

PACE-PAX research report 2024/09/19

Compiled by Kirk Knobelspiesse, Ivona Cetinić, Michael Ondrusek, Bridget Seegers
2024/09/28

Reviewed by Samuel LeBlanc

Planned ER2+TO+Shearwater+Blissfully operations mainly offshore in southern California. Perfect aligned EarthCARE track over Santa Barbara Channel (Orbit 1773). Double sortie of Twin Otter to get south. Unfortunately ER-2 flight scrubbed due to aircraft issue.

ER-2

ER-2 flight scrubbed due to aircraft issue relating to cabin pressure. Fixed and resolved to be ready for flight next day.

Twin Otter

Double sortie

Take off: 11:07:20 (18:07:20 UTC) Marina Airport (OAR)

Landing: 15:43:17 (22:43:17 UTC) Camarillo Airport (CMA), Duration 4.6 hrs

Take off: 16:45:37 (23:40:30 UTC) Camarillo Airport (CMA)

Landing: 18:03:07 (25:03:07 UTC) Marina Airport (OAR), Duration 1.3 hrs

Manifest: Bryce Kujat (pilot), Jeff Martin (pilot), Anthony Bucholtz (QNC), Adam Ahern (QNC), Edward Winstead (QNC)

[See end for full Twin Otter report](#)

R/V Shearwater

Mission Scientist: Michael Ondrusek

Sailed out: 15:54 UTC

Back in port: 23:15 UTC

[See end for full R/V Shearwater report](#)

R/V Blissfully

Mission Scientist: Bridget Seegers

Sailed out: 16:29 UTC

Back in port: 00:06 (2024/09/20) UTC

[See end for full R/V Blissfully report](#)

PACE

Overpass at 19:45, to east

Overpass at 21:23, offshore to west

EarthCARE

22:15 over Pt. Mugu. Orbit 1773

Gliders

Operational

HyperNAV

Operational

19:45	PACE		PACE overpass (east of operations region)
20:40	RS	1b(2.0), 1c(1.5)	On station 23 until 22:41, with Twin Otter spiral over top plus PACE-O
19:00	RB	1b(1.0), 1c(1.0*0.5)	Blissfully on station for PACE-O overpass. No USC_SeaPRISM data
21:23	PACE		PACE overpass (west of operations region)
22:17	TO, EarthCARE	1d(1.5), 3d(1.5), 3e(1.5*0.5)	After a first attempt to spiral down with aerosols but cloud below (which aircraft couldn't enter with IFR rules), found a second cloud free location to spiral during EarthCARE overpass. Spiral down to 2kft. Some cloud information on split TO spiral along EarthCARE
22:43	TO		Twin Otter lands for refueling in Camarillo
23:15	RS		Shearwater back in port
23:40	TO		Takeoff Camarillo
01:03 (2024/09/20)	TO		Landed Marina

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

Assessment:

- 0.5% of objectives observed, as expected with no ER-2 operations. Unfortunate as this would have resulted in a very successful day otherwise.
- Top remaining objectives (score above 6.0): PACE aerosol in narrow swath (3a,b)

PACE-PAX progress tracking															
Validation objectives	ID	Measurement objectives	Importance, w	Observation time, h (hours)	Total observed (hours)	Fractional success 9/16	Fractional success 9/17	Fractional success 9/18	Fractional success 9/19	Fractional success 9/20	Fractional success 9/21	Fractional success 9/22	Total success	Remaining score	
1. Validate new retrieval properties	a	Land surface parameters	8	2.0	4.0	0.0%	39.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.938	0.5	
	b	Ocean radiometric parameters	10	8.0	15.0	0.0%	2.6%	0.5%	0.4%	0.0%	0.0%	0.0%	0.994	0.1	
	c	Aerosol parameters over the ocean	12	8.0	10.0	0.0%	4.1%	1.1%	1.2%	0.0%	0.0%	0.0%	0.975	0.3	
	d	Aerosol parameters over land	12	8.0	4.5	0.0%	0.1%	0.0%	0.0%	0.0%	0.0%	0.0%	0.998	0.0	
	e	Cloud parameters	12	8.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.695	1.7	
	f	Ocean surface parameters	1	8.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.0	
3. Validate in a narrow swath	a	Aerosol parameters over the ocean (PACE)	10	8.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.354	6.5	
	b	Aerosol parameters over land (PACE)	10	8.0	2.0	0.0%	17.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.403	6.0	
	c	Cloud parameters (PACE)	5	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.713	1.4	
	d	Aerosol parameters (EarthCARE)	8	4.0	4.5	0.0%	28.2%	0.0%	7.9%	0.0%	0.0%	0.0%	0.826	1.4	
	e	Cloud parameters (EarthCARE)	8	4.0	1.0	0.0%	19.5%	0.0%	0.0%	0.0%	0.0%	0.0%	0.313	5.8	
	f	Aerosol parameters over land (EarthCARE)	6	2.0	4.0	0.0%	49.3%	0.0%	0.0%	0.0%	0.0%	0.0%	0.923	0.5	
4. Validate radiometric and polarimetric properties	a	Validate large reflectances	6	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.393	3.6	
	b	Validate large reflectances with high polarization	6	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.777	1.3	
	c	Validate large reflectances with low polarization	6	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.268	4.4	
	d	Overfly vicarious calibration sites	6	4.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0	
	e	High aerosol loads over land	4	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.000	0.0	
	f	High aerosol loads over ocean	4	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.393	2.4	
5. Focus on specific processes or phenomena	a	Multiple aerosol layers	1	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	1.000	0.0	
	b	Aerosol under thin cirrus	2	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	2.0	
	c	Aerosol above liquid phase cloud	4	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.836	0.7	
	d	Broken clouds with complex structure	4	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.528	1.9	
	e	Dust aerosols over ocean	4	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.430	2.3	
	f	Aerosol and ocean parameters over turbid waters	2	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.790	0.4	
	g	Aerosol and ocean parameters over biologically productive waters	4	2.0	5.0	0.0%	86.5%	5.3%	0.0%	0.0%	0.0%	0.0%	0.918	0.3	
	h	Smoke aerosols over ocean	1	2.0	0.0	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.0%	0.713	0.3	
	total:					150	98	0.0%	10.6%	0.3%	0.0%	0.0%	0.0%	0.690	
	ER-2 flight hours					15.8	0	0	0	0	0	0	0	0	15.8
	TO flight hours					11.2	0	0	0	0	0	0	0	0	11.2
Shearwater days					4	0	0	0	0	0	0	0	0	4	
PACE-PAX overall objectives satisfied:					0.690										

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>

R/V Shearwater photos

Station #23 34° 15.038', -119° 45.721', arrival 17:17 UTC → departure 20:20 UTC Twin otter overflight + spiral

Arrival photo:



Departure photo (departure location - 34° 16.017', -119 46.988')



Station #24 34° 16.681' N, - 119° 40.640', arrival 20:40 Z UTC → departure 22:41 UTC Twin otter spiral.

Arrival photo:



Departure photo: (34° 16.670', -119° 40.479' W)



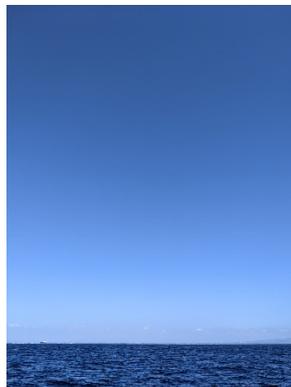
R/V Blissfully photos

Stations:

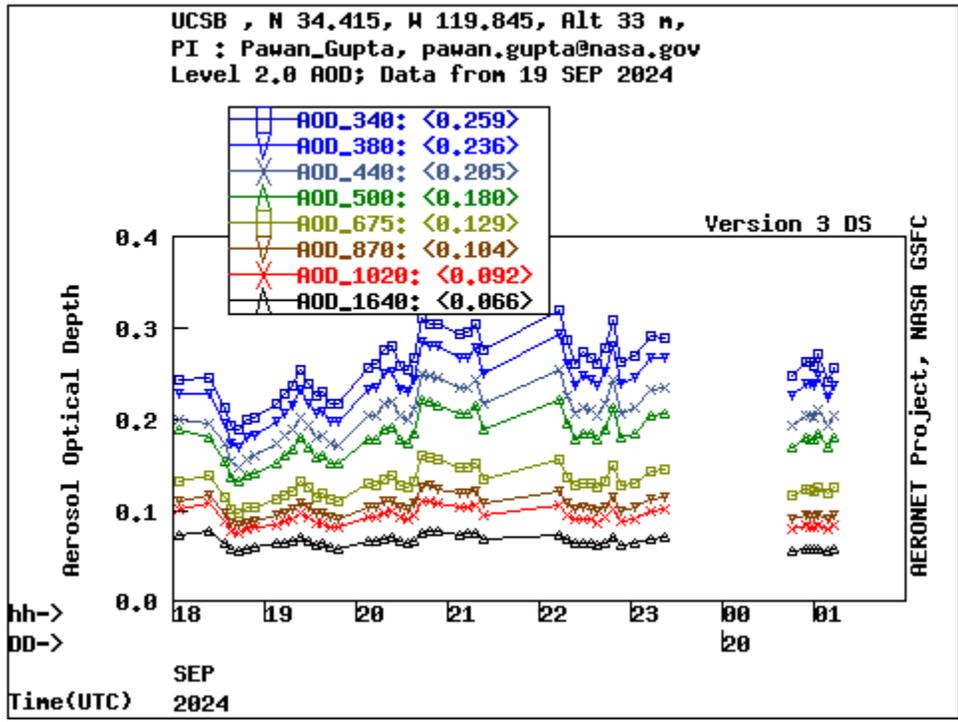
Station #RB_19 33° 34.907', -118° 7.413' arrival, 19:00 UTC



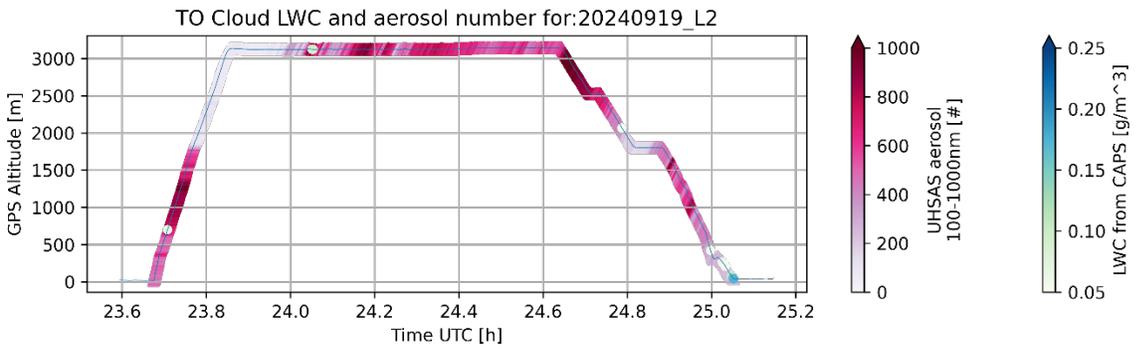
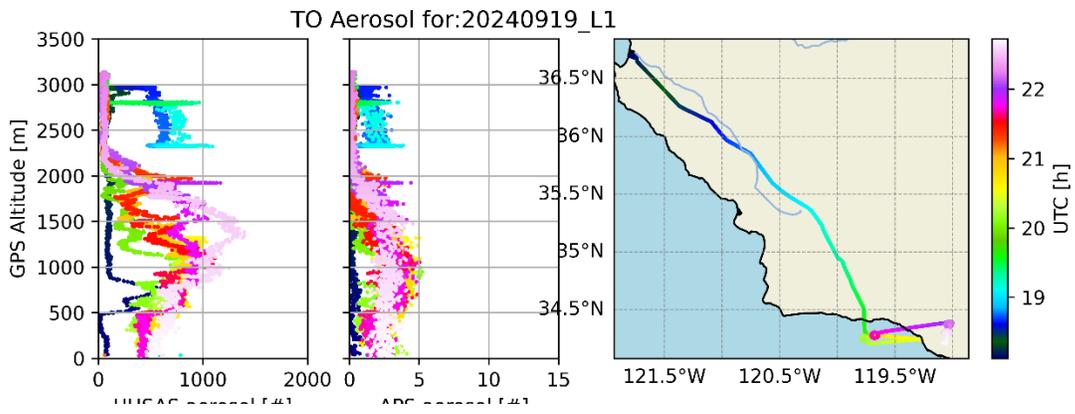
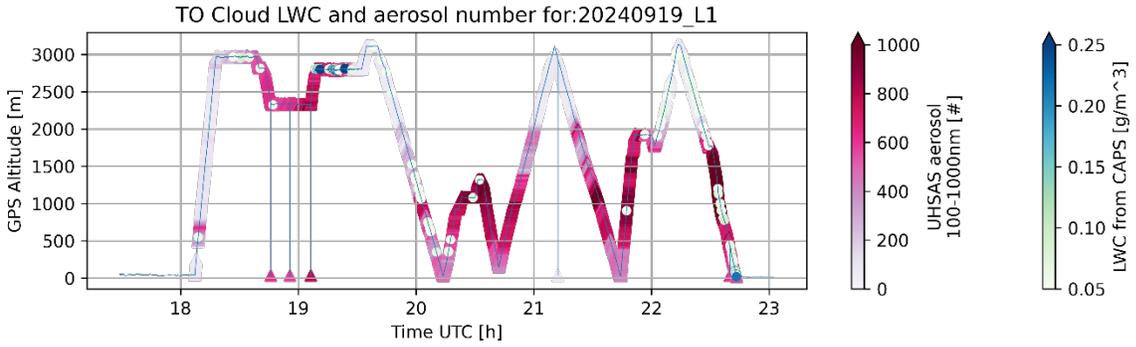
Tomorrow, Heading back to home harbor in San Diego.



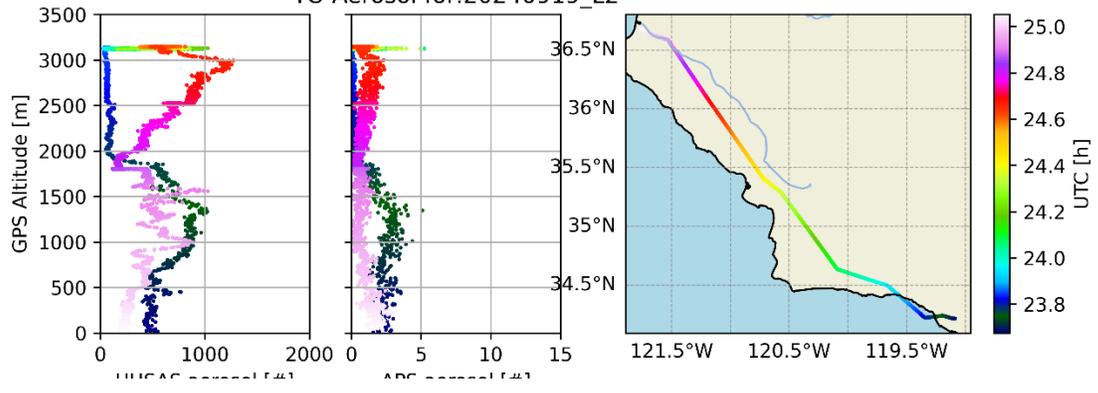
AERONET Quicklooks



TO Quicklooks



TO Aerosol for:20240919_L2



Twin Otter flight report

PACE-PAX Research Flight report 2024/09/19

Twin Otter Flight

Manifest:

Bryce Kujat (pilot)

Jeff Martin (pilot)

Anthony Bucholtz (QNC)

Adam Ahern (QNC)

Edward Winstead (QNC)

Note: AERONET at UCSB might not be working – taking data

Take off: 11:07:20 (18:07:20 UTC) Marina Airport (OAR)

Landing: 15:43:17 (22:43:17 UTC) Camarillo Airport (CMA)

Duration = 4.6 hrs

Take off: 16:45:37 (23:40:30 UTC) Camarillo Airport (CMA)

Landing: 18:03:07 (25:03:07 UTC) Marina Airport (OAR)

Duration: 1.3 hrs

Objectives: Profiles of aerosol scattering, absorption coefficients, and size distributions together with scattering (polarized) phase functions of dust and/or smoke south of Santa Barbara. Slow spirals were made above the R/V Shearwater at two locations during two PACE overpasses. Between the two PACE overpasses, sampling of dust in level/porpoise maneuvers to gain statistics for the phase functions and size distributions of dust aerosols. After second PACE overpass, transit at altitude of interest for aerosols during EarthCARE overpass and spiral before landing at Camarillo. After refueling in Camarillo, return to Marina Airport.

Summary:

Takeoff was uneventful with limited aerosol observed during climb out at 9.7 kft scattering coefficients were $\sim 10 \text{ Mm}^{-1}$. Small diversions around weather and clouds during transit to Santa Barbara. We observed scattering coefficients of about 15 Mm^{-1} of aerosol above thick clouds until reaching the shore at 19:22 UTC. Upon reaching R/V Shearwater which was at waypoint SHER1, we began a slow spiral (200 ft/min) down at 19:40 UTC. PACE overpass occurred during the spiral down. Climbed in-line towards T1906 (near Oxnard Beach) into thickest aerosol, 3.0 kft. At 20:21 UTC we were forced to climb to 3.5 kft for traffic, but stayed in the thickest aerosol with scattering coefficients of $\sim 32 \text{ Mm}^{-1}$. At the end of the way point we climbed up to 4.25 kft to try to sample a different layer of aerosol, but it appeared to be the same layer – no decrease in scattering was observed. Instead we headed down to 500' to start the spiral over the Shearwater in the second location (SHER2.) We spiraled up to 10 kft and then back down again. PACE overpass was at 21:23 UTC just as we started spiraling into the thicker aerosol with scattering coefficients of $\sim 15 \text{ Mm}^{-1}$. Note that the aerosol had a slightly different magnitude of scattering profile on the way down than it did on the spiral up.

After the spiral down, we headed towards the EART4, climbing rapidly to get over the clouds on the shore. We reached 6.2 kft trying to hit the upper layer of aerosol on the way to the EART4 overpass location. We had broken clouds underneath us at 21:54 UTC, and overcast cloud cover at 21:56 UTC. We descended to the cloud top at 22:00 UTC before spiraling up, with the aerosol layer thinning at 7.5 kft to having scattering coefficients of $\sim 2.5 \text{ Mm}^{-1}$. We could not go into the clouds without IFR. After spiraling up, we transitioned to coordinates provided by Sam Leblanc via the chat for clearer skies to spiral down to 2.0 kft. We landed at 22:43:17 UTC at Camarillo, CA.

After refueling at Camarillo, we took off at 23:27:51 UTC. Since there were no coincident measurements, we exceeded science speed of 100 kts, ~ 160 kts indicated. We observed a consistent layer of aerosol around 10 kft with scattering coefficients of $\sim 10 \text{ Mm}^{-1}$. We were forced to take an odd course, out to sea and then diverting again inland due to traffic and then weather. We saw some clear aerosol spikes where the angstrom exponent went to 0 at 24:15 UTC and 24:20 UTC. We landed at Marina at 25:03:07 UTC, no missed approach at the tower.



Beginning first spiral down – R/V Shearwater from 10000 ft; photo taken by Adam Ahern.



R/V Shearwater at ~1000'; photo taken by Adam Ahern.



Quicklook from CIRPAS Instrument Suite showing three layers of aerosols.

R/V Shearwater report

PACE-PAX R/V Shearwater day report

Date: 09/19/2024

Creator: Michael Ondrusek

Cruise ID: RF0919-RS

Sailed out: 15:54 UTC

Back in port: 23:14 UTC (09/19/2024)

Today, the ship occupied two stations:

Station #23 34° 15.038', -119° 45.721', arrival 17:17 UTC → departure 20:20 UTC

- Twin otter overflight + spiral
-

Arrival photo:



Departure photo (departure location - 34° 16.017', -119 46.988')



Station #24 34° 16.681' N, - 119° 40.640', arrival 20:40 Z UTC → departure 22:41 UTC

- Twin otter spiral.

Arrival photo:



Departure photo: (34° 16.670', -119° 40.479' W)



Tomorrow, RV Shearwater will

Ship plans through the next 3 days...

System Status...

All good

Group Status...

All great

Photo of the beginning of the first spiral over the station 23, at 19:45

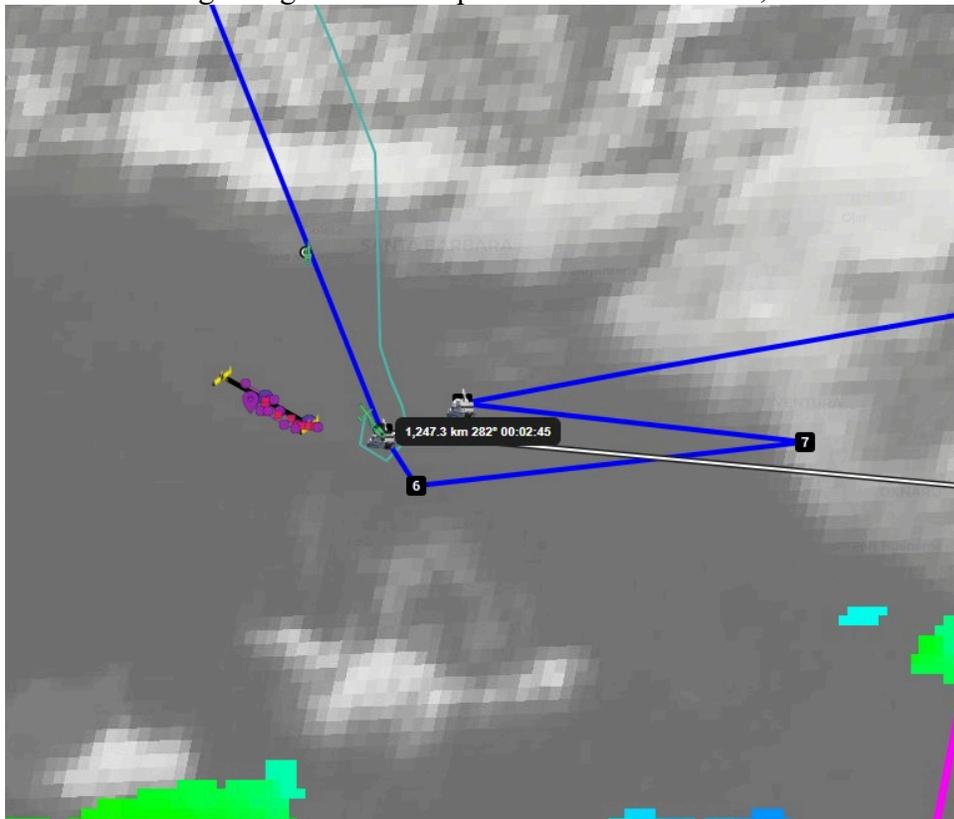


Photo from MTS during the second spiral over the station 24, at 21:00



R/V Blissfully report

Date: 09/19/2024

Creator: Bridget Seegers

Cruise ID: RF0919-RB

Sailed out: 16:29 UTC/17:49 UTC

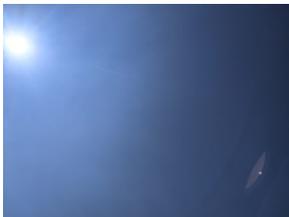
Back in port: 00:06 UTC (09/20/2024)

Today, the ship accomplished....

Collection of vertical radiometry profiles and discrete sample collection (HPLC + ap) on three stations in proximity of SeaPRISM site. The stations had three sets of 5 HyperPro profiles to 20m and a single deep cast to 60m. Station discrete water samples included triplicate HPLC + ap and duplicate community composition Lugol's preserved and paraformaldehyde samples for flow cytometry. Slight issues with the engine caused the return to the port and later sail-out at 17:49

Stations:

Station #RB_19 33° 34.907', -118° 7.413' arrival, 19:00 UTC



Tomorrow, Heading back to home harbor in San Diego.



Ship plans through the next 3 days... Heading back to home harbor in San Diego.

System Status...

All good

Group Status... All great