PACE

Short-Wave Infrared Detection Assembly

A digital rendering shows the instruments and associated equipment that will be included onboard the PACE spacecraft. (Credit: NASA/GSFC)

MISSION FACTS

NASA's Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) mission launched onboard a SpaceX Falcon 9 rocket from Cape Canaveral, FL, on February 8, 2024. PACE provides critical information on ocean ecology with unprecedented fidelity.

The science objective of PACE is to advance ocean health assessment by measuring the distribution of phytoplankton, tiny plants, and algae. With PACE data, scientists are better able to identify harmful algal blooms, monitor fisheries, track the carbon cycle, and observe changes in marine resources.

The ocean and atmosphere are closely connected and transfer and move water, nutrients, energy, aerosols, gases, and pollutants. PACE also measures atmospheric particles and clouds that affect Earth's climate and air quality. Through PACE's improved characterization of aerosol particles, scientists can better quantify their impact on marine biology, ocean chemistry, and Earth's ecological forecasting and energy budget.

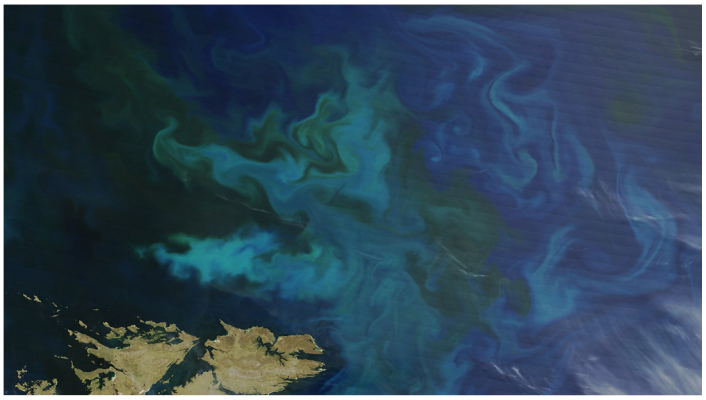
MISSION TEAMS

NASA's Goddard Space Flight Center (GSFC) facilitated the primary instrument design and fabrication and led the observatory integration and launch. The Space Dynamics Laboratory(SDL) designed, fabricated, assembled, and tested the Short-Wave Infrared (SWIR) Detection Assembly (SDA) for the OCI payload. The SDA provides the near-IR to SWIR data, which is critical to the scientific objectives of the mission.

MISSION INSTRUMENTS

The PACE scientific instrument suite includes the following:

- The Ocean Color Instrument (OCI) spectrometer, designed to measure sunlight interaction with particles in seawater in hyperspectral resolution from 350 nm to 865 nm, with multispectral infrared channels extending from 940 nm to 2260 nm
- Two multi-angle, polarimetric radiometers, designed to measure sunlight polarization to determine how it is affected by clouds, aerosols, and the ocean



Phytoplankton blooms off the Falkland Islands.
(Credit: NASA/Jeff Schmaltz, https://earthobservatory.nasa.gov/images/)

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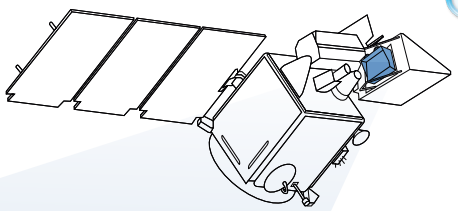
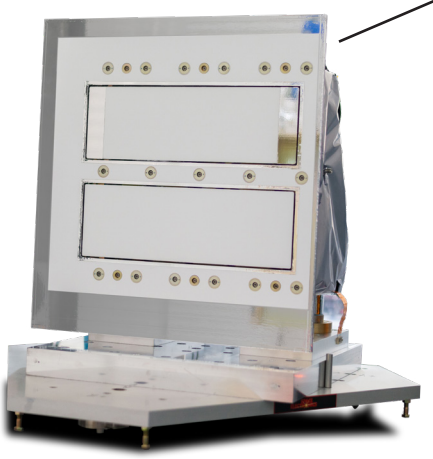
PACE Short-Wave Infrared Detection Assembly

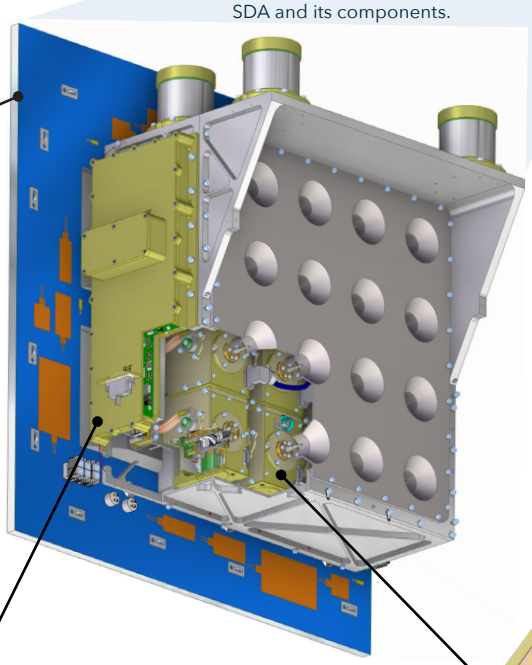
SDL built the SDA for the OCI payload on the PACE spacecraft, which is composed of several subsystems.



CAD view of the assembled SDA and its components.

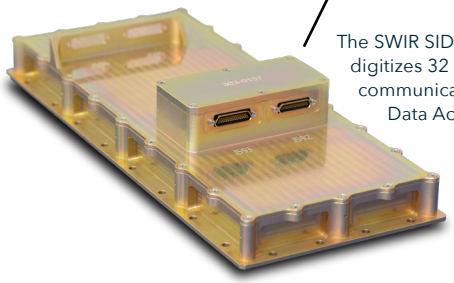
The Thermal Control System (TCS) includes one thermal radiator designed to cool the SDA to -25°C and two thermal radiators to cool the Cold Sensor Assemblies (CSAs) to -65°C.



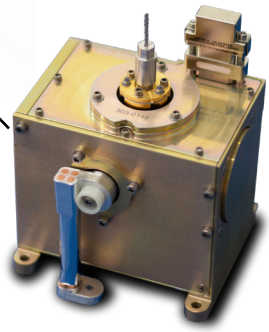


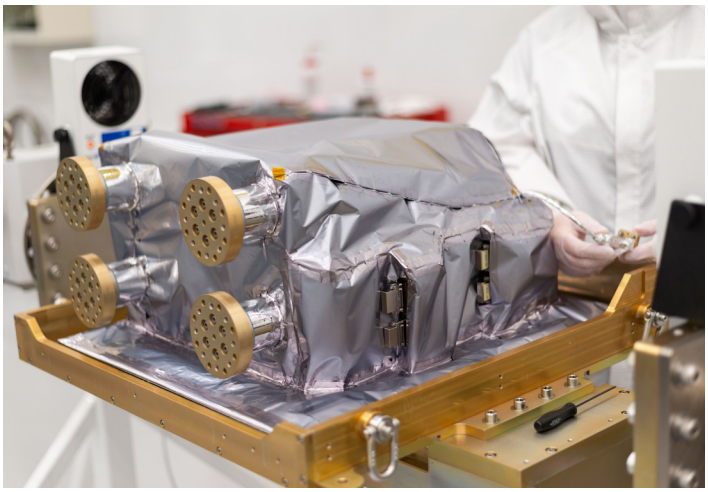
The Aft Optics Box (AOB) assembly comprises 16 SWIR Detection Subassemblies (SDSs), with five unique variants. These subassemblies detect the intensity of the various IR wavelengths and are supported by the following:

- Mercury cadmium telluride (HgCdTe) and indium gallium arsenide (InGaAs) photodiode detectors to cover the near-IR to SWIR wavelengths
- Cold Optical Assembly (COA) to split the light into two channels and focus the light onto the detectors
- Front-End Electronics (FEE) to condition the detector analog voltage signals

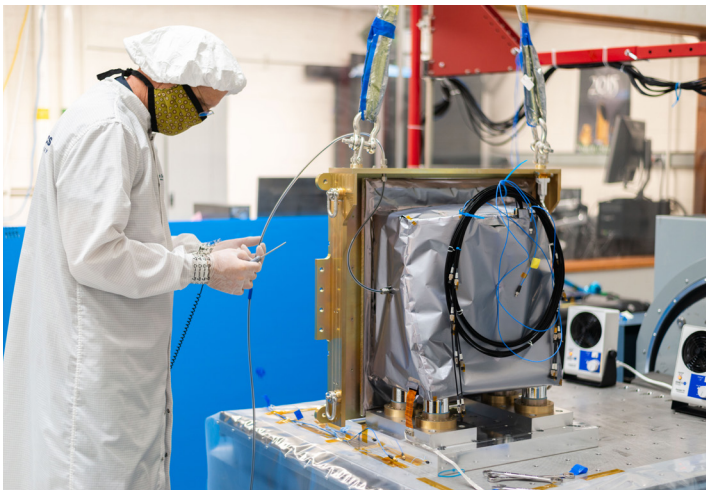


The SWIR SIDECAR Module (SSM) digitizes 32 analog channels and communicates with the spacecraft Data Acquisition Unit (DAU).





The assembled flight SDA covered with protective multi-layer insulation (MLI) blanketing.



The assembled flight SDA being prepared for vibration testing.