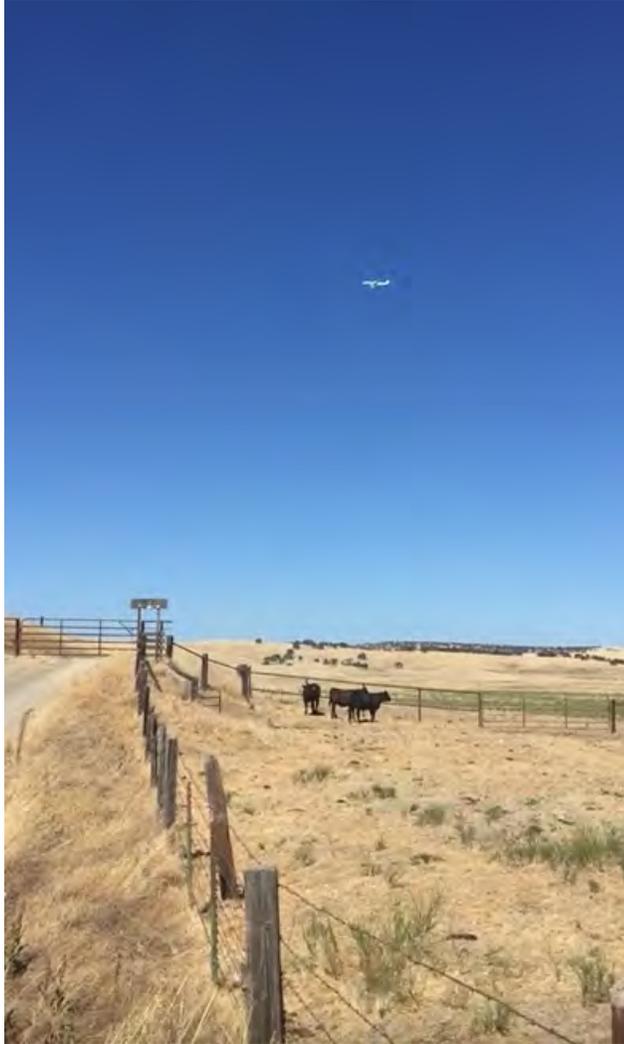
Zoom in



SARP flight on July 16: Timeline



Video of DC-8 Over Northern CA



<https://www.youtube.com/watch?v=UdYL0sAVp9w>

Twin Otter Operations & Locations

Both Twin Otters transit to Boise as first operational base

Three (possibly four) locations with hotel room blocks

- Klamath, Oregon
- Yakima, Washington
- Spokane, Washington
- Possibly Missoula, Montana

Three blocks of time in the month of August

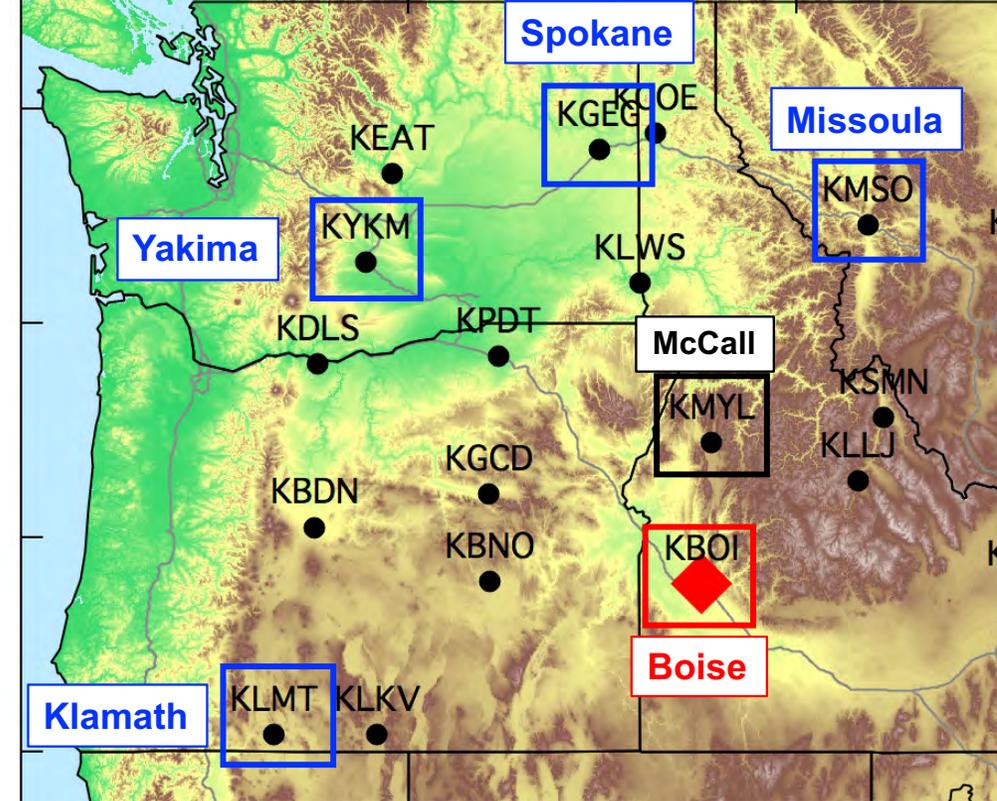
- Excursion 1: August 4 – 14 (15 room block)
- Excursion 2: August 14 – 22 (12 room block)
- Excursion 3: August 22 – 31 (12 room block)

Logistics

- Hotel room blocks set aside for each place for each set of dates
- Room block release 1-2 weeks prior to excursion start date / Cancellation on 24 hour notice
- Reservations made for all Twin Otter investigators beginning this week
- Cancellation of unneeded locations ~2-3 days out, or when basing decision is final

Questions

- Expand hotel room blocks to include mobile lab investigators ? If so, how many ?
- How likely is it that other assets are interested in following the Twin Otters during these dates ?



Twin Otter Excursion Calendar

- Boise
- Excursion
- Transit

Any of these
“excursion” blocks may
be in Boise ... it is likely
that we will spend at
least one there, and
probably two

| 2019 AUGUST | | | | | | |
|----------------|--------|---------|-----------|----------|--------|----------|
| SUNDAY | MONDAY | TUESDAY | WEDNESDAY | THURSDAY | FRIDAY | SATURDAY |
| | | | | 1 | 2 | 3 |
| 4 | 5 | 6 | 7 | 8 | 9 | 10 |
| ← Met + Chem → | | | | | | |
| 11 | 12 | 13 | 14 | 15 | 16 | 17 |
| ← Chem Only → | | | | | | |
| 18 | 19 | 20 | 21 | 22 | 23 | 24 |
| 25 | 26 | 27 | 28 | 29 | 30 | 31 |

Data Archive

Data archive for the chem otter will be hosted at NOAA. This archive will then be linked / mirrored at the NASA web site for the broader FIREX-AQ project.

Data manager = Ken Aikin, kenneth.c.aikin@noaa.gov

Data format will be the standard ICARTT files

Many of us are familiar with this format. Contact Ken Aikin for instructions if you are not.

There may be updates to the file format for this project to include additional data in the headers.

Instructions for submitting data to the archive:

- 1) Log into <ftp.al.noaa.gov>; Username = firex_aq_otter; Password = sm0k3y!
- 2) Upload your ICARTT files into the IncomingData folder
- 3) Ken will add these files to the NOAA TropChem data archive, and data will be available at: <https://esrl.noaa.gov/csd/groups/csd7/measurements/2019firex-aq/TwinOtter/DataDownload/>
Username = firex_aq; Password = sm0k3y!

In-Field Communication of Twin Otter Operations

1. E-mail: Two lists currently.

- a) firex-otter@noaa.gov Use this for daily logistics updates to otter group only
- b) firex-tomlg@noaa.gov Use for communication of flight plans and operations to larger group

2. Slack

Lisa Azzarello has established a slack channel for the Otters. If you would like to be added to that channel, please contact Lisa. lisa.azzarello@noaa.gov

3. Campaign web site

Link will be added to the Chem Otter, Met Otter and Planning pages with a “daily operations plan”

Steve will alert both lists when this tab is operational

In-Field Communication of Twin Otter Operations

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- NASA DC-8
- NOAA-MET Twin Otter
- NOAA-CHEM Twin Otter
- Langley Mobile Lab
- Aerodyne Mobile Lab
- McCall Ground Site

Daily schedule and operations plan, like the one for the NASA DC-8, to be added here

