INSIDE THE ISSUE

PACE Community Newsletter / May 2023/ Issue 4

WELCOME

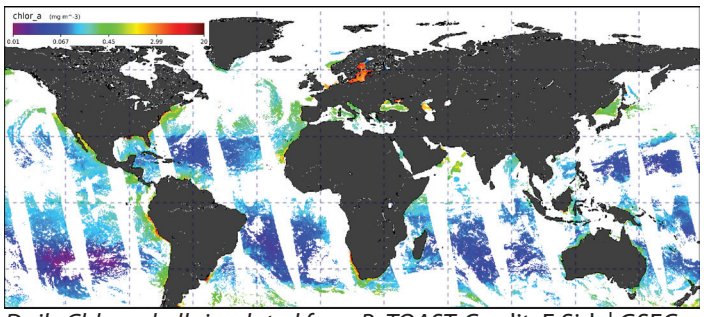
It may not be the final countdown yet, but with the PACE observatory working its way through its vibration testing campaign and then getting ready for thermal/vacuum (TVAC) testing in the coming months the project is certainly living up to its name. The instrument teams are all coordinating to make the best use of the time that is available during PACE TVAC testing and improve the characterization of their sensors over the range of environments expected on orbit.

I'm sure everyone is excited about this uniquely capable set of instruments getting into orbit and providing new insights into the workings of the atmosphere and oceans of the Earth, I know I am!

- Brian Cairns
PACE Deputy Project Scientist

PyTOAST: "PACE like" Data!

As preparations for the launch continue, an exciting tool, Python Top-Of-Atmosphere Simulator Tool (PyTOAST), has been developed to help the science and data teams get ready for PACE. PyTOAST uses a combination of satellite and modeled data to simulate the top-of-atmosphere data that will be collected by the hyperspectral Ocean Color Instrument (OCI). By providing a realistic representation of the data, PyTOAST is helping the PACE team prepare for the mission's ground-breaking science goals.



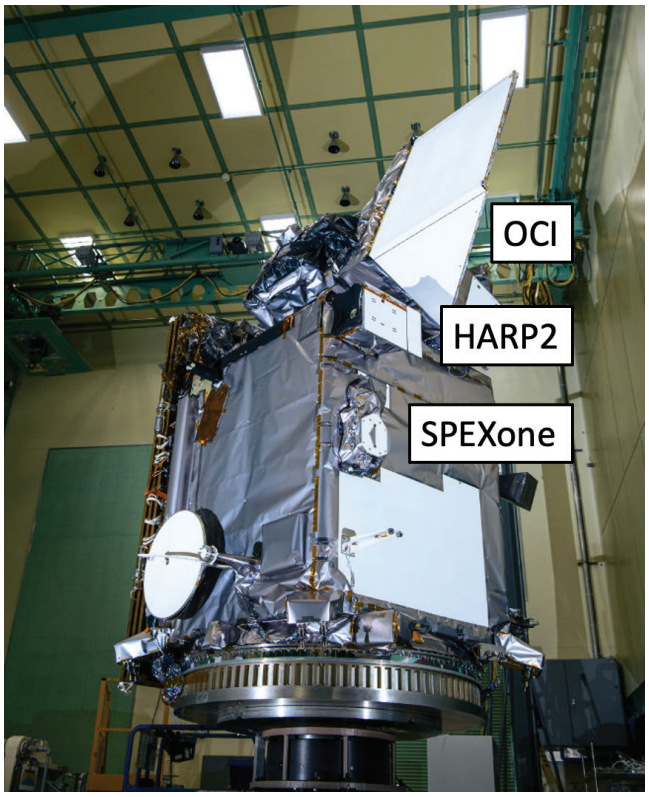
Daily Chlorophyll simulated from PyTOAST. Credit: E Sirk | GSFC

The PACE science data segment is using the simulated data to develop and test the PACE data processing system, ensuring that the team will be ready to hit the ground running when the real data is received within 60 days of launch. The PACE Science & Applications team is also using the data to test and develop PACE-specific algorithms, covering areas such as water quality, phytoplankton biology, and atmospheric science.

PyTOAST data is freely available at NASA's OceanColor Web for anyone interested in playing with "PACE-like" data in a research and application development environment. However, PyTOAST has limitations and should not be used for actual research or application purposes. Access data and get more information here.

PACE Mission Updates

At the time of release, PACE is 253 days from launch. That's 8 months and 8 days until there's smoke on the pad. To borrow a lyric… *funny how time flies*! Our last mission update reported that the PACE observatory finally consisted of all three instruments. Since then, its solar arrays were also integrated (see a test deployment here), resulting in a completed observatory. As such, PACE is enjoying its final few months at Goddard Space Flight Center, which means it's time for full system testing. In general, this comes in several forms: interoperability and compatibility tests (see Newsworthy: PACE Observatory Environmental Test), testing related to the launch environment, and testing related to the post-launch space environment. Evaluating how the observatory responds to the unavoidable stress of the launch environment includes performing vibration tests in all three axes, acoustics tests, and shock tests that simulate launch locks being released, among other things. We're happy to report that all such mechanical tests have been completed successfully!



The full PACE observatory with OCI, HARP2, and SPEXone all indicated. Credit: Dennis Henry| NASA GSFC

In the coming weeks, the PACE observatory will move to a thermal vacuum chamber where performance tests and spacecraft plus instrument characterizations will be performed in a space-like environment– namely, under a dynamic range of cold-to-hot temperatures while under vacuum. In parallel, end-to-end data flow tests – from the ground system to the spacecraft back to the ground system and science data processing system – are also being conducted to ensure high quality and efficient data flows to the public soon after post-launch in-orbit commissioning of the observatory.

What a year so far. Next stop…
Kennedy Space Center in Cape Canaveral, Florida!!

PACE CoP

Interested in joining a growing group of researchers & applied scientists who are excited about everything PACE!?

The PACE Community of Practice fosters new partnerships and collaboration, generates new knowledge and innovations, and promotes interdisciplinary research using PACE data.

SIGN UP NOW

PACE Early Adopter Program

Do you have an existing application or system that could leverage PACE data for societal benefit?

The Early Adopter Program promotes applied science designed to scale and integrate PACE data into activities that directly benefit society and inform decision-making.

LEARN MORE

Newsworthy

GLORIA enables remote sensing for underserved communities & regions

GLORIA (Global Reflectance community dataset for Imaging and optical sensing of Aquatic environments) will enable aquatic remote sensing across poorly studied regions and expand the user base to underserved communities and countries that lack resources for studying and monitoring aquatic ecosystems. It is anticipated that this collection of field setups and methodologies will encourage data collection for the calibration and validation of upcoming satellites, including PACE. GLORIA was co-led by some familiar faces – Moritz Lehmann (Early Adopter) and Nima Pahlevan (SAT member). Learn about GLORIA and browse the data inventory.

Right: *Water color data collection in the Amazon floodplain forests.* Source

PACE Observatory Environmental Test

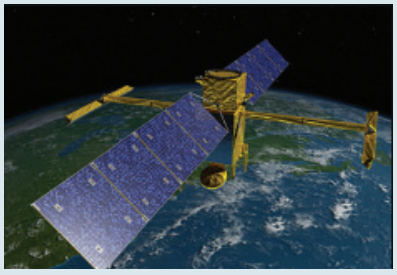
The PACE mission recently completed our observatory electromagnetic interference test, or EMI. The test has roughly three objectives; first, we make sure that the electromagnetic energy that the PACE observatory emits is at a low enough level to not cause a problem for the launch vehicle electronics. Second, we make sure that the PACE observatory is robust and can function when exposed to external sources of electromagnetic radiation. Third, we verify observatory self-compatibility such that our sensitive instruments and other flight electronics are not adversely affected by our own electronics and operation of our onboard S-band and Ka-band transmitters.

Left: *PACE Observatory is being configured for test in the EMI Test Chamber.* Credit: Dennis Henry | NASA

Learn about Ocean Color!

Learn about how combining data from PACE and the NASA Surface Water and Ocean Topography (SWOT) mission can make ocean and inland research more actionable. Check out our recent StoryMap.

Artist rendition of the PACE observatory. NASA GSFC



Artist rendition of the SWOT observatory. NASA JPL

"Of particular interest to oceanographers, SWOT and PACE data may be used together to determine where phytoplankton blooms are potentially nourished by internal tides. Internal waves can modulate the local environment of coastal marine organisms in numerous ways."

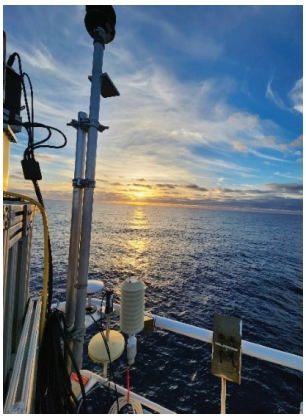
Read more

Penguins and Niskins and Sunsets, oh my!

Fieldwork is different depending on one's research questions but undeniably cool; we get to travel to remote areas of the earth with cutting edge equipment and take measurements in areas that nobody else can. NASA's field support group got to travel to the Falkland Islands during February 2023 to participate in the northbound 30th Atlantic Meridional Transect (AMT), coordinated by the Plymouth Marine Lab in the UK. In the Falklands, two kinds of penguins live on the beach!

Gentoo and King penguins on the beach of Stanley, Falkland Islands. Credit: H Smith | NASA GSFC/SSAI

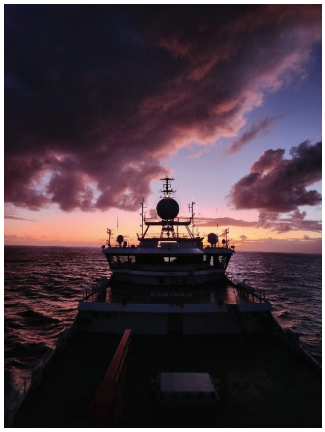
NASA's field support group is interested in what the Atlantic looks like during the day – the only time satellites past, present, and future (PACE) can take snapshots of the ocean surface. My experience of 38 days at sea started with a sunrise and a climb to the ship's meteorological tower where our solar-tracking above-water radiometry sensors needed a daily cleaning of lenses to ensure the best measurements.



Sunrise off the starboard side of RRS Discovery's Met Tower. Credit: H. Smith | NASA GSFC/SSAI

Each day, I would prepare lab instruments to be clean, calibrated, and ready to measure optical properties of seawater taken from Niskin bottles or the continuously pumped "underway" seawater available inside the laboratory. The measurements made will be used to help make sure PACE's measurements are agreeing with what we can measure now!

As the sun set, I would climb the tower again to ensure all the hardware was secure, safe, and operational. You can never be too prepared!

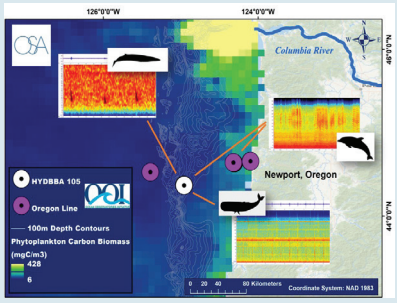


Sunset looking aft from RRS Discovery's Met Tower. Credit: H. Smith | NASA GSFC/SSAI

Written & Experienced by Harrison Smith, Optics Research Assistant; NASA GSFC/SSAI

EA Spotlight

Early Adopter Liz Ferguson's organization Ocean Science Analytics is using data from the Ocean Observatories Initiative (OOI) in combination with remotely sensed data to study a dynamic environment along the coastal northeast Pacific Ocean. Using data from underwater hydrophones located along the OOI cabled array, they can determine the temporal and spatial occurrence of marine mammals. To assess the habitat and trophic characteristics associated with these top predators, they plan to incorporate plankton functional group information from PACE data.



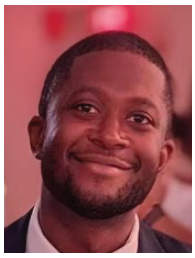
Geographic distribution of phytoplankton carbon biomass (mgC/m^3) within the OOI study area off Oregon. Credit: Liz Ferguson | OSA

They also provide training and will be developing a PACE data access/associated data analysis module to share with the ocean science community!

Learn more!

People of PACE

Jeffrey Twum | PACE Solar Array Deployment System (SADS) Lead



The SADS (or SA Wing) provides the power generation required for the PACE Observatory throughout its mission. Jeffrey's primary focus has been leading or coordinating all activities associated with the fabrication, assembly, and testing of the SA Wing. Jeffrey's team recently integrated the Wing to PACE ahead of its environmental testing campaign, and he will continue to lead the deployments of the Wing on and off of the Bus. One of Jeffrey's many interests includes exercising in order to support his love of trying new restaurants in the DC area.

Dr. Lorraine Remer | PACE Science & Applications Team (SAT) Member

Lorraine is an active member of the PACE family. She and her team are developing an algorithm to retrieve advanced aerosol products from OCI measurements, while she serves as Deputy Lead of the PACE SAT and leads the PACE SAT subgroup on using the ultraviolet. In addition, Lorraine is Manager for the HARP2 instrument, working as part of the UMBC group to maximize the contribution that HARP2 will make to the mission. Lorraine is addicted to viewing total solar eclipses and is looking forward to the next one in 2024 in Texas.

Dr. Violeta Sanjuan Calzado | PACE Project Science Lead for NOMAD

Violeta is PACE Project Science Lead for NOMAD. NOMAD is a high quality, global, in situ bio-optical dataset that was developed during the SeaWIFS era and is used in algorithm development and validation activities for satellite ocean color sensors. Violeta is updating NOMAD to meet PACE hyperspectral data requirements as well as introduce new data sources. She works closely with validation leads and database managers to implement these updates. Violeta enjoys watching rocket launches with her daughter who wants to be an astronaut.

Dr. Moritz Lehmann | PACE Early Adopter (EA) Member

Moritz works on lake water quality monitoring using satellites and in situ sensors. He moved to New Zealand (NZ) from Canada where he has conducted field campaigns to characterize the extreme bio-geo-optical diversity of NZ lakes. Moritz was a co-lead of a project to improve cyanobacteria bloom detection by satellite and is an international advisor for Australian AquaWatch. He plans to use hyperspectral OCI data to monitor lake water quality in NZ. Moritz works from his home in Raglan where he practises horsemanship and longboard surfing.

This newsletter is brought to you by the PACE Applications Team!

Erin Urquhart | Project Applications Coordinator

Natasha Sadoff | Project Applications Deputy Coordinator

CONTACT US

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NEW PACE PUBLICATIONS

- *The CHROMA cloud-top pressure retrieval algorithm for the Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) satellite mission* (Sayer et al. 2023). Read More
- *Ocean carbon from space: Current status and priorities for the next decade* (Brewin et al. 2023). Read More
- *A neural network approach to the estimation of in-water attenuation to absorption ratios from PACE mission measurements .* (Agagliate et al., 2023). Read More
- *The impact and estimation of uncertainty correlation for multi-angle polarimetric remote sensing of aerosols and ocean color.* (Gao et al. 2023). Read More

UPCOMING EVENTS

NASA Carbon Cycle & Ecosystems Joint Science Workshop | May 8-12, 2023 | College Park, MD, USA

Climate Prediction Applications Science Workshop | May 9-11, 2023 | Asheville, NC, USA

Air and Waste Management Association (A&WMA) Conference | June 5-8, 2023 | Orlando, FL, USA

International Operational Satellite Oceanography Symposium | June 12-15, 2023 | Busan, South Korea

Asia Oceania Geosciences Society | July 30 – Aug. 4, 2023 | Singapore

Save the Date! Registration opens 6/6/23