

# 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)*

The purpose of NASA's Plankton, Aerosol, Cloud, ocean Ecosystem (PACE) mission is to advance ocean health assessment by measuring the distribution of phytoplankton, tiny plants, and algae. This will enable scientists to identify harmful algal blooms, monitor fisheries, better track the carbon cycle, and observe changes in marine resources.

Since the ocean and atmosphere are closely connected (transferring and moving water, nutrients, energy, aerosols, gases, and pollutants), PACE will also measure atmospheric particles and clouds that affect Earth's climate and air quality. Improved characterization of aerosol particles will enable scientists to quantify their impact on marine biology, ocean chemistry, and Earth's ecological forecasting and energy budget.

NASA's Goddard Space Flight Center (GSFC) is responsible for the spacecraft and primary instrument design and fabrication, as well as the observatory integration and launch. The PACE scientific instrument suite includes the following:

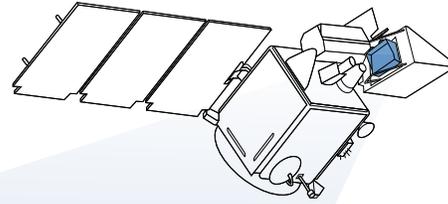
- The Ocean Color Instrument (OCI) spectrometer, designed to measure sunlight interaction with particles in seawater in hyperspectral resolution from 350 nm to 865 nm, with multispectral infrared channels extending from 940 nm to 2260 nm.
- Two multi-angle, polarimetric radiometers, designed to measure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

The PACE/OCI mission will provide NASA critical information on ocean ecology with unprecedented fidelity. The Space Dynamics Laboratory's (SDL) role on the PACE team is to design, fabricate, assemble, and test the Short-Wave Infrared (SWIR) Detection Assembly (SDA) for the OCI payload. The SDA will provide the near-IR to SWIR data, which is critical to the overall scientific objectives of the mission.



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

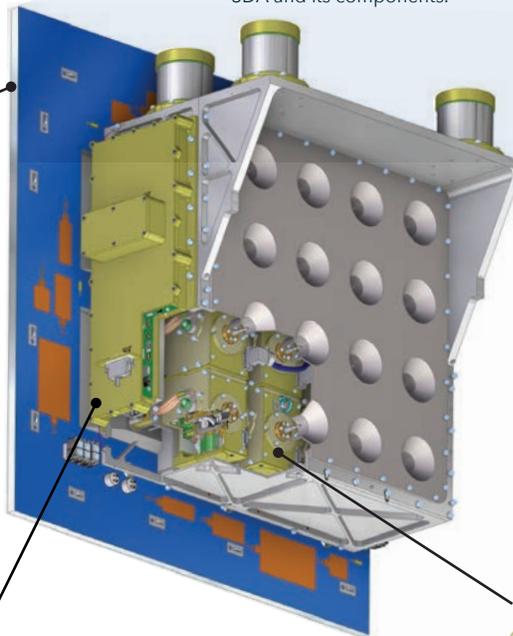
SDL is building the SDA for the OCI payload on the PACE spacecraft, which is composed of several subsystems.



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.

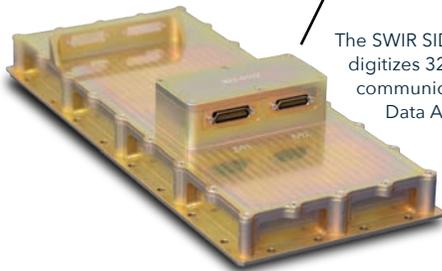


CAD view of the assembled SDA and its components.

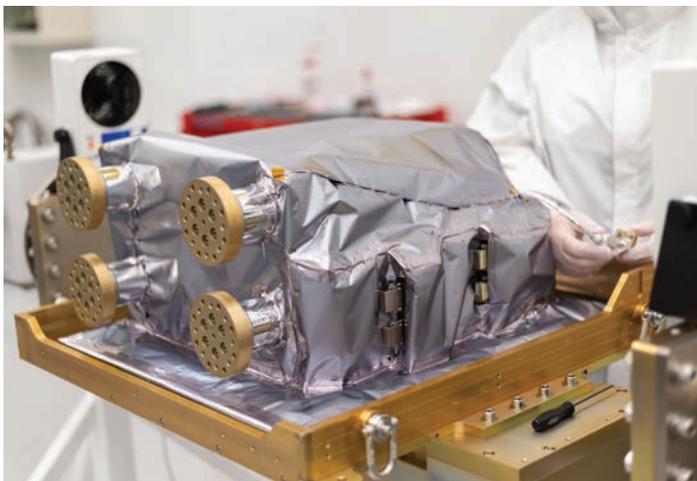


The Aft Optics Box (AOB) assembly comprises 16 SWIR Detection Subassemblies (SDSs), with five unique variants. These subassemblies detect the intensity of the various IR wavelengths and are supported by the following:

- 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).



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



Assembled flight SDA being prepared for vibration testing.