PACE will provide key information on aerosols such as airborne dust, pollen, smoke and haze. These particles can significantly reduce air quality, leading to asthma and respiratory distress among vulnerable people.

The effect of human-produced aerosols on clouds – and the impact on climate – is not well understood. Measurements from PACE will help to clarify the connections between aerosols, clouds, and climate.

PACE MISSION

PACE will extend and improve NASA's 20 plus years of global satellite observations of our living ocean, atmospheric aerosols, and clouds and initiate an advanced set of climate-relevant data records. By determining the distribution of phytoplankton, PACE will help assess ocean health. It will also continue key measurements related to air quality and climate.

Science Goals

To extend systematic ocean color, atmospheric aerosol, and cloud data records for Earth system and climate studies.

To address new and emerging science questions by detecting a broader range of color wavelengths that will provide new and unprecedented detail.

Key Mission Characteristics

- **Hyperspectral ocean color instrument**
- **Two multi-angle polarimeters**
- **Launch readiness date: January 2024**
- **675 km (419 mi) orbital altitude**
- **Sun-synchronous, polar orbit**
- **Global coverage every two days**
- **Managed by Goddard Space Flight Center**

National Aeronautics and Space Administration

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National Aeronautics and Space Administration

NASA

Clouds & Aerosols

PACE will study clouds along with tiny airborne particles known as aerosols.

Plankton, Aerosol, Cloud, ocean Ecosystem

More wavelengths.

Unprecedented information.

Clouds & Aerosols

Climate is the prevailing condition that you plan for. Weather is what you get. The difference between the two is simply time. For decades, information from weather satellites has helped us plan our daily activities. Collecting and analyzing these data over time has resulted in more accurate weather forecasts.

Similarly, predicting climate involves long-term studies of Earth's atmosphere, including clouds and small particles suspended in the atmosphere known as *aerosols*. Both clouds and aerosols affect how sunlight is reflected and absorbed by our planet and its atmosphere.

Aerosols and clouds can interact in complex ways, which are not well understood. For example, cloud drops can form on aerosols and aerosols can be washed out of the air by rain. The overall effect of aerosols and clouds on climate is quite uncertain.

Different types of aerosols absorb and reflect different fractions of sunlight. Their interaction

with clouds alters cloud brightness and coverage, further affecting reflection of sunlight. Aerosol types and how they interact with clouds vary a great deal from place to place over time. Thus, we need satellites to capture a complete and accurate picture of how much energy Earth is absorbing from the sun.

Aerosol data will not only be used to better understand our atmosphere but our ocean, as well. How? Most of the light that is seen by a satellite comes from the atmosphere and its aerosols. Only a small fraction of the light comes from the ocean. PACE will take this into account when deciphering its data, including when deriving information about the microscopic algae that float in our ocean, *phytoplankton*. For PACE to accurately "see" the ocean, we must understand the aerosols present in the atmosphere.

PACE's advanced technologies will provide unprecedented insight into Earth's ocean and atmosphere.

Why do we need PACE? To better understand how the ocean and atmosphere exchange carbon dioxide.

Decades of clouds and aerosols data from satellites have been used to forecast weather, visibility and air quality. PACE will go a step further by observing the ocean, clouds, and aerosols together to better understand how they interact. Its data will reveal new details about the exchange of carbon dioxide and how some aerosols fuel the growth of phytoplankton.

Conversely, PACE will help to track the types of phytoplankton that can release particles to the atmosphere, which may lead to the formation of clouds. Overall, these processes affect how much heat is trapped by Earth's atmosphere and thus are vital for accurate weather and climate predictions.

PACE science objectives for clouds and aerosols:

- **Determine global aerosol distribution and type**
- **Provide new insight into aerosol properties**
- **Monitor cloud properties, and the interaction between aerosols and clouds**
- **Observe fundamental components of our global climate in new ways**

Plankton, Aerosol, Cloud, ocean Ecosystem

Learn more at pace.gsfc.nasa.gov