PACE-PAX research flight report 2024/09/15

Compiled by Kirk Knobelspiesse, Ivona Cetinić, Michael Ondrusek, Bridget Seegers 2024/09/21
Reviewed by Samuel LeBlanc

ER2 samples SoCal smoke on line with marine stratus near coast, on to overpasses of blissfully, shearwater, hypernav but unfortunately clouds. Then up north for PACE track over clouds and return to hypernav location for time of PACE overpass. Cloudy HyperNAV profile. After that RTB due to surface winds, missing planned EarthCARE lines.

ER-2
Takeoff: 16:24, Landing: 21:37, Duration: 5.2
Early return due to high surface winds at AFRC
Instrument status: RSP possibly functional, all others good
Pilot: Tim Williams, mobile pilot: Kirt Stallings

Twin Otter
No flight day

R/V Shearwater
Mission Scientist: Michael Ondrusek
Sailed out: 17:35 UTC
Back in port: 00:40 (09/16)PACE UTC
See end for full R/V Shearwater report

R/V Blissfully
Mission Scientist: Bridget Seegers
Sailed out: 14:59 UTC
Back in port: 21:04 UTC
See end for full R/V Blissfully report

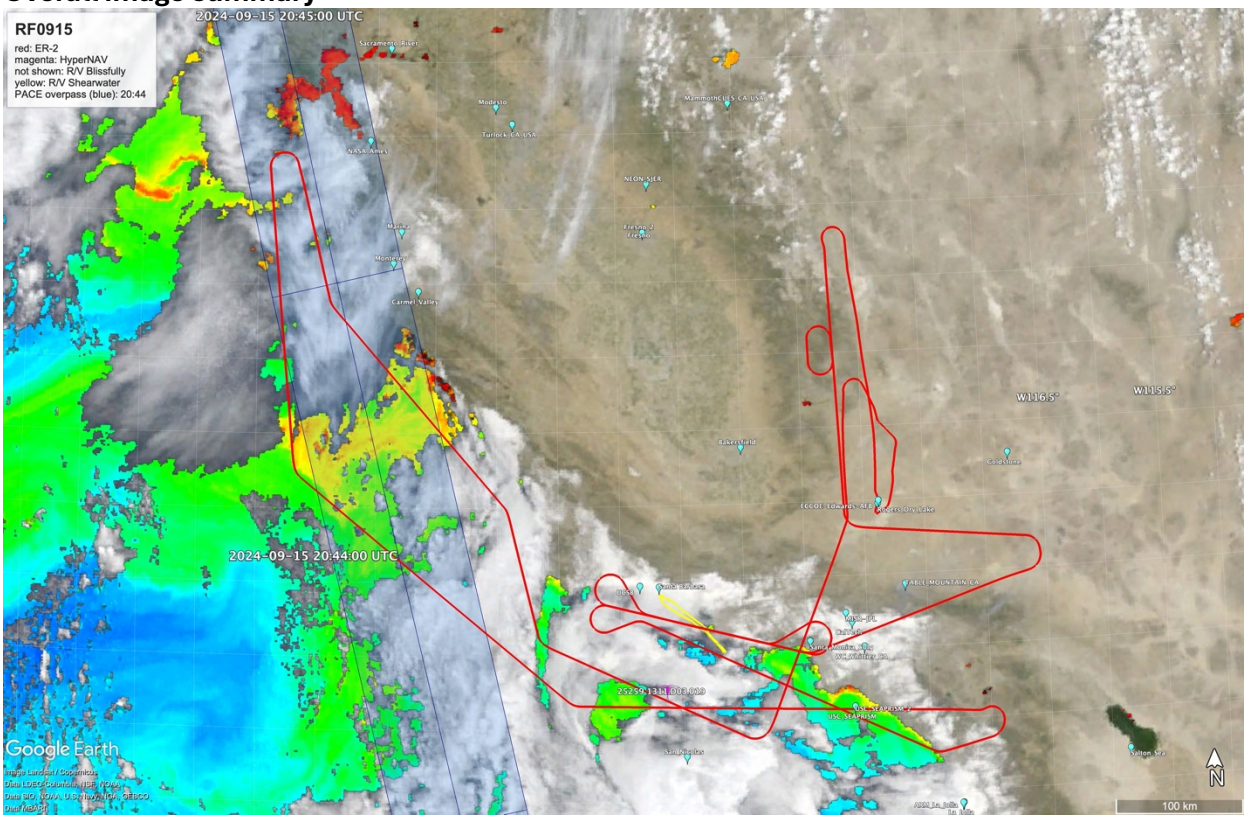
PACE
Overpass at 20:44 (offshore)

EarthCARE
No targeted underpass

Gliders
Operational

HyperNAV
Operational

Overall image summary



Validation Traceability Matrix itemized objectives

VTM elements in **black** satisfied, **blue** partially satisfied, red to be confirmed

Time UTC	Platform	VTM(hrs)	
14:59	RB		Departure
16:24	ER2		Takeoff
17:35	RS		Departure
17:38	ER2		Line over smoke and low clouds. Passes over CalTech AERONET site but there are clouds.
18:35	ER2, gliders		ER-2 over gliders, cloudy
18:45	ER2, RB		ER-2 over R/V Blissfully, but cloudy. Repeat of same at 19:04
19:39	ER2, PACE	1e(1*0.5), 6f(1.0*0.5), 6d(0.5*0.5)	In solar principal plane PACE-OH line extending to 19:57. Counting half because of time difference with PACE overpass. Marine Strat. Clouds with high cloudsand some aerosol layer under – based on HSRL-2
19:57	RB	1b(1.5), 1c(1.5*0.5)	On station for PACE overpass near USC_SeaPRISM. no USC_SeaPRISM archived data.
20:00	RS	1b(1.5*0.5), 1c(1.5*0.5),	On station until 21:28. Partly cloudy conditions with PACE overpass.
20:10	ER2, PACE	1e(1.0*0.5), 3c(1.0*0.5)	Two legs withing PACE-OHS swath. Ends 20:20. Appears to be high/ice clouds over low clouds, No TO
20:30	ER2, PACE	1e(1.0), 6f(1.0)	Final leg, now in PACE-OH swath Marine stratocumulus. , possibly high clouds too.
20:17	HyperNAV		Surfaces

20:41	ER2	4d(1.0*0.5), 1b(1.0)	ER-2 overflies surfacing HyperNAV during PACE overpass. Partial cloudy HyperNAV profile, but clear at surface.
20:44	**PACE**		**PACE overpass**
21:28	RB		On station until 22:23 near USC_SeaPRISM
21:37	ER2		Landing
22:11	RS		On station until 23:07, partly cloudy to clear skies
22:25	RS		Return
21:04	RB		Return

PACE-O: within swath of PACE's OCI instrument
PACE-OH: within swath of PACE's OCI and HARP2 instruments
PACE-OHS: within swath of PACE's OCI, SPEXone and HARP2 instruments
RB: R/V Blissfully
RS: R/V Shearwater
ER2: NASA ER-2

Assessment:

- 3.1% of objectives observed. Largely foiled by clouds over HyperNAV site and other ocean locations. Did manage some cloud observations in PACE-OHS swath.
- Top remaining objectives (score above 6.0): PACE aerosol in narrow swath (3a,b), EarthCARE cloud (3e)

PACE-PAX progress tracking

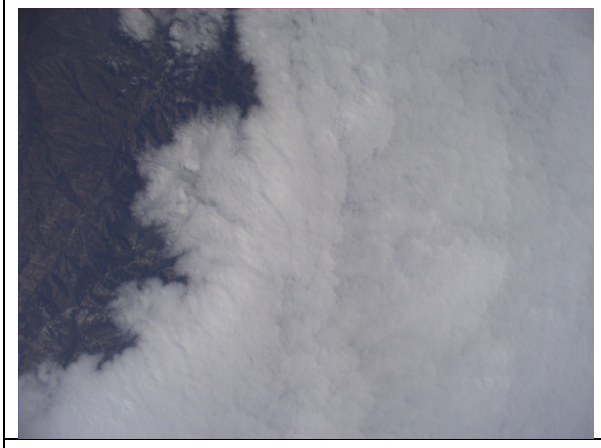
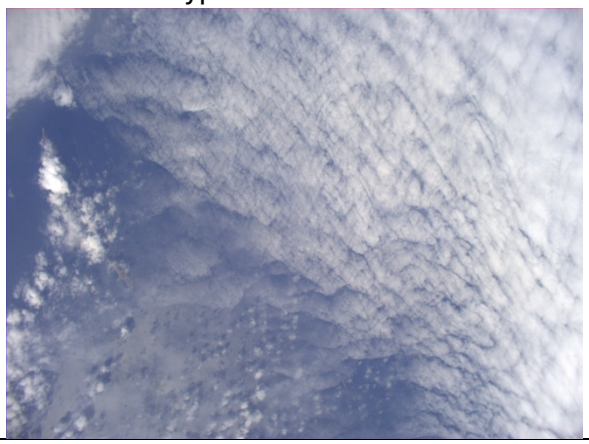
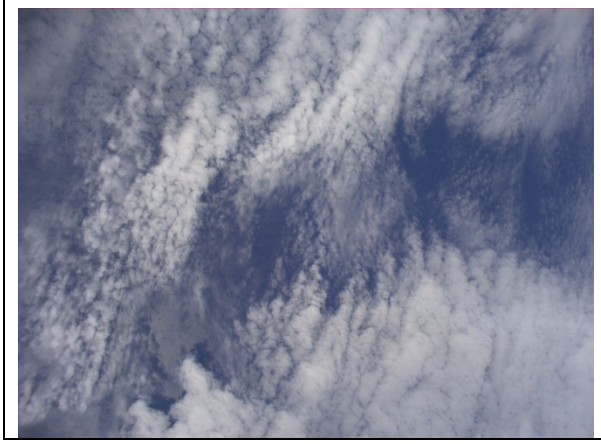
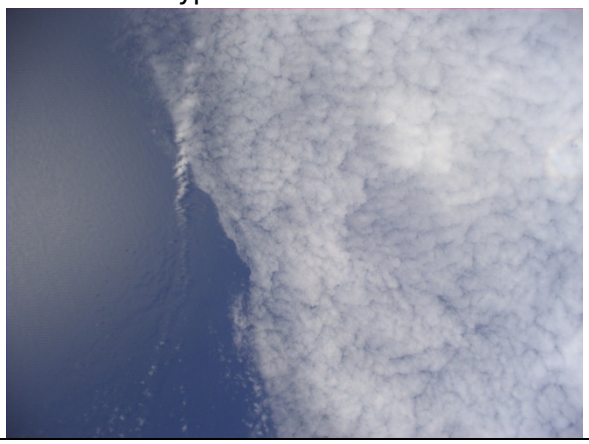
Validation objectives	ID	Measurement objectives	Importance, w	Observation time, h (hours)	Total observed (hours)	Fractional success 9/9	Fractional success 9/10	Fractional success 9/11	Fractional success 9/12	Fractional success 9/13	Fractional success 9/14	Fractional success 9/15	Total success	Remaining score
1. Validate new retrieval properties	a	Land surface parameters	8.000	2.000	1.575	0.000	**0.048**	0.000	0.000	**0.295**	0.000	0.000	**0.545**	3.640
	b	Ocean radiometric parameters	10.000	8.000	25.500	0.000	**0.036**	0.000	**0.067**	**0.010**	0.000	**0.009**	**0.959**	0.413
	c	Aerosol parameters over the ocean	12.000	8.000	19.375	0.000	**0.051**	0.000	**0.050**	**0.022**	0.000	**0.018**	**0.911**	1.065
	d	Aerosol parameters over land	12.000	8.000	45.663	0.000	**0.017**	0.000	**0.023**	**0.030**	0.000	0.000	**0.997**	0.040
	e	Cloud parameters	12.000	8.000	9.500	0.000	0.000	0.000	0.000	0.000	0.000	**0.112**	**0.695**	3.660
	f	Ocean surface parameters	1.000	8.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**1.000**
3. Validate in a narrow swath	a	Aerosol parameters over the ocean (PACE)	10.000	8.000	3.500	0.000	0.000	0.000	**0.133**	0.000	0.000	0.000	**0.354**	6.456
	b	Aerosol parameters over land (PACE)	10.000	8.000	2.125	0.000	0.000	0.000	**0.116**	0.000	0.000	0.000	**0.233**	7.667
	c	Cloud parameters (PACE)	5.000	2.000	2.500	0.000	0.000	0.000	0.000	0.000	0.000	**0.186**	**0.713**	1.433
	d	Aerosol parameters (EarthCARE)	8.000	4.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.465**	4.282
	e	Cloud parameters (EarthCARE)	8.000	4.000	0.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.118**	7.060
4. Validate radiometric and polarimetric properties	a	Validate large reflectances	6.000	2.000	1.125	0.000	**0.061**	0.000	0.000	**0.370**	0.000	0.000	**0.430**	3.419
	b	Validate large reflectances with high polarization	6.000	2.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.393**	3.639
	c	Validate large reflectances with low polarization	6.000	2.000	3.000	0.000	0.000	0.000	0.000	**0.145**	0.000	0.000	**0.777**	1.339
	d	Overfly vicarious calibration sites	6.000	4.000	1.250	0.000	**0.268**	0.000	0.000	0.000	0.000	0.000	**0.268**	4.390
6. Focus on specific processes or phenomena	a	High aerosol loads over land	4.000	2.000	20.750	0.000	**0.410**	0.000	0.000	**0.197**	0.000	0.000	**1.000**	0.000
	b	High aerosol loads over ocean	4.000	2.000	1.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.393**	2.426
	c	Multiple aerosol layers	1.000	2.000	21.625	0.000	0.000	0.000	0.000	**0.127**	0.000	0.000	**1.000**	0.000
	d	Aerosol under thin cirrus	2.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**2.000**
	e	Aerosol above liquid phase cloud	4.000	2.000	3.500	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**0.826**	0.695
	f	Broken clouds with complex structure	4.000	2.000	1.500	0.000	0.000	0.000	0.000	0.000	0.000	**0.528**	**0.528**	1.889
	g	Dust aerosols over ocean	4.000	2.000	1.125	0.000	0.000	0.000	**0.430**	0.000	0.000	0.000	**0.430**	2.279
	h	Aerosol and ocean parameters over turbid waters	2.000	2.000	3.125	0.000	0.000	0.000	**0.569**	0.000	0.000	0.000	**0.790**	0.419
	i	Aerosol and ocean parameters over biologically productive waters	4.000	2.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	**4.000**
	k	Smoke aerosols over ocean	1.000	2.000	2.500	0.000	0.000	0.000	0.000	**0.320**	0.000	0.000	**0.713**	0.287
		total:	150.000	98.000	171.738	0.000	0.034	0.000	0.046	0.049	0.000	0.031	0.577	
														total
				ER-2 flight hours	18.900	0.000	4.300	0.000	0.000	6.300	0.000	0.000	0.000	**10.600**
				TO flight hours	22.200	0.000	0.000	0.000	3.700	7.500	0.000	0.000	0.000	**11.200**
				Shearwater days	2.000	0.000	1.000	0.000	1.000	1.000	0.000	0.000	0.000	**3.000**

PACE-PAX overall objectives satisfied: 0.577

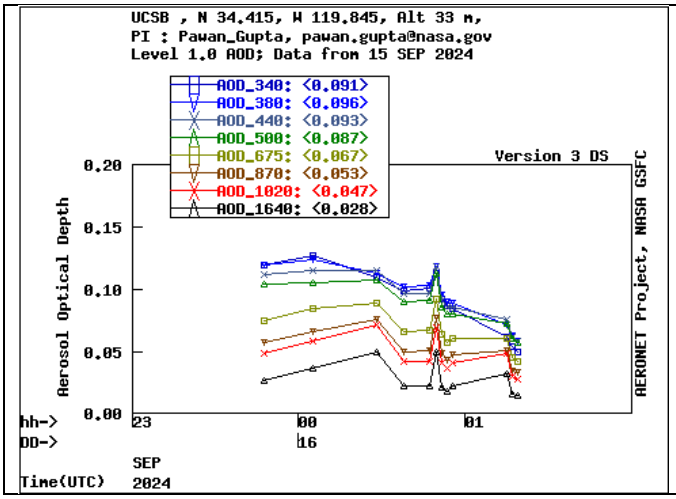
Note: images and data presented in this report are preliminary, and not for publication, presentation, or scientific use. The PACE-PAX data archive is:

https://www-air.larc.nasa.gov/missions/pacepax/index.html

ER-2 MVIS quicklooks

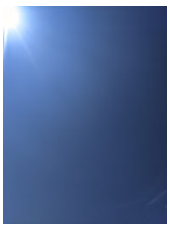
17:38 over CalTech aeronet 	18:35 Over HyperNAV 
20:24 in PACE-OHS swath 	20:41 over HyperNAV 

AERONET quicklooks

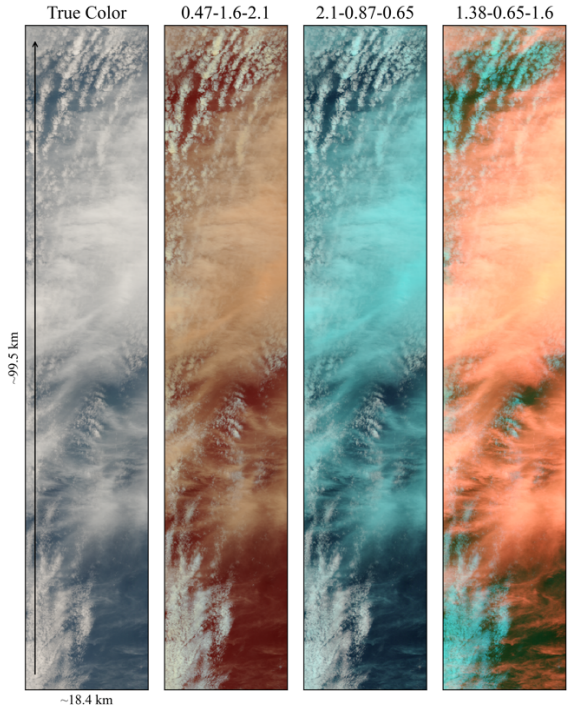


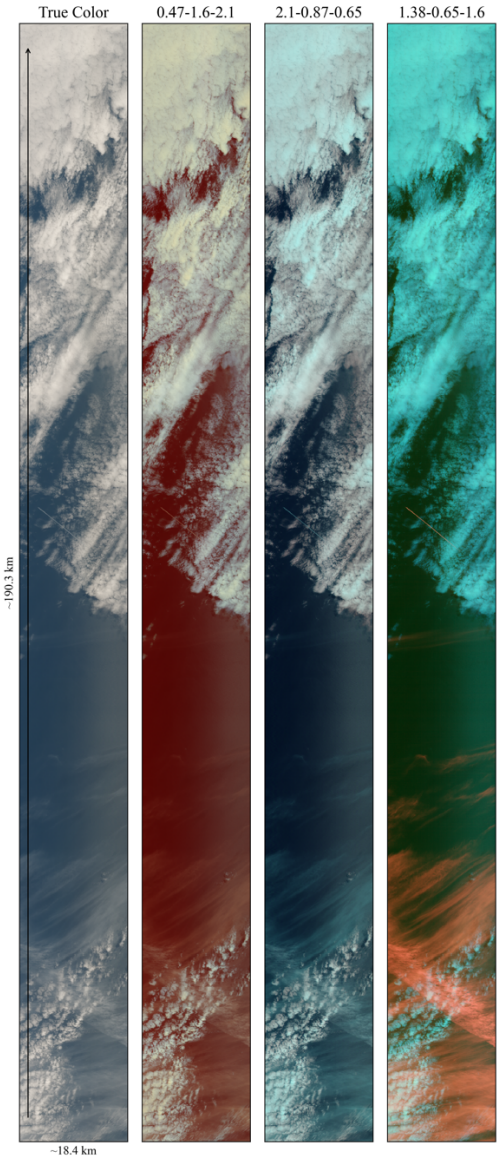
R/V Blissfully photos

a) PACE overflight 20:44 UTC – sampling started at 19:57 utc

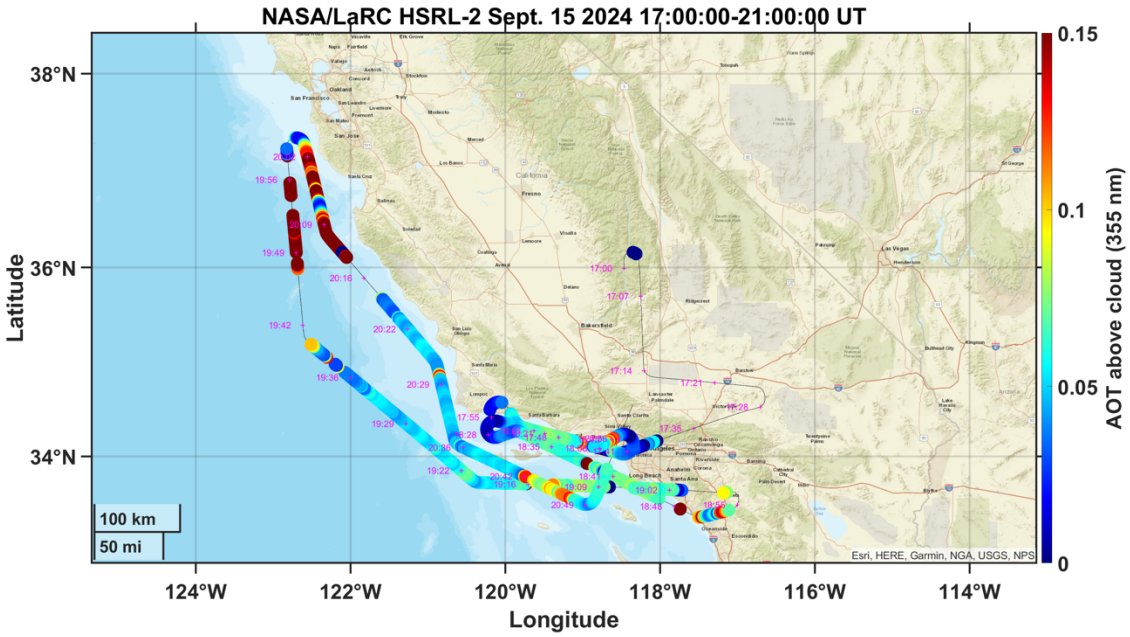
 clear skies for PACE

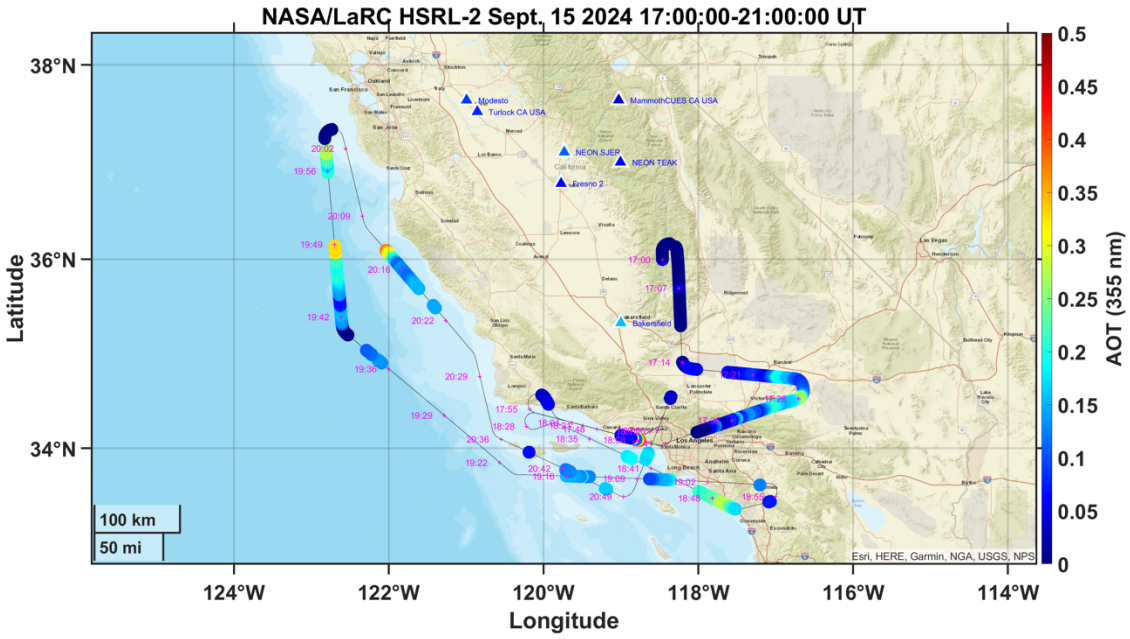
ER-2/PICARD, PACE swath

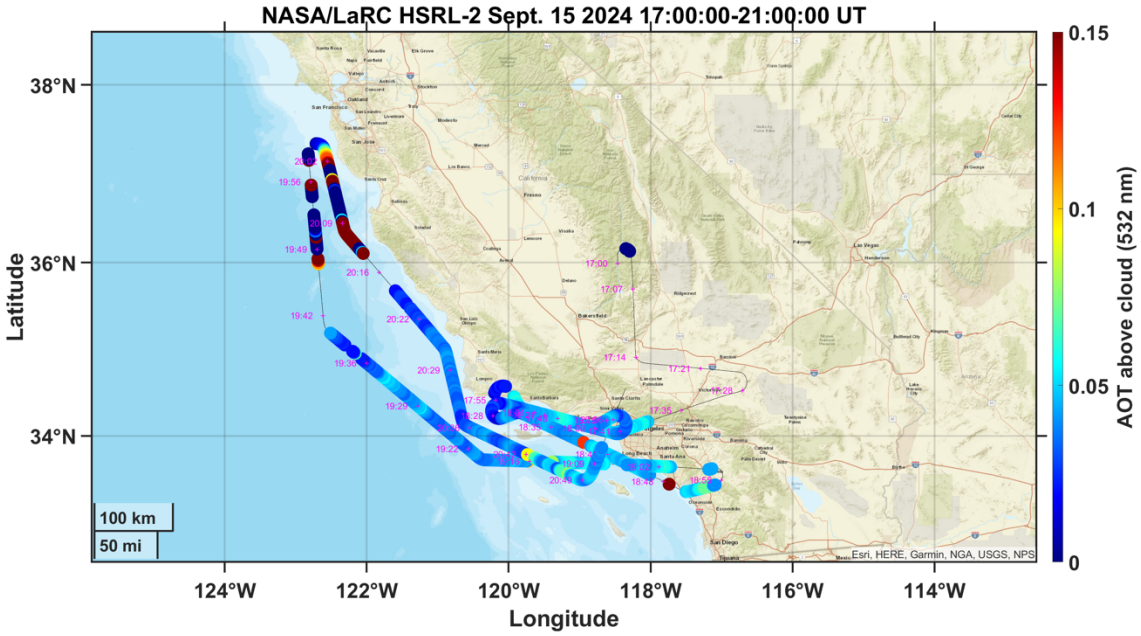


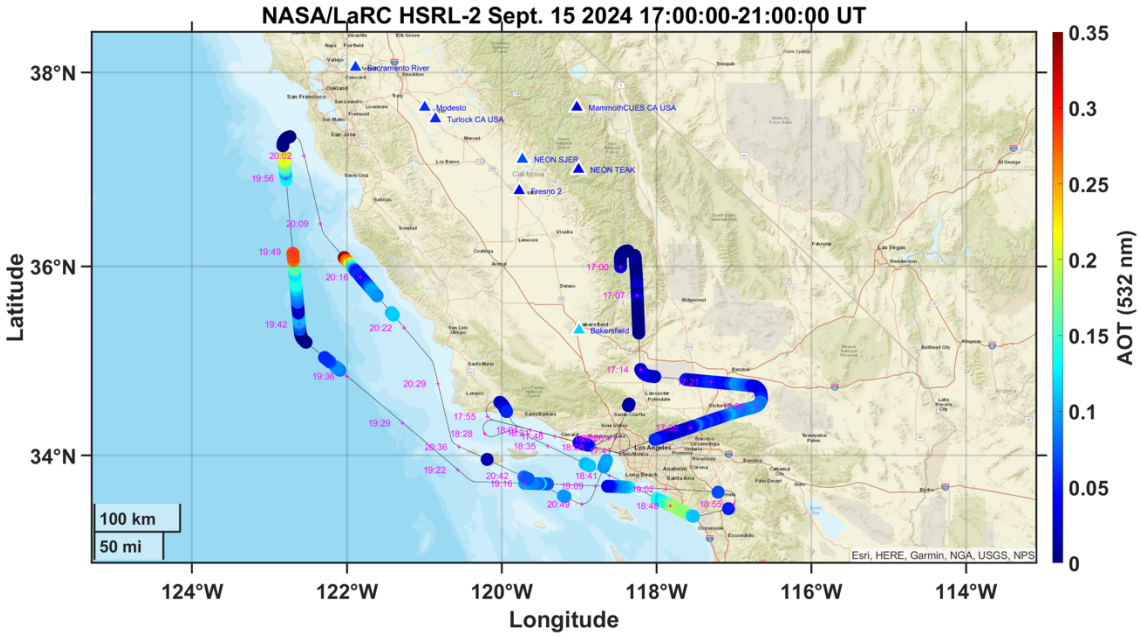


ER-2/HSRL

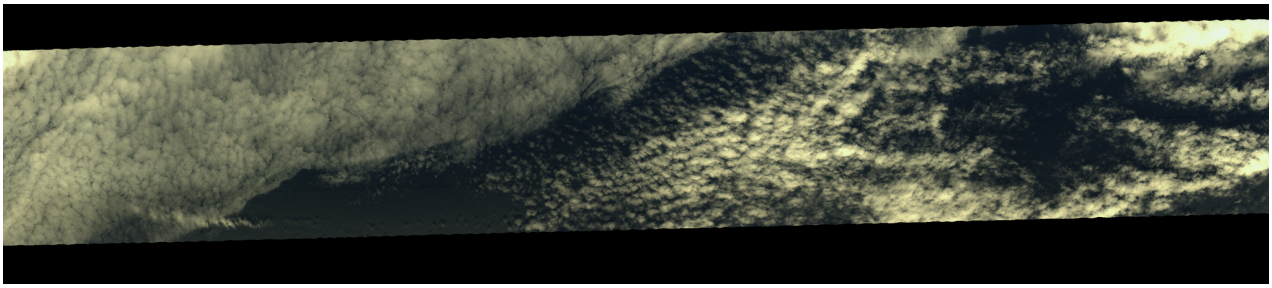

NASA/LaRC HSRL-2 Sept. 15 2024 17:00:00-21:00:00 UT
38°N
36°N
34°N
Latitude
124°W
122°W
120°W
118°W
116°W
114°W
Longitude
AOT above cloud (355 nm)
0.15
0.1
0.05
0
100 km
50 mi
Esri, HERE, Garmin, NGA, USGS, NPS


NASA/LaRC HSRL-2 Sept. 15 2024 17:00:00-21:00:00 UT
Modesto
Turlock CA USA
MammothCUES CA USA
NEON SJER
NEON TEAK
Fresno 2
Bakersfield
38°N
36°N
34°N
Latitude
124°W
122°W
120°W
118°W
116°W
114°W
Longitude
AOT (355 nm)
0.5
0.45
0.4
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
100 km
50 mi
Esri, HERE, Garmin, NGA, USGS, NPS

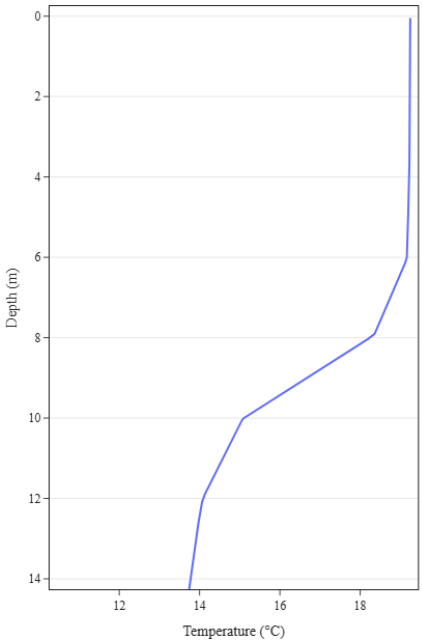

NASA/LaRC HSRL-2 Sept. 15 2024 17:00:00-21:00:00 UT
38°N
36°N
34°N
Latitude
124°W
122°W
120°W
118°W
116°W
114°W
Longitude
100 km
50 mi
Esri, HERE, Garmin, NGA, USGS, NPS
0.15
0.1
0.05
0
AOT above cloud (532 nm)

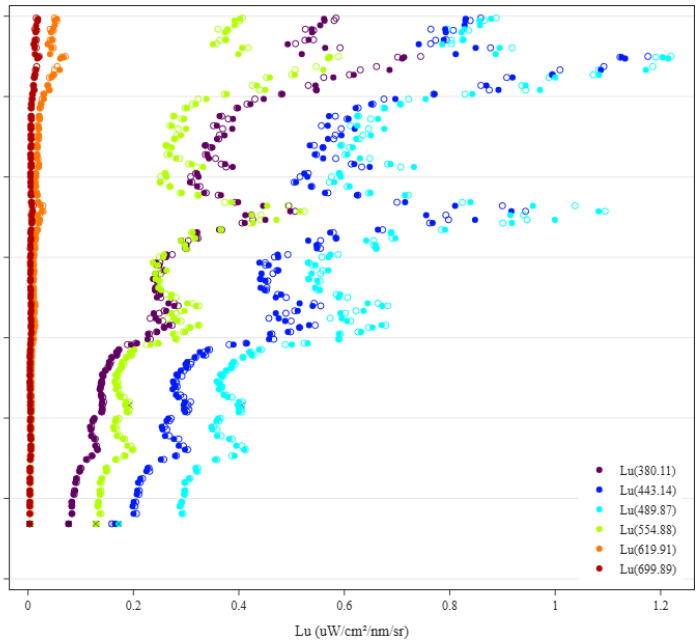

NASA/LaRC HSRL-2 Sept. 15 2024 17:00:00-21:00:00 UT
Sacramento River
Modesto
Turlock CA USA
MammothCUES CA USA
NEON SJER
NEON TEAK
Fresno 2
Bakersfield
38°N
36°N
34°N
Latitude
124°W
122°W
120°W
118°W
116°W
114°W
Longitude
100 km
50 mi
Esri, HERE, Garmin, NGA, USGS, NPS
0.35
0.3
0.25
0.2
0.15
0.1
0.05
0
AOT (532 nm)

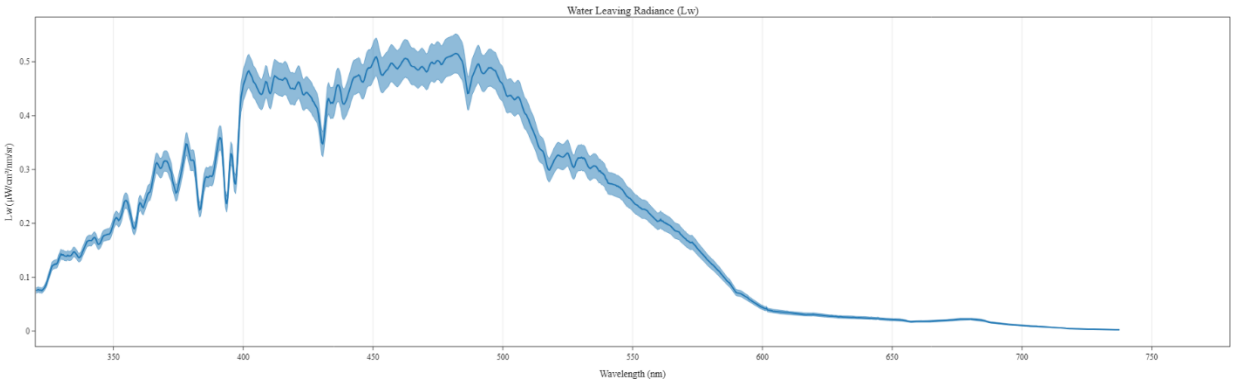
ER-2/PRISM
HyperNAV location



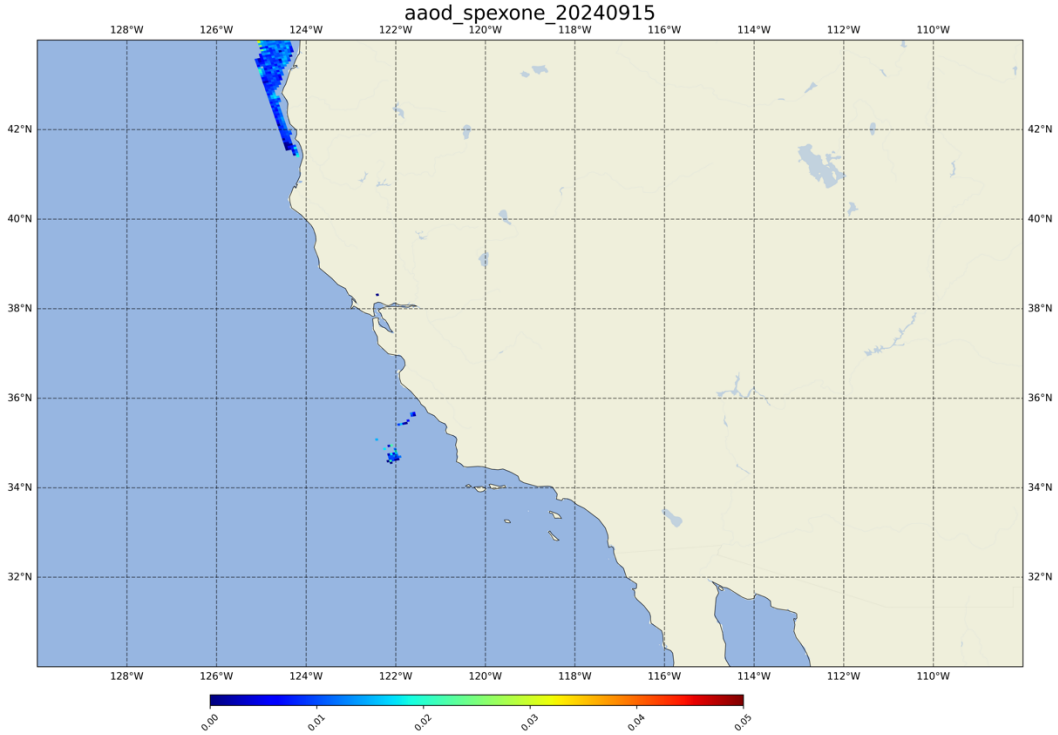
HyperNAV quicklook

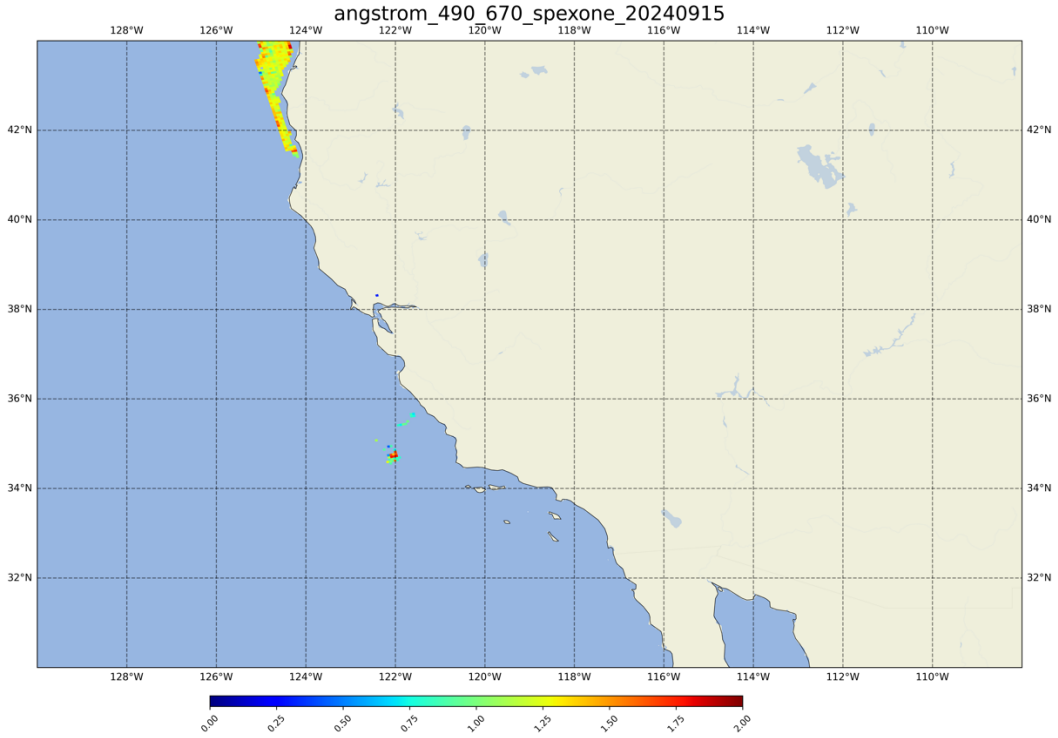


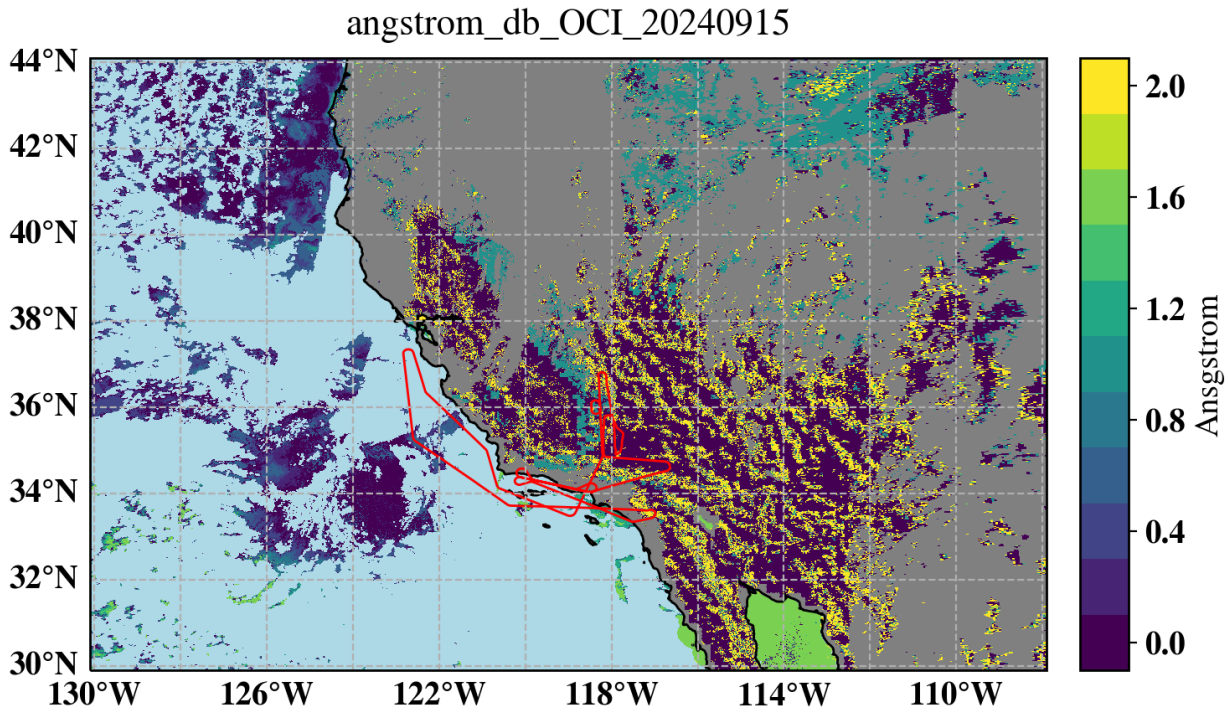


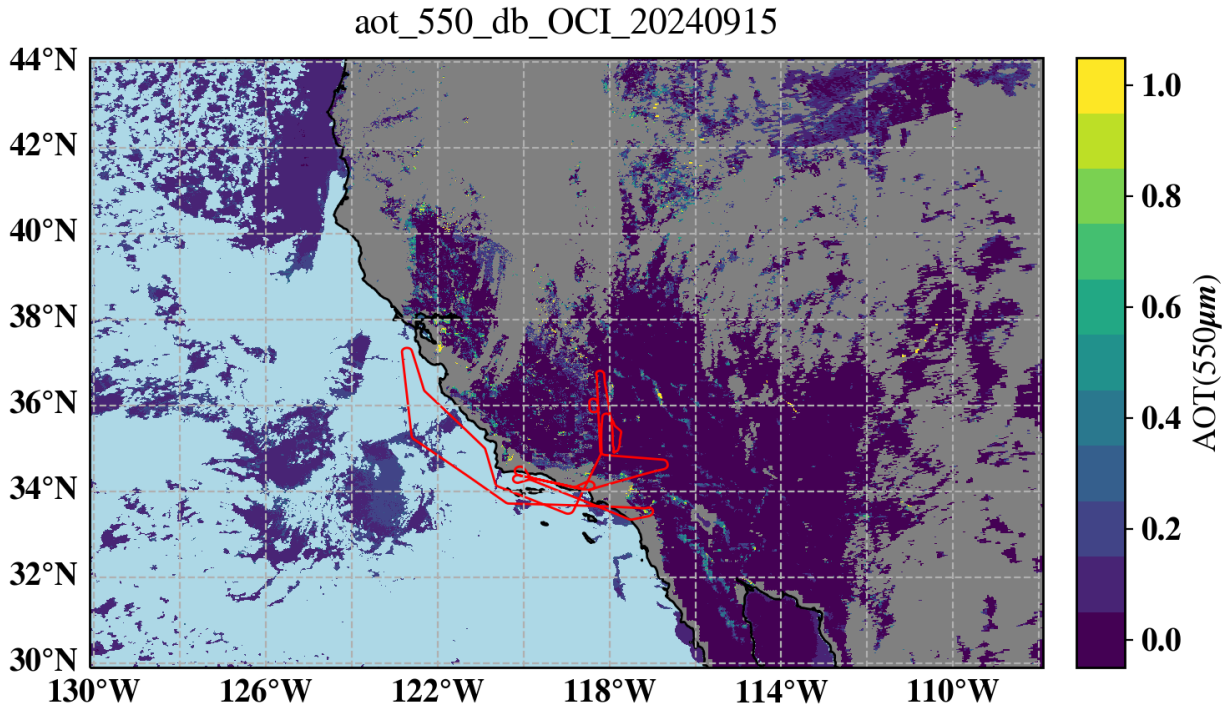


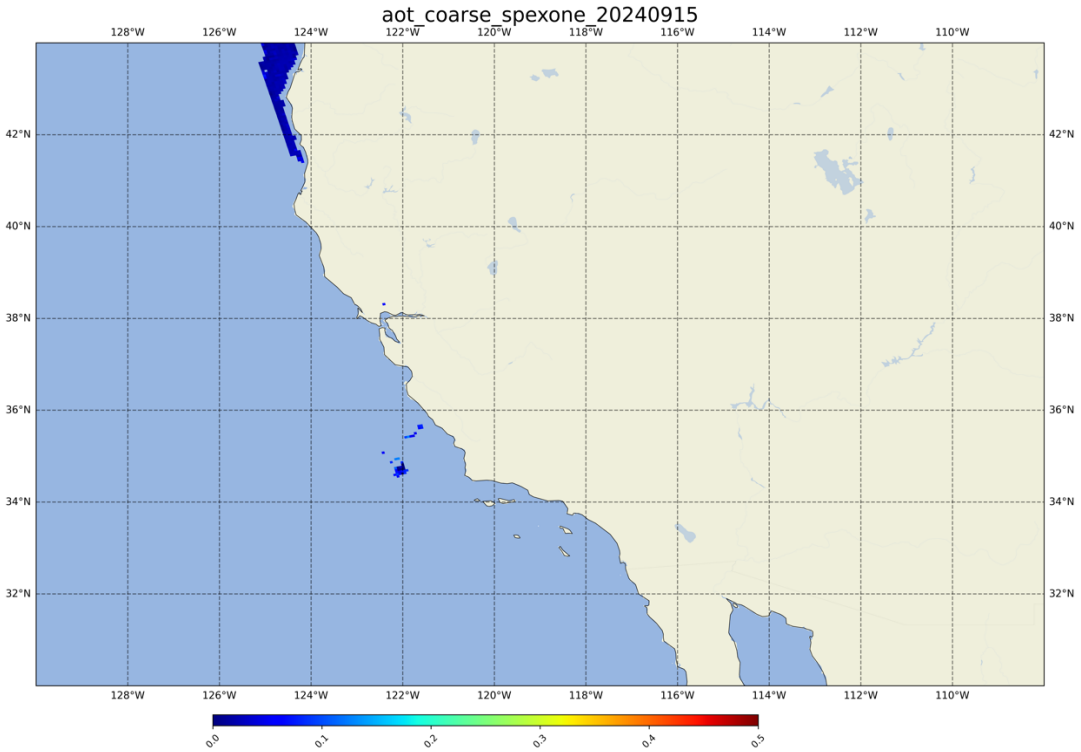
PACE Satellite products

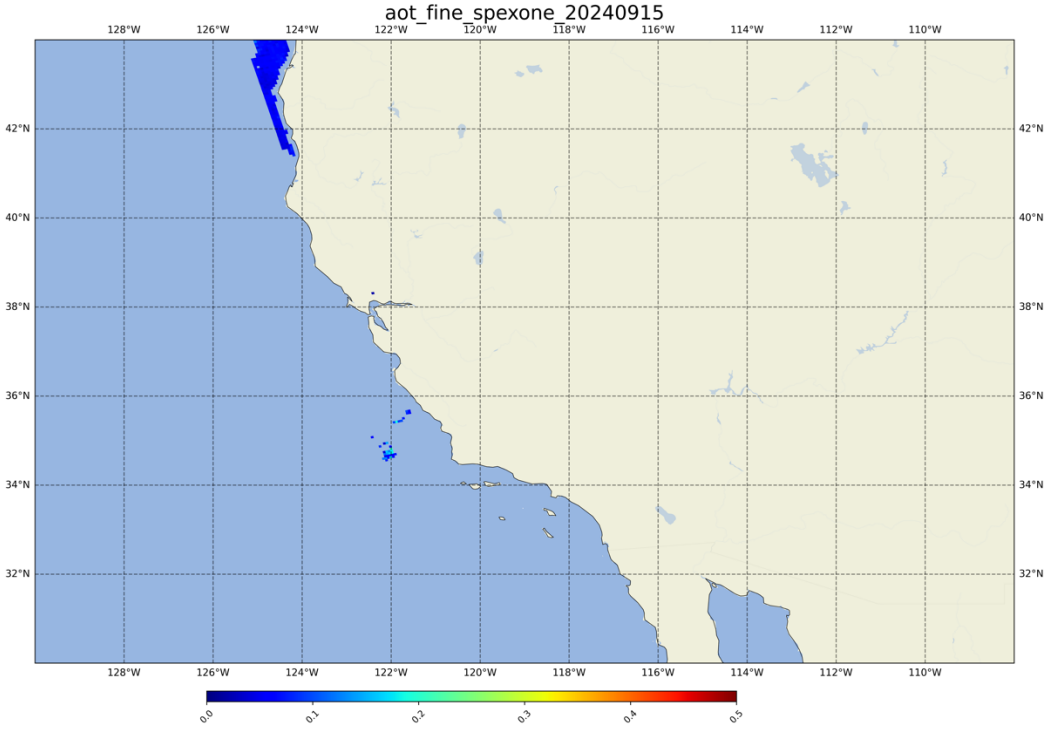


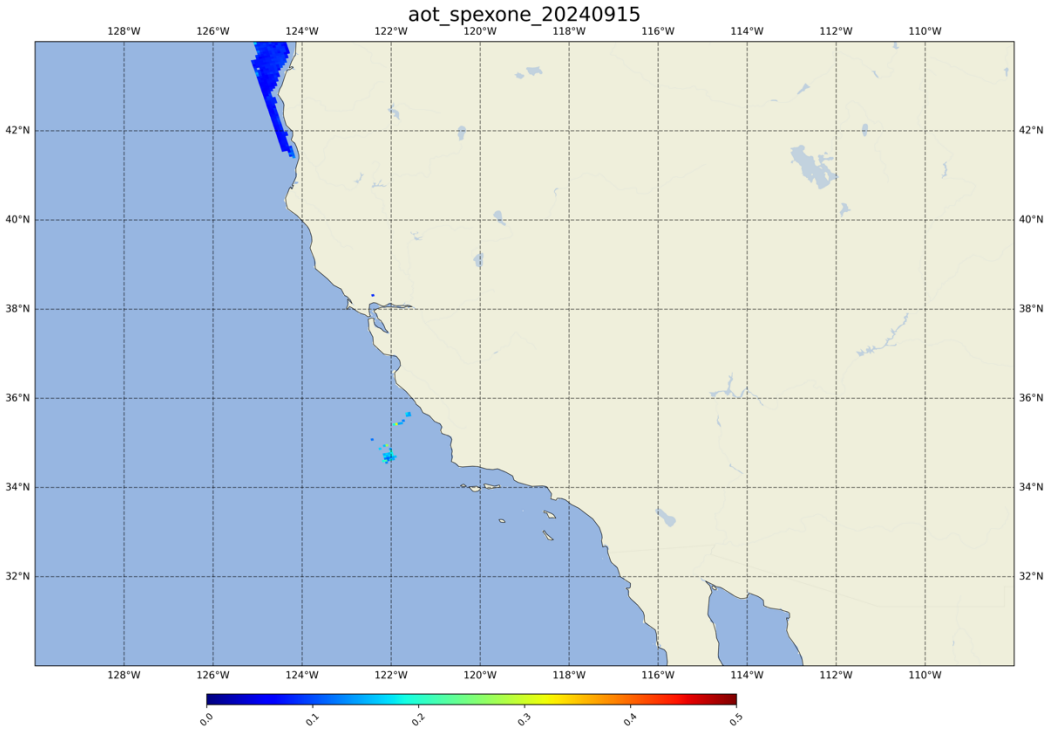


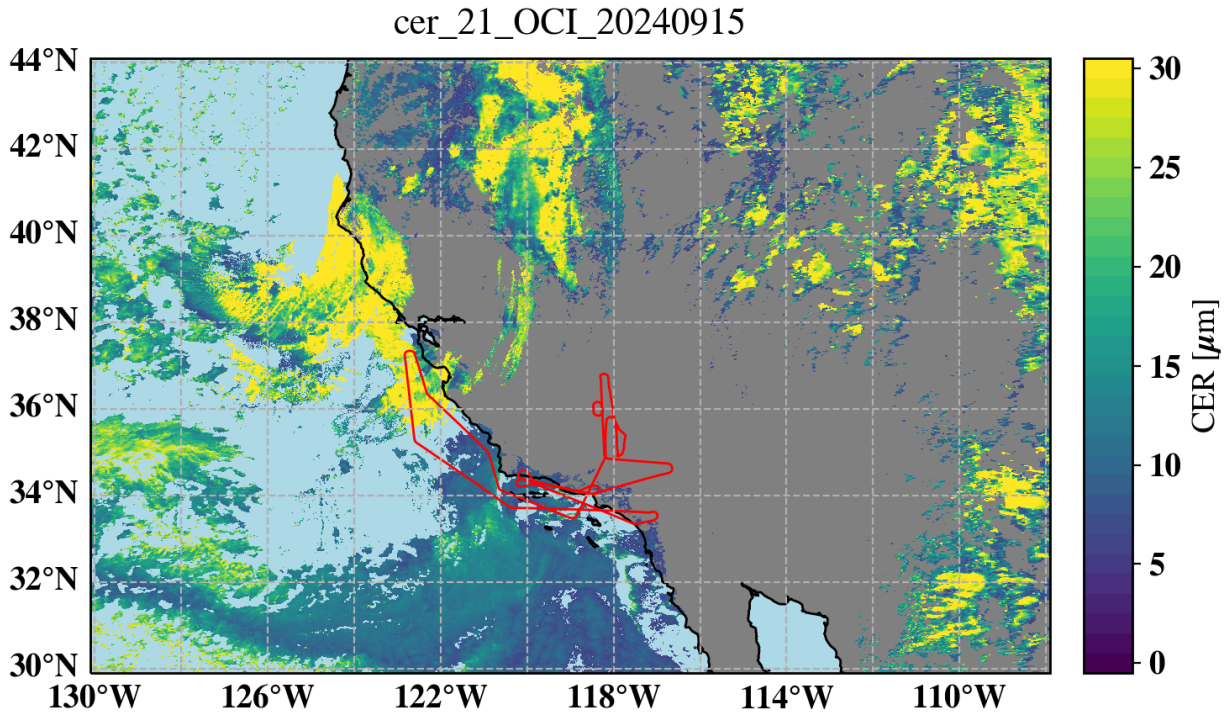

angstrom_db_OCI_20240915
44°N
42°N
40°N
38°N
36°N
34°N
32°N
30°N
130°W
126°W
122°W
118°W
114°W
110°W
2.0
1.6
1.2
0.8
0.4
0.0
Ansgstrom

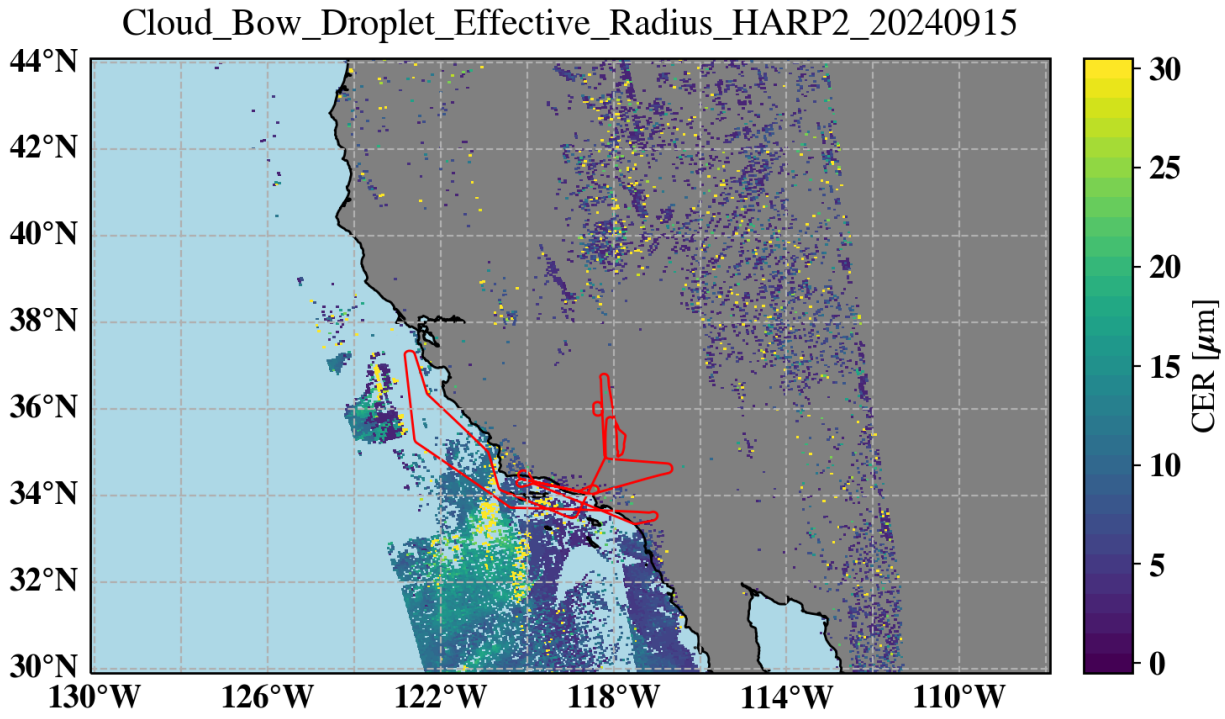

aot_550_db_OCI_20240915
44°N
42°N
40°N
38°N
36°N
34°N
32°N
30°N
130°W
126°W
122°W
118°W
114°W
110°W
1.0
0.8
0.6
0.4
0.2
0.0
AOT(550μm)

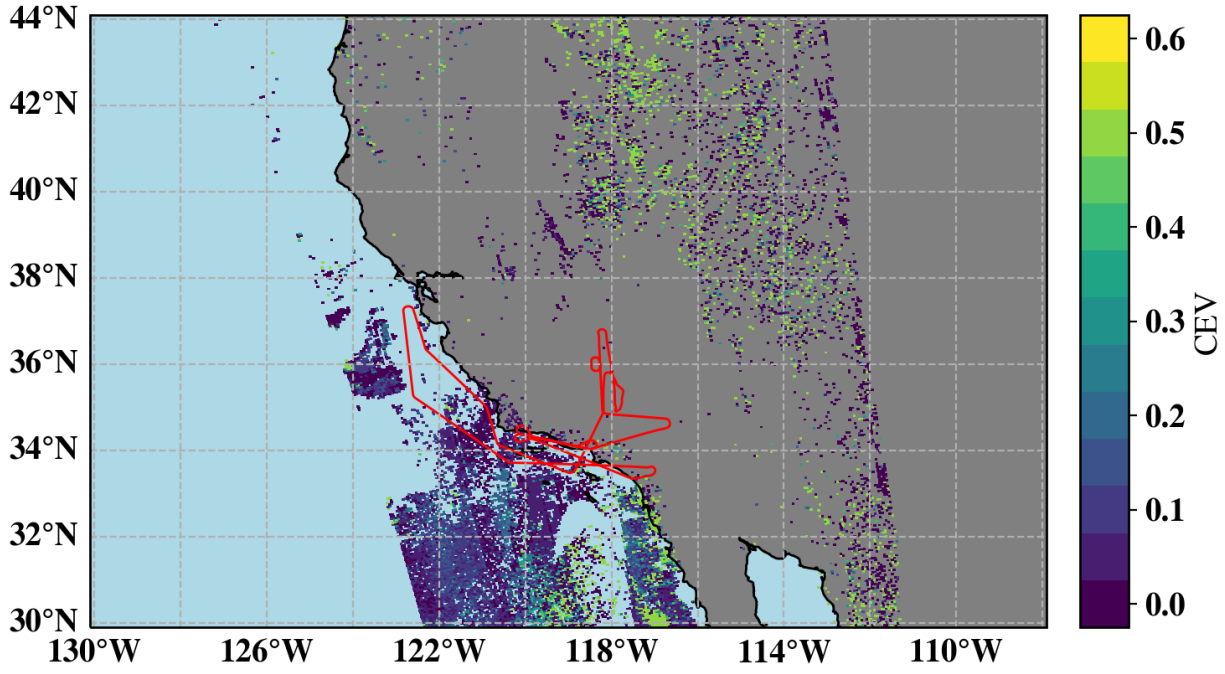

aot_coarse_spexone_20240915
128°W
126°W
124°W
122°W
120°W
118°W
116°W
114°W
112°W
110°W
42°N
40°N
38°N
36°N
34°N
32°N
0.0
0.1
0.2
0.3
0.4
0.5

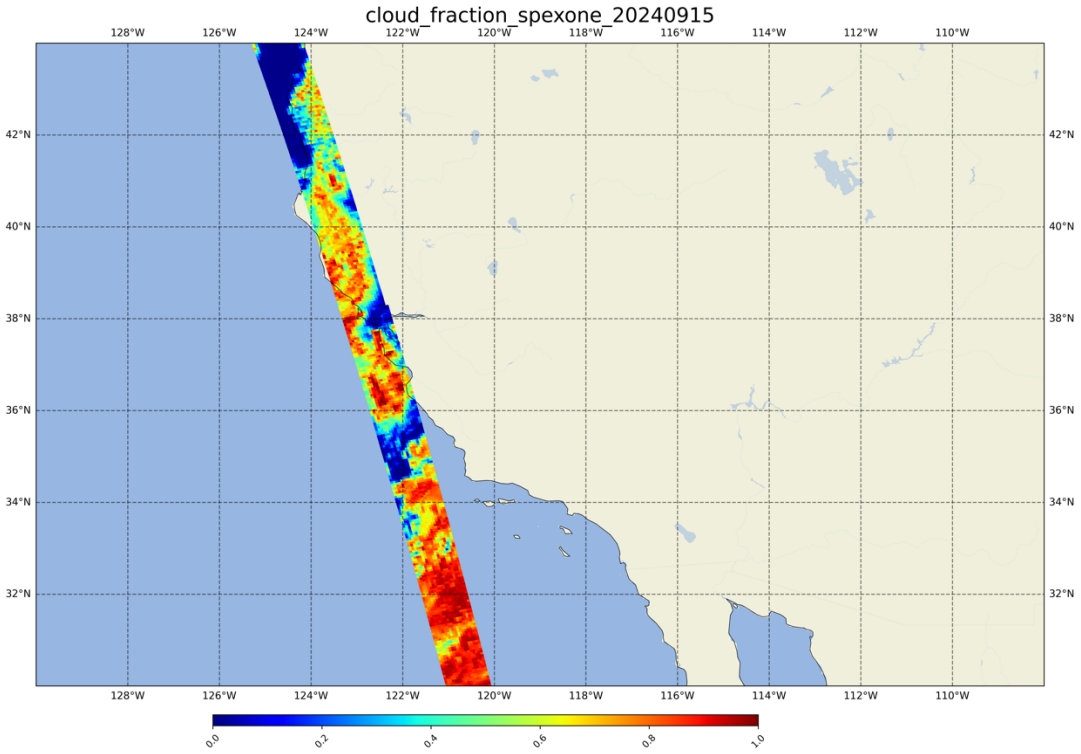

aot_fine_spexone_20240915
128°W
126°W
124°W
122°W
120°W
118°W
116°W
114°W
112°W
110°W
42°N
40°N
38°N
36°N
34°N
32°N
0.0
0.1
0.2
0.3
0.4
0.5

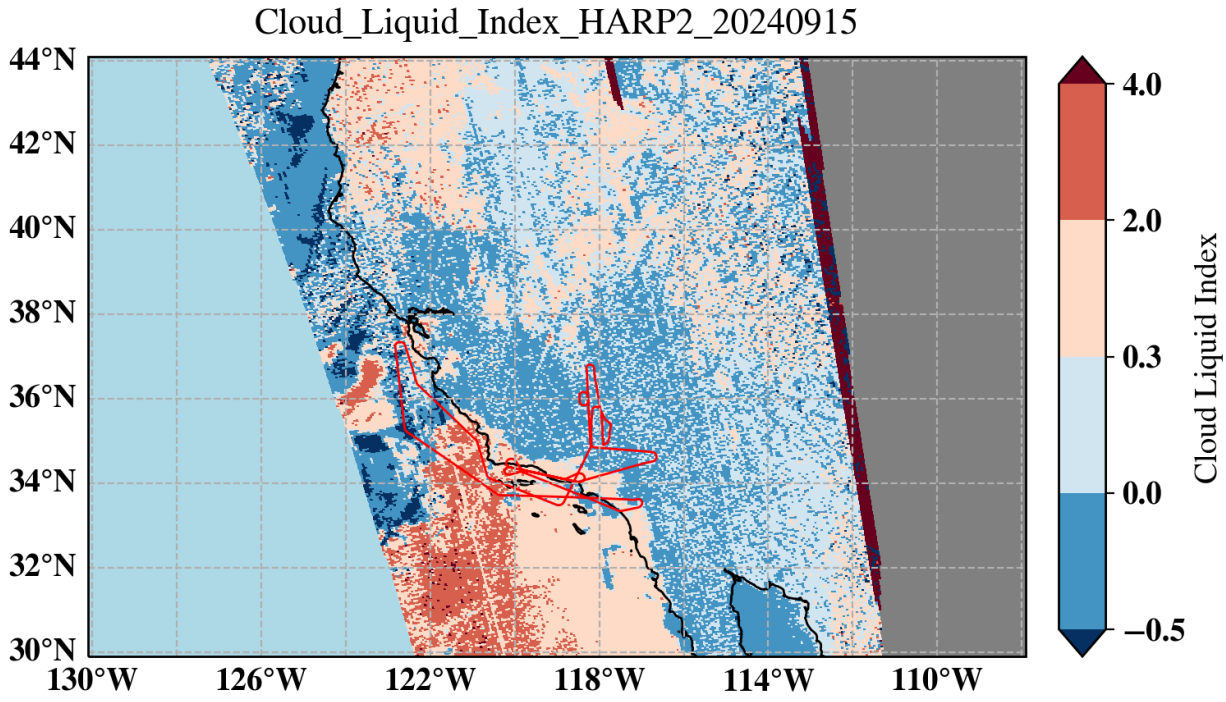

aot_spexone_20240915
128°W
126°W
124°W
122°W
120°W
118°W
116°W
114°W
112°W
110°W
42°N
40°N
38°N
36°N
34°N
32°N
0.0
0.1
0.2
0.3
0.4
0.5

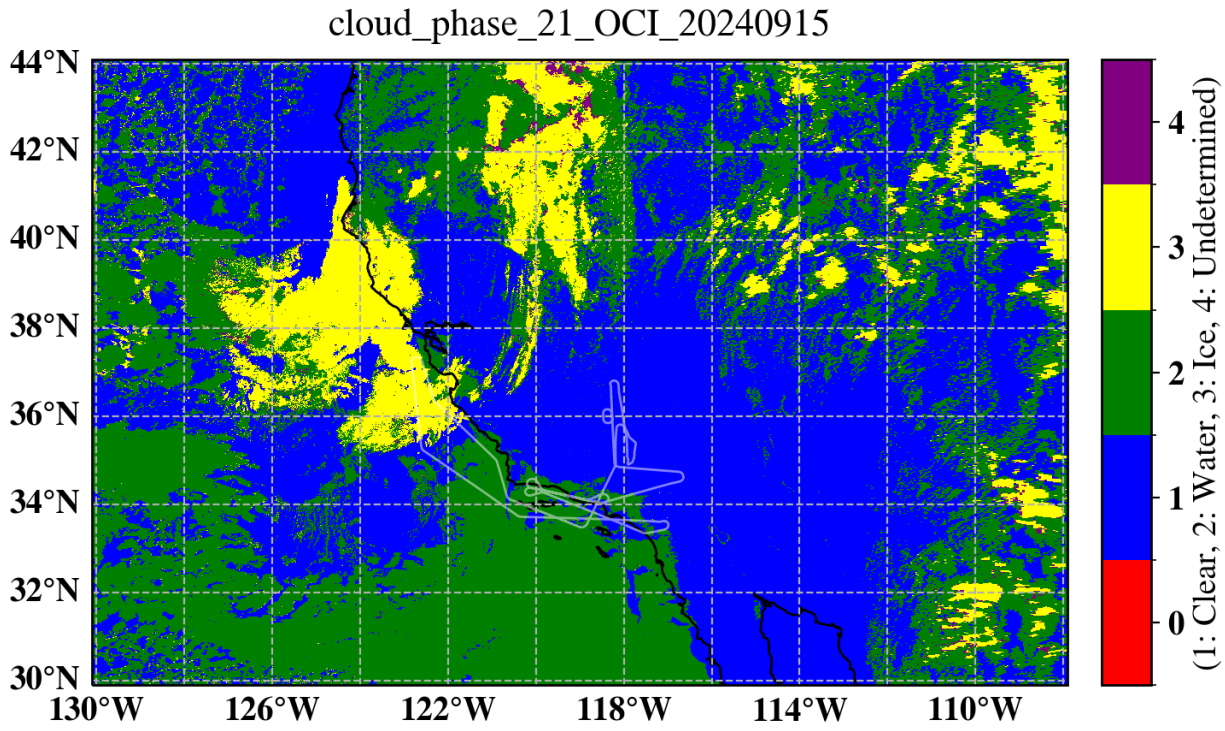

cer_21_OCI_20240915
44°N
42°N
40°N
38°N
36°N
34°N
32°N
30°N
130°W
126°W
122°W
118°W
114°W
110°W
30
25
20
15
10
5
0
CER [μm]

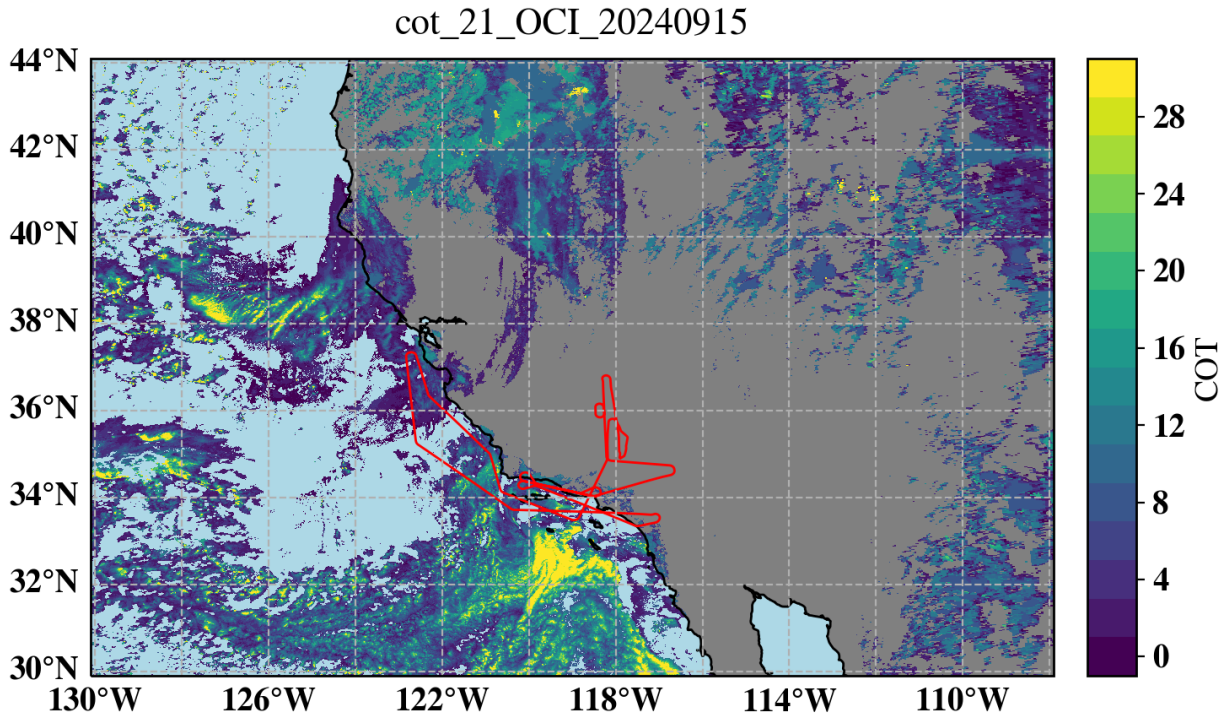

Cloud_Bow_Droplet_Effective_Radius_HARP2_20240915
44°N
42°N
40°N
38°N
36°N
34°N
32°N
30°N
130°W
126°W
122°W
118°W
114°W
110°W
30
25
20
15
10
5
0
CER [μm]

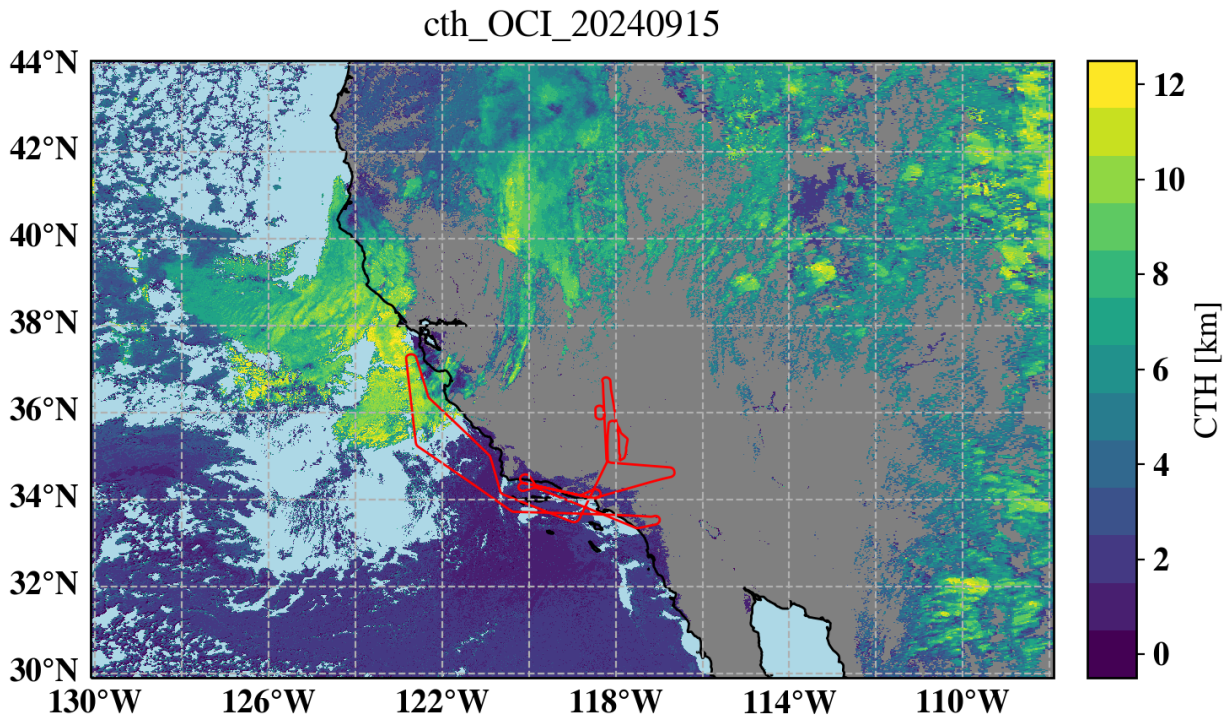

Cloud_Bow_Droplet_Effective_Variance_HARP2_20240915
44°N
42°N
40°N
38°N
36°N
34°N
32°N
30°N
130°W
126°W
122°W
118°W
114°W
110°W
0.6
0.5
0.4
0.3
0.2
0.1
0.0
CEV

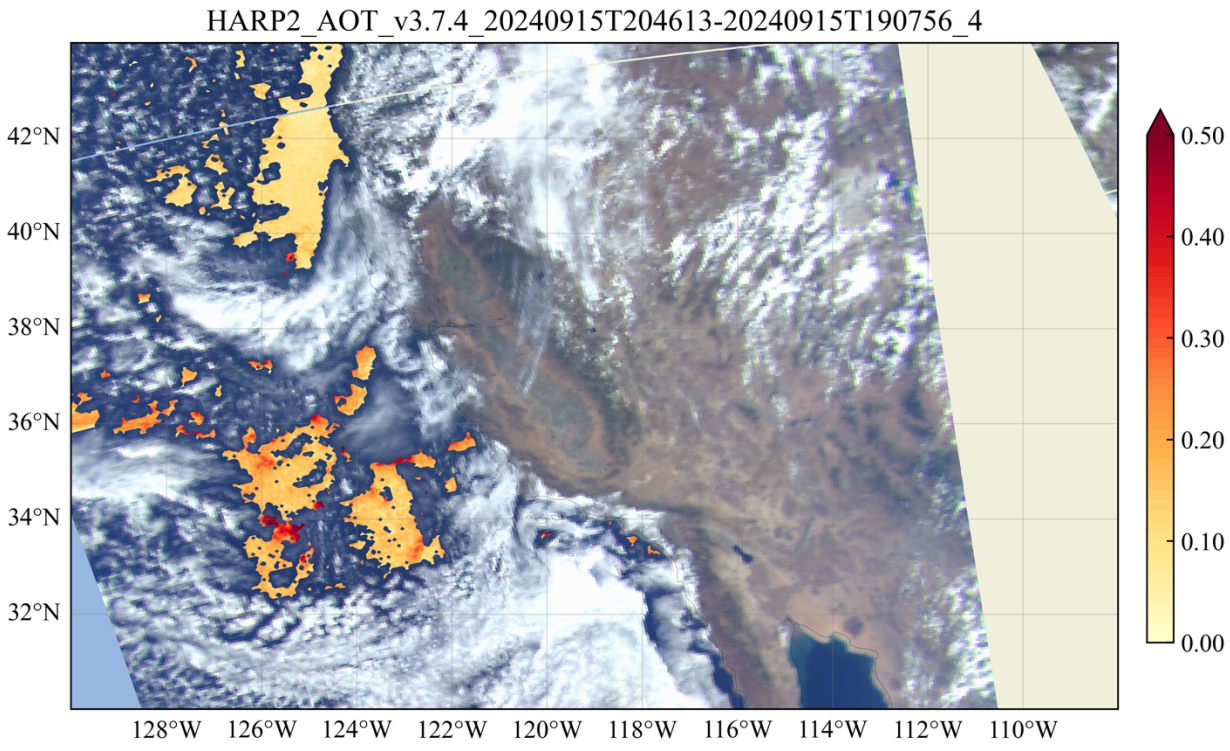

cloud_fraction_spexone_20240915
128°W
126°W
124°W
122°W
120°W
118°W
116°W
114°W
112°W
110°W
42°N
40°N
38°N
36°N
34°N
32°N
0.0
0.2
0.4
0.6
0.8
1.0


Cloud_Liquid_Index_HARP2_20240915
44°N
42°N
40°N
38°N
36°N
34°N
32°N
30°N
130°W
126°W
122°W
118°W
114°W
110°W
4.0
2.0
0.3
0.0
−0.5
Cloud Liquid Index


cloud_phase_21_OCI_20240915
44°N
42°N
40°N
38°N
36°N
34°N
32°N
30°N
130°W
126°W
122°W
118°W
114°W
110°W
4
3
2
1
0
(1: Clear, 2: Water, 3: Ice, 4: Undetermined)


cot_21_OCI_20240915
44°N
42°N
40°N
38°N
36°N
34°N
32°N
30°N
130°W
126°W
122°W
118°W
114°W
110°W
28
24
20
16
12
8
4
0
COT


cth_OCI_20240915
44°N
42°N
40°N
38°N
36°N
34°N
32°N
30°N
130°W
126°W
122°W
118°W
114°W
110°W
12
10
8
6
4
2
0
CTH [km]


HARP2_AOT_v3.7.4_20240915T204613-20240915T190756_4
42°N
40°N
38°N
36°N
34°N
32°N
128°W
126°W
124°W
122°W
120°W
118°W
116°W
114°W
112°W
110°W
0.50
0.40
0.30
0.20
0.10
0.00

R/V Shearwater report

PACE-PAX R/V Shearwater day report

Date: 09/15/2024

Creator: Michael Ondrusek

Cruise ID: RF0915-RS

Sailed out: 1035 PST

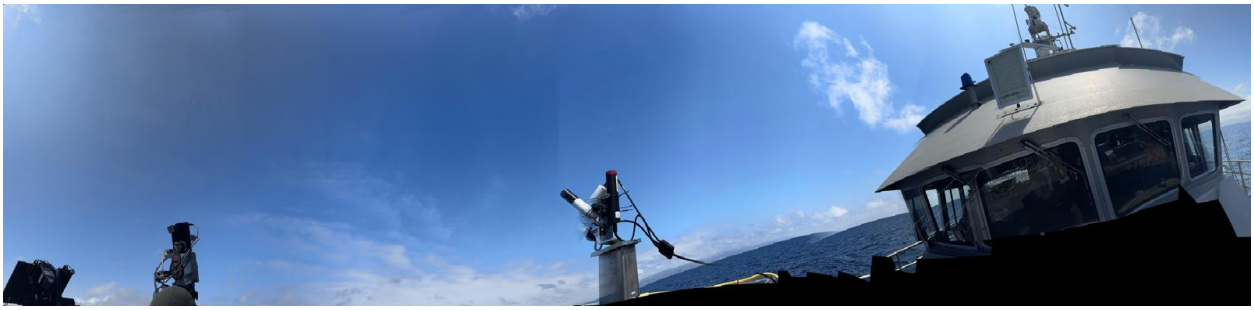
Back in port: 1725 PST

Today, the ship occupied two stations

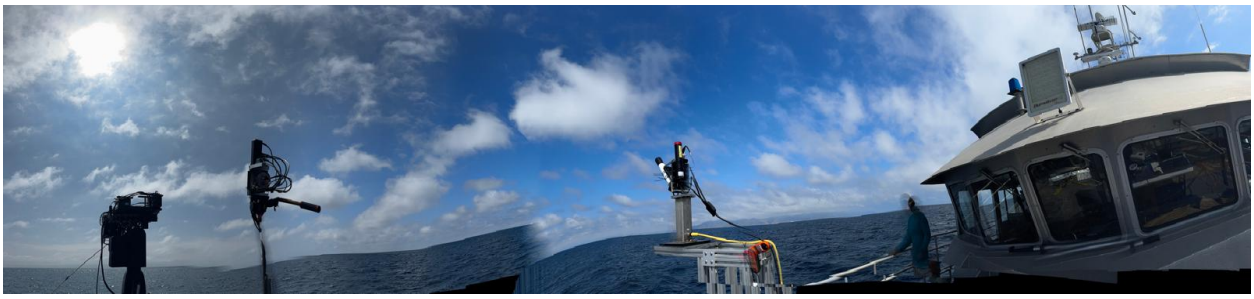
Station #14 34° 00.891', -119° 10.441' arrival 20:00 UTC →departure 21:28 UTC.

Cloudy all morning. Did profiles first in and out of clouds. Then did polarimager then IOP's.

Arrival photo:



Departure photo (departure location - 34° 00.890', -119° 09.368')

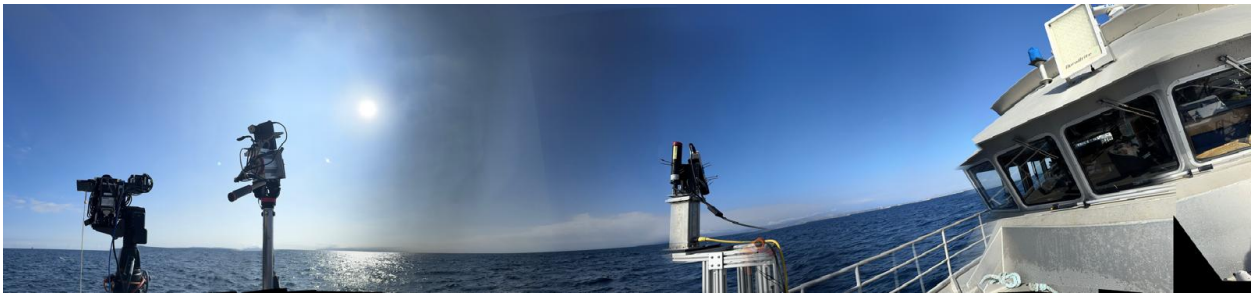


Station #15 34° 09.595’ -119° 16.653’, arrival 22:11 UTC→ departure 23:07 UTC

Found hole on way back in that was clear during the 1415 VIIRS overpass. NRL Hyperpro quit on second set so continues with mpr 179 and C-Ops. Did IOPs and then polarimager.

Arrival photo:

Departure photo:



System Status:

Problems with 179 Hyuperpro.

Group Status: All's well.

R/V Blissfully report

PACE-PAX R/V Blissfully day report

Date: 09/15/2024

Creator: Bridget Seegers

Cruise ID: RF0915-RB

Sailed out: 14:59 UTC

Back in port: 21:04 UTC

Today, the ship accomplished….

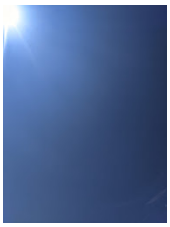
Collection of vertical radiometry profiles and discrete sample collection (HPLC + ap) on two stations in proximity of SeaPRISM site. The station had three sets of 5 HyperPro profiles to 20m and a single deep cast to ~35m, because of shallow bottom. Discrete water samples included triplicate HPLC + ap and duplicate community composition Lugol's preserved and paraformaldehyde samples for flow cytometry.

Stations:

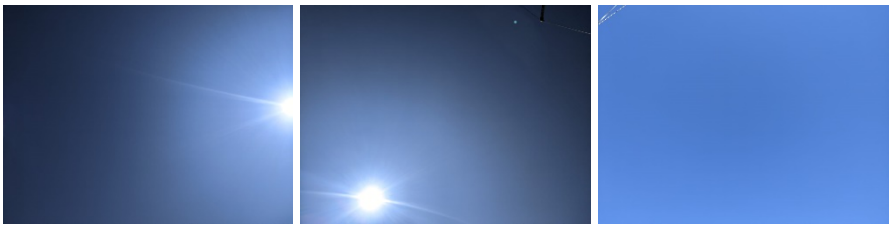
33.651571°, -118.117143°, arrival at 18:53 UTC, delayed sampling (cruise station RB_12) until 19:57 with clear skies PACE window

a) ER-2 overflight 19:03 UTC – sampling delayed, cloudy (see below)

b) PACE overflight 20:44 UTC – sampling started at 19:57 utc

 clear skies for PACE

Station #2 (cruise station RB_13) 33.63638, -118.116617, arrival 21:28, departure 22:23 UTC



Tomorrow, RV Blissfully

Ship plans through the next 3 days…

Sampling in coordination with rest of the experiment

System Status…

All good

Group Status…

All great