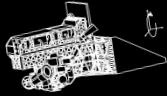


AERONET observations as a valuable component of the PACE Postlaunch Airborne eXperiment (PACE-PAX)

Andrew Sayer on behalf of the PACE-PAX team and PACE project
(leads: Kirk Knobelspiesse, Brian Cairns, Ivona Cetinić, P. Jeremy Werdell)



pace.gsfc.nasa.gov



OCI

340-890 nm in 2.5 nm steps
7 discrete SWIR, 940-2260 nm
1-2 day coverage $\pm 20^\circ$ tilt, 1km



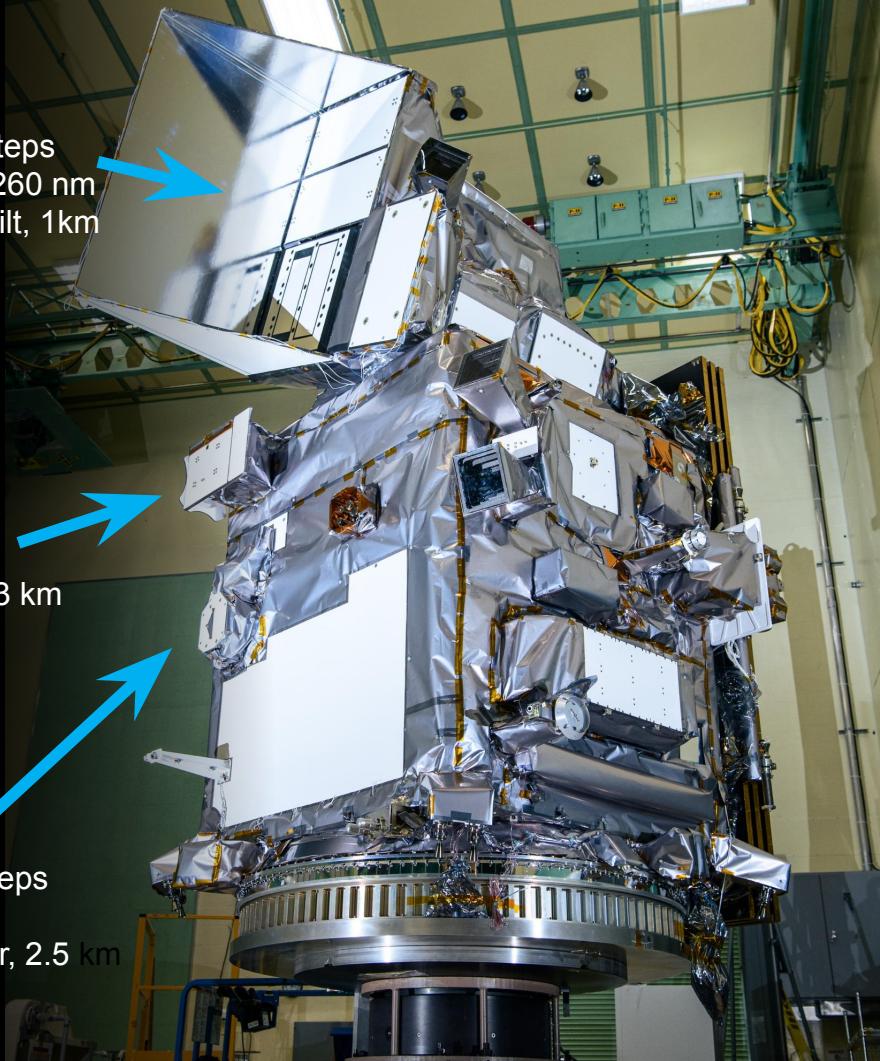
HARP2

440, 550, 670, 870 nm
10-60 viewing angles
wide swath polarimeter, 3 km



SPEXone

380-770 nm in 2-4 nm steps
5 viewing angles
narrow swath polarimeter, 2.5 km



NASA Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) mission

PACE will extend key systematic ocean color, aerosol, & cloud climate data records, reveal the diversity of organisms fueling marine food webs, and introduce new methods to observe aerosols and clouds, the largest source of climate uncertainty.

Characteristics:

- February 8th launch, April 11th initial data release
- 676.5 km, polar, ascending orbit, 98°
- Sun synchronous, 13:00 Equatorial crossing
- Global (land and ocean) data
- Data to OB.DAAC
(oceancolor.gsfc.nasa.gov)



NASA PACE - Data Products x + pace.oceansciences.org/data_table.htm

PACE Plankton, Aerosol, Cloud, Ocean Ecosystem

National Aeronautics and Space Administration

Data Products Table

Calibrated Radiometry and Polarimetry: Ocean Properties to be Produced by OCI | Atmospheric Properties to be Produced by OCI | Land Data Products to be Produced by OCI | Aerosol and Ocean Properties from HARP2 | Aerosol and Land Surface Products from HARP2 | Cloud Products from HARP2 | Ocean Surface Properties from HARP2 | Aerosol and Ocean Properties from SPEXIE | Aerosol and Land Surface Properties from SPEXIE | Atmospheric and Ocean Properties from OCI + HARP2 + SPEXIE

Access to data series with its status (data maturity level). Provisional data are available through Earthdata Search, the OB DAAC File Search and Level 3 & 4 Browse, Test and Diagnostic data are available through the OB DAAC File Search and Level 3 & 4 Browse. See also "Access PACE Data".

What colors do in the "Availability" column mean?

Available	Coming soon!	Currently implementing and evaluating	No approach currently identified
-----------	--------------	---------------------------------------	----------------------------------

Calibrated Radiometry and Polarimetry

Calibrated and geocorrected radiometry and polarimetry as observed at sensor

Product	Description and Use	Units	Availability	Status	Additional Info
Spectral top-of-atmosphere radiances from OCI	Spectral radiance observed at the top of the atmosphere.	$\text{W m}^{-2} \mu\text{m}^{-1} \text{sr}^{-1}$	Available (OCI), Coming soon! (HARP2)	Provisional	Level 1C draft data format and examples
Spectral top-of-atmosphere radiances and polarimetry from SPEXIE	Spectral radiance and polarimetry observed at the top of the atmosphere, for all sensor viewing angles.	Various	Coming soon! (OCI), Coming soon! (HARP2)	Provisional	Level 1C draft data format and examples
Spectral top-of-atmosphere radiances and polarimetry from HARP2	Spectral radiance and polarimetry observed at the top of the atmosphere, for all sensor viewing angles.	Various	Coming soon! (OCI), Coming soon! (HARP2)	Provisional	Level 1C draft data format and examples

Ocean Properties to be Produced by OCI

Bi-optical and biogeochemical properties of seawater constituents in the sunlit upper ocean.

Product	Description and Use	Units	Availability	Status	Additional Info
Spectral remote sensing reflectances	Spectral color of the ocean in the ultraviolet-visible-near infrared region, derived from algorithms to retrieve information about colored dissolved organic matter, phytoplankton, suspended particles, and other aquatic constituents. Provided in continuous 3.25 nm wavelength bands, with a resolution (bandwidth) of 5 nm.	sr^{-1}	Coming soon! (OCI) & ready (HARP2), Coming soon! (SPEXIE)	Test	ATBD SAT members: Boss, Zheng, Choudhury, Stansbie, Zhang In situ measurement protocols
Apparent visible wavelength	An optical water classification index as weighted the harmonic mean of visible wavelengths.	nm	Coming soon! (OCI) & ready (HARP2), Coming soon! (SPEXIE)	Test	ATBD
Spectral diffuse attenuation coefficients	Spectral diffuse attenuation of downwelling irradiance at multiple wavelengths between 350 and 700 nm. Provides indices of water clarity and light penetration.	m^{-1}	Coming soon! (OCI) & ready (HARP2), Coming soon! (SPEXIE)	Test	ATBD SAT members: Boss, Stansbie, Odumetam
Spectral phytoplankton absorption coefficients	Spectral absorption coefficients for total phytoplankton, including multiple wavelengths between 350 and 700 nm. Provides information on phytoplankton pigmentation, abundance, and community composition.	m^{-1}	Coming soon! (OCI) & ready (HARP2), Coming soon! (SPEXIE)	Provisional	ATBD SAT members: Twidwell, Stansbie, Probert, Polleman, Siegel, Barnes, Stansbie, Choudhury In situ measurement protocols
Spectral non-algal particle plus dissolved organic matter absorption coefficients	Spectral absorption coefficients for non-algal particles and dissolved organic matter at multiple wavelengths between 350 and 700 nm. Provides information on the concentrations of the dissolved component of organic matter and the non-algal component of the particulate sample.	m^{-1}	Coming soon! (OCI) & ready (HARP2), Coming soon! (SPEXIE)	Provisional	ATBD SAT members: Twidwell, Stansbie, Barnes, Stansbie, Choudhury In situ measurement protocols
Spectral chromophoric dissolved organic matter absorption coefficients	Spectral absorption coefficients for dissolved organic matter at multiple wavelengths between 350 and 700 nm, based on the concentration of the dissolved component of organic matter.	m^{-1}	Coming soon! (OCI) & ready (HARP2)	Test	SAT member: Stansbie In situ measurement protocols

NASA PACE - Data Products x + pace.oceansciences.org/data_table.htm

Calibrated radiometric brightness

Calibrated spectral radiometric brightness of ocean waters, corrected for atmospheric effects, including the effect of atmospheric absorption and scattering, and the effect of sensor calibration processing.

Calibrated high-latitude radiometric brightness

Calibrated spectral radiometric brightness for remote sensing of ice-covered oceans at high latitudes. This product is derived from the same data as the Calibrated radiometric brightness product, but it includes the effect of sea ice and snow cover.

Calibrated moderate-resolution radiometric brightness

Calibrated spectral radiometric brightness for remote sensing of ice-covered oceans at intermediate latitudes. This product is derived from the same data as the Calibrated radiometric brightness product, but it includes the effect of sea ice and snow cover.

Calibrated high-resolution radiometric brightness

Calibrated spectral radiometric brightness for remote sensing of ice-covered oceans at intermediate latitudes. This product is derived from the same data as the Calibrated radiometric brightness product, but it includes the effect of sea ice and snow cover.

Radiometric file header

Information on the radiometric calibration of the instrument, including the sensor calibration, atmospheric correction, and sensor gain.

Daily photometric variance statistics

The statistics of change in daily photometric variance over time. These statistics are used to monitor the performance of the instrument and to detect any significant changes in the instrument's performance.

Concentration of chlorophyll-a

New concentration of the phytoplankton pigment chlorophyll-a, derived from the concentration of chlorophyll-a in the water column, the depth of the water column, and the concentration of chlorophyll-a in the water column.

Photoplasma apparent concentration

Concentration of phytoplankton pigments in the water column, as derived from the concentration of phytoplankton pigments in the water column, the depth of the water column, and the concentration of phytoplankton pigments in the water column.

Net primary production (NPP)

Estimated net primary production (NPP) in the ocean, derived from the concentration of phytoplankton pigments in the water column, the depth of the water column, and the concentration of phytoplankton pigments in the water column.

Photoplasm community succession

Derivatives of the concentration of phytoplankton pigments in the water column, derived from the concentration of phytoplankton pigments in the water column, the depth of the water column, and the concentration of phytoplankton pigments in the water column.

Concentration of phytoplankton pigments

New concentration of the phytoplankton pigment chlorophyll-a, derived from the concentration of chlorophyll-a in the water column, the depth of the water column, and the concentration of chlorophyll-a in the water column.

Concentration of particulate organic carbon

Concentration of particulate organic carbon in the water column, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.

Concentration of phytoplankton carbon

Concentration of phytoplankton carbon in the water column, derived from the concentration of phytoplankton carbon in the water column, the depth of the water column, and the concentration of phytoplankton carbon in the water column.

Concentration of dissolved organic carbon

New concentration of dissolved organic carbon in the water column, derived from the concentration of dissolved organic carbon in the water column, the depth of the water column, and the concentration of dissolved organic carbon in the water column.

Concentrated particulate matter

New concentration of particulate organic carbon, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.

Atmospheric Properties to be Produced by OCI

Atmospheric properties to be produced by OCI

Product	Description and Use	Units	Availability	Status	Additional Info
Spectral aerosol optical depth	Spectral measurement of the extinction of the beam of light passing through the atmosphere, derived from algorithms to retrieve information about aerosol optical properties.	sr^{-1}	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Aerosol free transmission factor	Factor of a solar spectrum divided by the measured spectrum, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Cloud mask	Predicted information on whether a pixel contains a cloud or not, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Cloud phase	Predicted information on whether a pixel contains a liquid or solid cloud, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Cloud top pressure of ocean pixels	Estimated information on the pressure at the top of clouds, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Cloud fraction	Information on the fraction of the ocean area covered by clouds, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Cloud top pressure of land pixels	Estimated information on the pressure at the top of clouds, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Cloud top pressure of ocean pixels	Estimated information on the pressure at the top of clouds, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Cloud fraction of land pixels	Information on the fraction of the land area covered by clouds, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Cloud top pressure of ocean pixels	Estimated information on the pressure at the top of clouds, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Cloud fraction of land pixels	Information on the fraction of the land area covered by clouds, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Satellite-derived surface biomass	Derived information on the biomass of phytoplankton, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Atmospheric dust loading	Estimated information on the amount of dust in the atmosphere, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Satellite-derived surface biomass	Derived information on the biomass of phytoplankton, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols
Atmospheric dust loading	Estimated information on the amount of dust in the atmosphere, derived from the concentration of particulate organic carbon in the water column, the depth of the water column, and the concentration of particulate organic carbon in the water column.	-	Coming soon! (OCI) & ready (HARP2)	Test	SAT members: Stansbie, Choudhury, Stansbie, Zheng In situ measurement protocols



PACE has many data products

... some are currently available, others coming soon, being tested, or potential future development



PACE validation plan

Our mission requirements include validation

"post-launch field validation work is required to evaluate the PACE science data products ... within 12 months of commissioning. The PACE validation programs (provided by HQ PACE Science) shall include the following for the mission duration:

- a) *Shipboard and aircraft campaigns as required ...*
- b) *Autonomous instrument systems that collect continuous records of any of the individual data products..."**

The PACE Science Data Product Validation Plan describes activities to meet these requirements

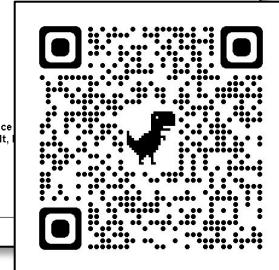
PACE Validation Plan – July 2020

Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) mission

PACE Science Data Product Validation Plan

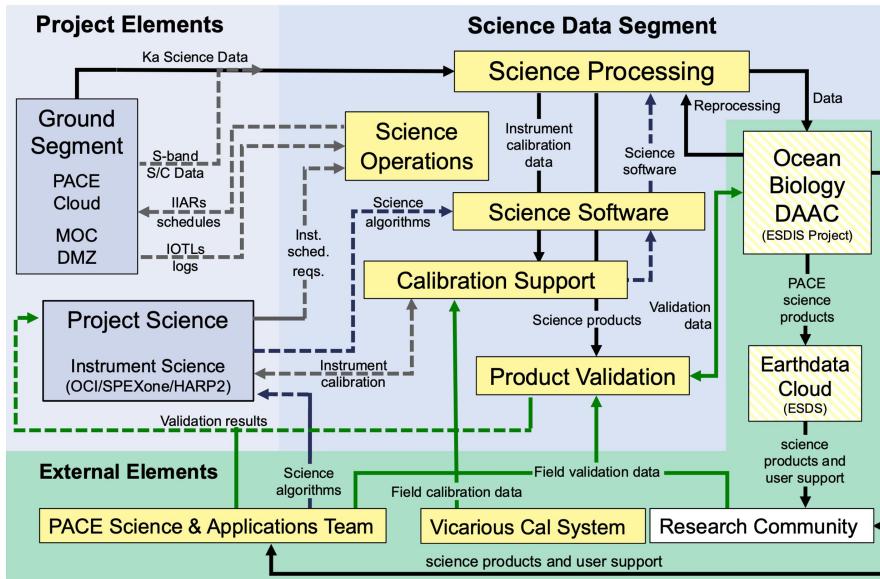


Goddard Space
Greenbelt,



pace.oceansciences.org/documents.htm

PACE validation plan



- NASA Ocean Ecology Lab field support group
- PACE Validation Science Team (PVST)
- Existing community activities
 - Instrument networks e.g. AERONET, ARM, Cloudnet
 - Ongoing field activities
- OEL hosted archive and analysis system (SeaBASS)
- **PACE Postlaunch Airborne eXperiment**

Related: System Vicarious Calibration

Autonomous regular measurement of ocean water leaving radiance for OCI vicarious calibration. Two systems:

- HyperNAV – Lagrangian profiling buoys (Crete + TBD)
- MarONet – fixed mooring based on MOBY (W. Australia)
- MOBY refresh – fixed mooring (Hawaii)





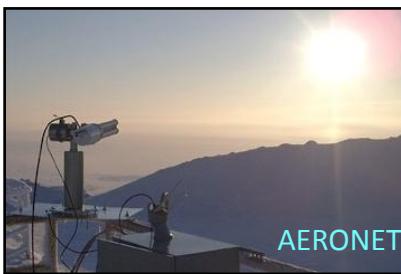
PACE Postlaunch Airborne EXperiment



GODDARD
EARTH SCIENCES



SRON
Netherlands Institute for Space Research



JPL
Jet Propulsion Laboratory
California Institute of Technology



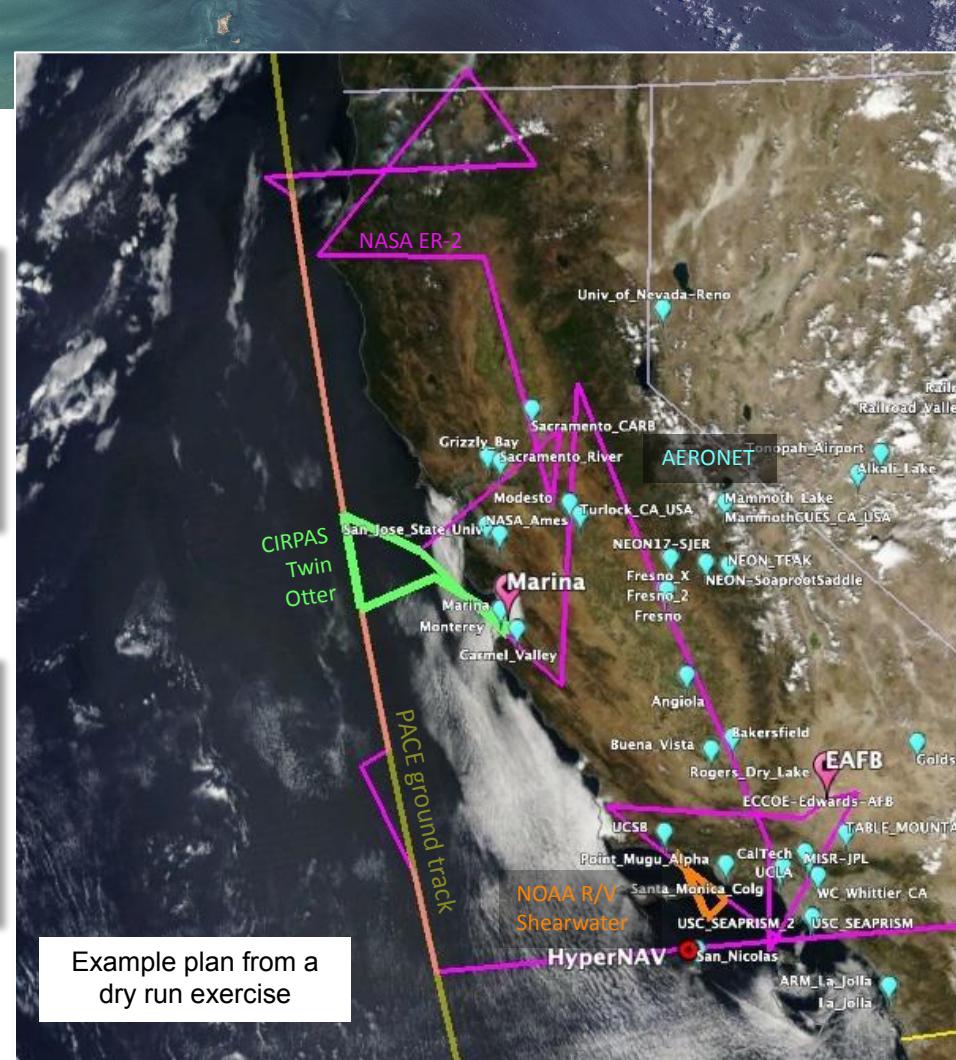
NOAA



UMBC



Langley
Research
Center





How we designed PACE-PAX

Validation objectives
Validate new retrieval properties
Validate in a narrow swath
Validate radiometric and polarimetric properties
Focus on specific processes or phenomena

Needed so products can mature from “provisional” to “standard” status

Enables validation of narrow swath PACE/SPEXone and EarthCARE

Traceability for satellite and airborne instrument characterization

Start with several top-level objectives

Target uncommon special cases



How we designed PACE-PAX

Validation objectives	Measurement objectives	Importance, w
Validate new retrieval properties	Land surface parameters	8
	Ocean radiometric parameters	10
	Aerosol parameters over the ocean	12
	Aerosol parameters over land	12
	Cloud parameters	12
	Ocean surface parameters	1
Validate in a narrow swath	Aerosol parameters over the ocean (PACE)	10
	Aerosol parameters over land (PACE)	10
	Cloud parameters (PACE)	5
	Aerosol parameters (EarthCARE)	8
	Cloud parameters (EarthCARE)	8
Validate radiometric and polarimetric properties	Validate large reflectances	6
	Validate large reflectances with high polarization	6
	Validate large reflectances with low polarization	6
	Overfly vicarious calibration sites	6
Focus on specific processes or phenomena	High aerosol loads over land	4
	High aerosol loads over ocean	4
	Multiple aerosol layers	1
	Aerosol under thin cirrus	2
	Aerosol above liquid phase cloud	4
	Broken clouds with complex structure	4
	Dust aerosols over ocean	4
	Aerosol and ocean parameters over turbid waters	2
	Aerosol and ocean parameters over biologically productive waters	4
	Smoke aerosols over ocean	1

Flow to specific measurement objectives

Prioritize with 'importance' metric

Validation Traceability Matrix

Validation objectives	Measurement objectives	Importance, w
Validate new retrieval properties	Land surface parameters	8
	Ocean radiometric parameters	10
	Aerosol parameters over the ocean	12
	Aerosol parameters over land	12
	Cloud parameters	12
	Ocean surface parameters	1
Validate in a narrow swath	Aerosol parameters over the ocean (PACE)	10
	Aerosol parameters over land (PACE)	10
	Cloud parameters (PACE)	5
	Aerosol parameters (EarthCARE)	8
	Cloud parameters (EarthCARE)	8
Validate radiometric and polarimetric properties	Validate large reflectances	6
	Validate large reflectances with high polarization	6
	Validate large reflectances with low polarization	6
	Overfly vicarious calibration sites	6
Focus on specific processes or phenomena	High aerosol loads over land	4
	High aerosol loads over ocean	4
	Multiple aerosol layers	1
	Aerosol under thin cirrus	2
	Aerosol above liquid phase cloud	4
	Broken clouds with complex structure	4
	Dust aerosols over ocean	4
	Aerosol and ocean parameters over turbid waters	2
	Aerosol and ocean parameters over biologically productive waters	4
	Smoke aerosols over ocean	1

Identify needed measurements

1c. Validate new retrieval properties: Aerosol properties over ocean		
	PAOL/DO PAOL/REFOC PAOL/WAP	Geophysical properties Aerosol spectral optical depth Aerosol microphysical properties Aerosol layer height Ocean surface roughness (windspeed) Spectral ocean remote sensing reflectance
	HISL-2 AirHAR/PICARD, PRISM, RSV SPEX Av	Walls: aerosol ER-2 At least 2/3 required TO
	Aerosol in situ instruments	Straight and level through aircraft plane
	No clouds Variable aerosol load Variable memory time and space scales	Figure-4 For ocean properties, this could be achieved with either in water measurements from Shearwater, AERONET-OC or HyperHAR, or the HSRL-2
	AERONET-OC, shearwater, HyperHAR	For aerosol properties, this could be either achieved with in situ data from the Twin Otter, or retrievals from passive instruments on the ER-2
4c. Validate radiometric and polarimetric properties: large reflectances with low polarization		
		Geophysical properties Uniform marine stratocumulus clouds or optically thick ice clouds
	AIRHAR/PICARD, PRISM, RSV SPEX Av	Importance: 6 Hours: 1 For 1°-50' from solar principal plane
	Uniform marine stratocumulus clouds or optically thick ice clouds	Potential ER2 flight patterns over cloud: Racetrack Rosette Principal plane
6h. Focus on specific processes or phenomena: aerosol and ocean properties over turbid waters		
	PAOL/DO PAOL/REFOC PAOL/WAP	Geophysical properties Aerosol spectral optical depth Aerosol microphysical properties Aerosol layer height Ocean surface roughness (windspeed) Spectral ocean remote sensing reflectance
	HISL-2 AirHAR/PICARD, PRISM, RSV SPEX Av	At least 2/3 required TO Figure-4 ER-2 Rosette
	Aerosol in situ instruments	Straight and level through aircraft plane
	No clouds	For ocean properties, this could be either achieved with in situ data from the Twin Otter, or retrievals from passive instruments on the ER-2
	AERONET-OC, shearwater, HyperHAR	For aerosol properties, this could be either achieved with in situ data from the Twin Otter, or retrievals from passive instruments on the ER-2
Turbid water		



How we designed PACE-PAX

Importance weights provide for a way to assess multiple options, make flight planning decisions and assess overall success

Overall 1st dry run progress tracking

Validation objectives	ID	Measurement objectives	Importance, w	Observation time, h (hours)	Total observed (hours)	Fractional success 3/7	Fractional success 3/8	Fractional success 3/9	Total success	Remaining score
1. Validate new retrieval properties	a	Land surface parameters	8	1.0	1.0	0.0%	63.2%	0.0%	63.2%	2.9
	b	Ocean radiometric parameters	10	4.0	5.0	0.0%	46.5%	24.9%	71.3%	2.9
	c	Aerosol parameters over the ocean	12	4.0	6.5	0.0%	58.3%	22.0%	80.3%	2.4
	d	Aerosol parameters over land	12	4.0	4.0	0.0%	58.3%	4.9%	63.2%	4.4
	e	Cloud parameters	12	4.0	1.0	0.0%	0.0%	17.1%	17.1%	9.9
	f	Ocean surface parameters	1	4.0	0.5	0.0%	11.8%	0.0%	11.8%	0.9
3. Validate in a narrow swath	a	Aerosol parameters over the ocean	10	4.0	1.0	0.0%	0.0%	22.1%	22.1%	7.8
	b	Aerosol parameters over land	10	4.0	0.5	0.0%	0.0%	11.8%	11.8%	8.8
	c	Cloud parameters	5	1.0	1.0	0.0%	0.0%	52.8%	52.8%	2.4
4. Validate radiometric and polarimetric properties	a	Validate large reflectances	6	1.0	1.0	0.0%	63.2%	0.0%	63.2%	2.2
	b	Validate large reflectances with high polarization	6	1.0	0.0	0.0%	0.0%	0.0%	0.0%	6.0
	c	Validate large reflectances with low polarization	6	1.0	1.0	0.0%	0.0%	52.8%	52.8%	2.8
	d	Overfly vicarious calibration sites	6	2.0	1.0	0.0%	39.3%	0.0%	39.3%	3.6
6. Focus on specific processes or phenomena	a	High aerosol loads over land	4	1.0	0.0	0.0%	0.0%	0.0%	0.0%	4.0
	b	High aerosol loads over ocean	4	1.0	0.0	0.0%	0.0%	0.0%	0.0%	4.0
	c	Multiple aerosol layers	1	1.0	0.0	0.0%	0.0%	0.0%	0.0%	1.0
	d	Aerosol under thin cirrus	2	1.0	0.0	0.0%	0.0%	0.0%	0.0%	2.0
	e	Aerosol above liquid phase cloud	4	1.0	0.0	0.0%	0.0%	0.0%	0.0%	4.0
	f	Broken clouds with complex structure	4	1.0	0.0	0.0%	0.0%	0.0%	0.0%	4.0
	g	Dust aerosols over ocean	4	1.0	3.0	0.0%	0.0%	95.0%	95.0%	0.2
	h	Aerosol and ocean parameters over turbid waters	2	1.0	0.0	0.0%	0.0%	0.0%	0.0%	2.0
	i	Aerosol and ocean parameters over biologically productive waters	4	1.0	4.0	0.0%	95.0%	3.1%	98.2%	0.1
	k	Smoke aerosols over ocean	1	1.0	0.0	0.0%	0.0%	0.0%	0.0%	1.0
		total:	134	45	30.5	0.0%	25.2%	15.6%	40.8%	



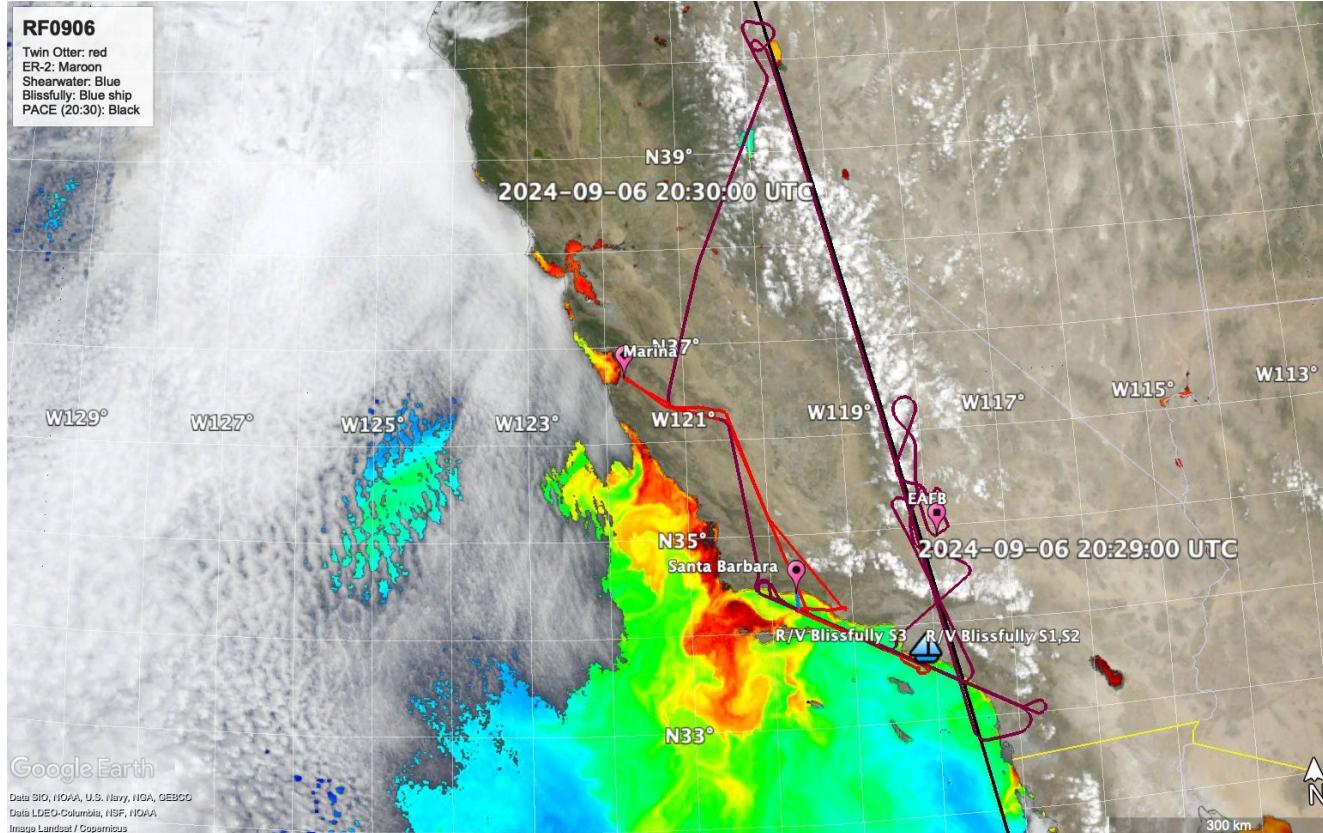
PACE-PAX instrumentation

Instrument	Platform	Role	Lead PI	Institution
AirHARP	ER-2	PACE/HARP2 polarimetry proxy	J. Vanderlei Martins	UMBC
PICARD	ER-2	PACE/OCI spectrometer proxy	J. Jacobson / K. Meyer	NASA ARC/GSFC
PRISM	ER-2	PACE/OCI spectrometer proxy	David R. Thompson	JPL
SPEX Airborne	ER-2	PACE/SPEXone polarimetry proxy	B. van Diedenhoven	SRON
HSRL-2	ER-2	Aerosol/cloud/ocean Lidar	T. Shingler / J. Hair	NASA LaRC
RSP	ER-2	Multi-angle polarimeter ref.	B. Cairns / K. Sinclair	NASA GISS
Facility instruments	Twin Otter	Aerosol/cloud in situ instruments	Anthony Bucholtz	NPS
LARGE	Twin Otter	Aerosol/cloud in situ instruments	Luke Ziemba	NASA LaRC
LI-Nephelometer	Twin Otter	Aerosol phase functions	Adam Ahern	NOAA
ISARA	Twin Otter	In situ data synergy activity	Snorre Stammes	NASA LaRC
Ocean instruments*	RV Shearwater	Day cruises, instrumentation TBD	Mike Ondrusek	NOAA
HyperNAV*	Ocean floats	Radiometric calibration ocean floats	Andrew Barnard	OSU
AERONET, AERONET-OC*	Surface	Aerosol prop., water leaving radiance	P. Gupta / E. Lind	NASA GSFC

*externally supported activities



September 6 flight



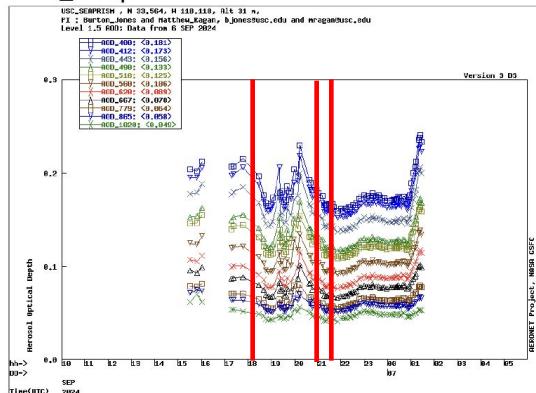
Twin Otter
ER-2
RV Shearwater
RV Blissfully
PACE

Background: RGB and
PACE OCI Chlorophyll

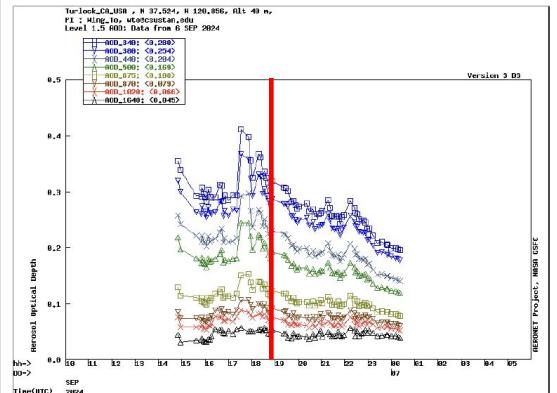


September 6 flight

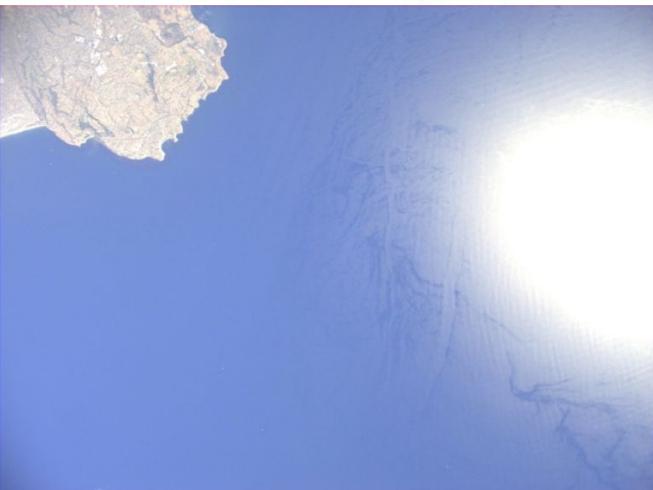
Usc seaprism



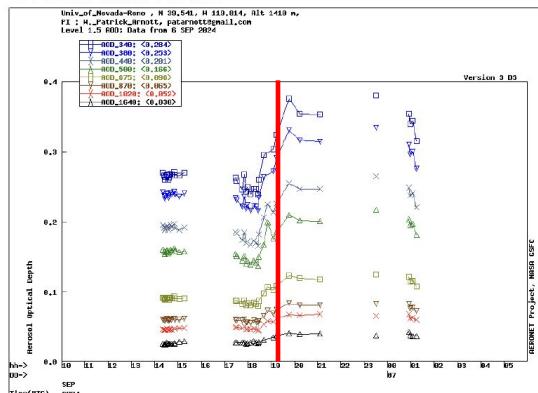
Turlock



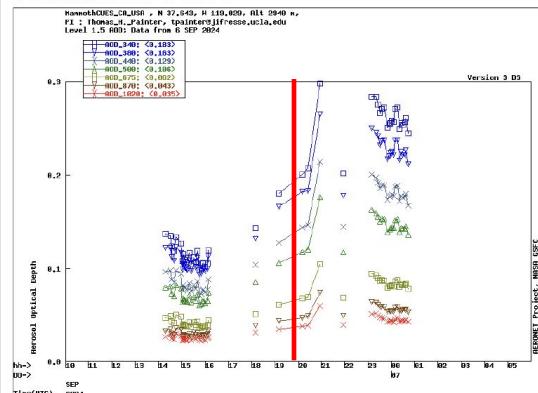
20:56:00 ER2+TO+RB+USC_SeaPRISM



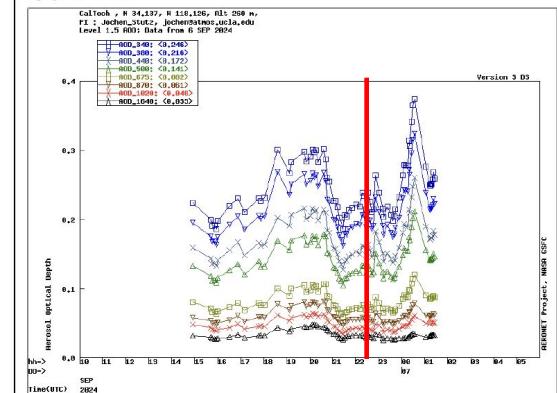
U. Nevada Reno



Mammoth CUES



CalTech



- Data product validation is crucial to PACE
- Validation activities are varied, many different teams contribute
- PACE-PAX is a dedicated PACE validation field campaign, happening now in California
- All data available at Langley DAAC end of March 2025

