Airborne Measurements of Ocean Color and Aerosols for Validation of NASA's PACE Satellite

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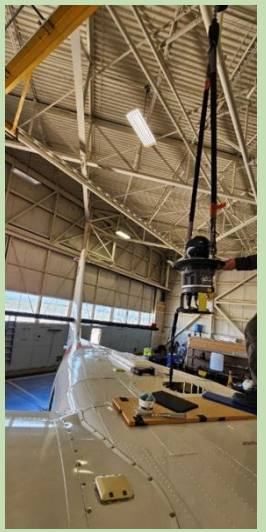
Background: Scientists at NASA have developed an airborne sensor approach to validate NASA's PACE (Plankton, Aerosol, Cloud, ocean Ecosystem) satellite ocean color and aerosol products. Ocean color and biogeochemistry observations accurately estimate phytoplankton populations, including algal blooms that can significantly harm fisheries, coastal tourism, and marine mammal habitats. Observing aerosols furthers our understanding of their contribution to phytoplankton growth.

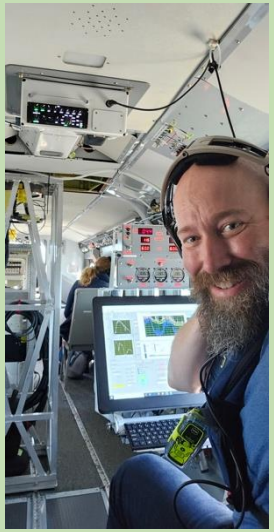
To ensure the accuracy of PACE in constantly changing ocean environments, ARC conducts airborne field campaigns with the Naval Postgraduate School (NPS) Twin Otter equipped with meteorology and navigation instruments in tandem with the University of California Santa Cruz's ship-based measurements that anchor the airborne data at stations. This joint project is called the Airborne asSessment of Hyperspectral Aerosol optical depth and water-leaving Reflectance Product Performance for PACE (AirSHARP). Taking place over the dynamic waters of Monterey Bay, AirSHARP takes measurements of the sky and ocean surface from radiometers and atmospheric column measurements with a sunphotometer.

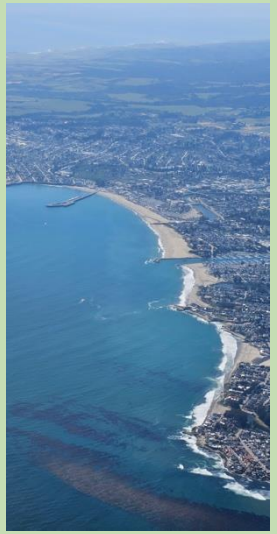
Main Findings: In May 2025, AirSHARP conducted seven successful flights over Monterey Bay with ARC instruments on the NPS Twin Otter, under mostly clear skies and calm seas. AirSHARP covered two seasons: five flights during October 2024 deployment, showcasing a clean atmosphere and a persistent algal bloom in the Monterey Bay, and the May 2025 deployment obscured by large atmospheric particles – potentially transported dust – over waters with different phytoplankton community composition.

Impact: By sampling over the entire Monterey Bay in one flight, in combination with the highly detailed in-water and surface measurements by UC Santa Cruz on the R/V Shana Rae, AirSHARP showcases the increase of observational area and gradient of ocean colors and atmospheric conditions, linked to ocean life. Suborbital measurements by AirSHARP enhanced PACE observations over a dynamic coastal ocean ecosystem, by improving the understanding of algal blooms and validating PACE ocean and atmospheric observations.

Read the full feature on AirSHARP here.







Left: Installment of 4STARB sunphotometer at the zenith port of the Twin Otter. **Middle:** Sam Leblanc monitors instrument data onboard the Twin Otter over Monterey Bay. **Right:** Monterey Bay from the Twin Otter.

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