National Aeronautics and Space Administration

PACE Clouds Challenge: Antarctica

NASA Earth Crowdsourcing



What is the PACE Clouds Challenge: Antarctica

Scientists working with NASA's PACE Ocean Color Instrument or OCI are asking for cloud observations submitted through NASA's GLOBE Observer app taken at critical time window.

Your view of sky and clouds through your up photo will be used to compare what PACE's OCI instrument is observing at almost the same time.



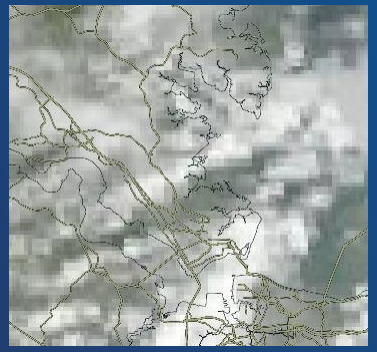
The Impact of Your Observations During This Challenge

Accurate identification of cloudy pixels is important because (1) clouds modulate Earth's **radiation budget** and (2) algorithms to determine aerosol, gas, and land/water surface properties mask out clouds to **avoid artefacts and biases**

Cloud retrieval validation typically uses ground stations, field campaigns, and active satellites but these are **sparse** in space and/or time

Volunteer observations can provide cloud fractional cover estimates to **expand** spatial extent of evaluation and **guide algorithm refinements**

PACE OCI



Ground observer



Examples of clouds detected by the PACE OCI instrument (left) and the up photo from an observer (right) at about the exact time when the satellite was over the observer's location.

Clouds can change rapidly in a short amount of time. Your observations at about the same time as the satellite flyover will help determine these differences in resolution.

From the Scientist: Dr. Andy Sayer

“Polar regions offer different challenges and opportunities for evaluating our cloud mask from much of the rest of the world. Because PACE is a polar-orbiting satellite and its OCI instrument has a wide swath, at high latitudes we often get two overpasses per day from consecutive orbits, about 98 minutes apart. On the first orbit the area viewed is to the west of the satellite, and on the second orbit it's to the east, so these repeat observations are useful to check consistency of our cloud identification techniques when viewing similar scenes from opposite directions. Additionally, the lower solar elevations towards the poles mean that e.g. shadows cast by clouds are elongated, which can also challenge cloud identification”.



Dr. Andy Sayer (University of Maryland Baltimore County/NASA Goddard Space Flight Center), NASA PACE Satellite Atmosphere Scientist

What is the PACE Satellite?

PACE, also known as the Plankton, Aerosol, Cloud, ocean Ecosystem satellite, provides a unique hyperspectral view of the entire planet every 1–2 days designed to reveal invisible information about tiny algae (fish food) in the sea, plants on the land, and particles in the air.

Hyperspectral imaging is remote sensing technology that captures hundreds of narrow, contiguous bands of light across multiple portions of the electromagnetic spectrum.



PACE launched on 8 February 2024 and is now in the phase in which scientists are learning how to use the information it provides to study clouds and aerosols.

What is the OCI?

PACE's primary sensor, the Ocean Color Instrument (OCI), is a highly advanced optical spectrometer that measures properties of light over portions of the electromagnetic spectrum. It enables continuous measurement of light at finer wavelength resolution than previous NASA satellite sensors, extending key system ocean color data records for climate studies.

OCI data are also being used to better understand our atmosphere and land vegetation.

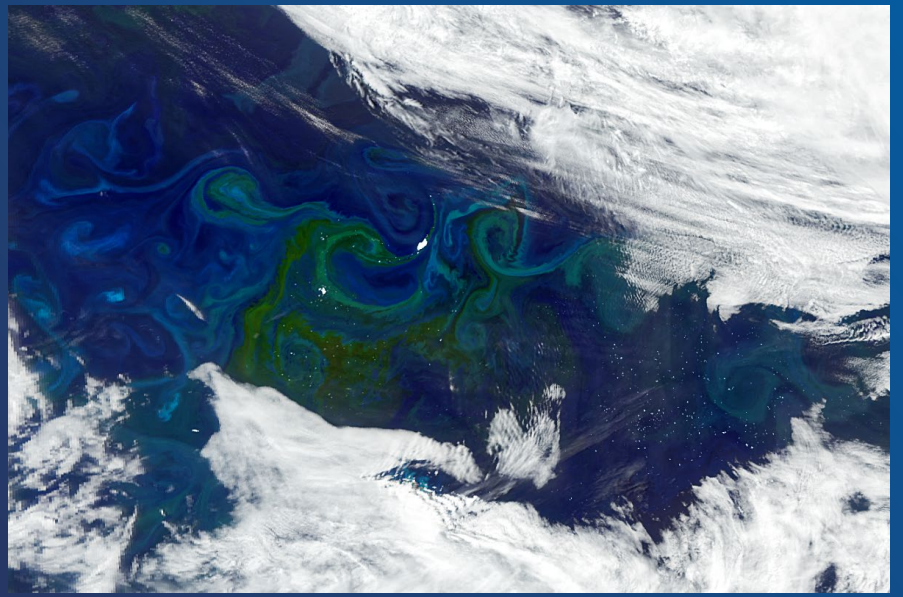
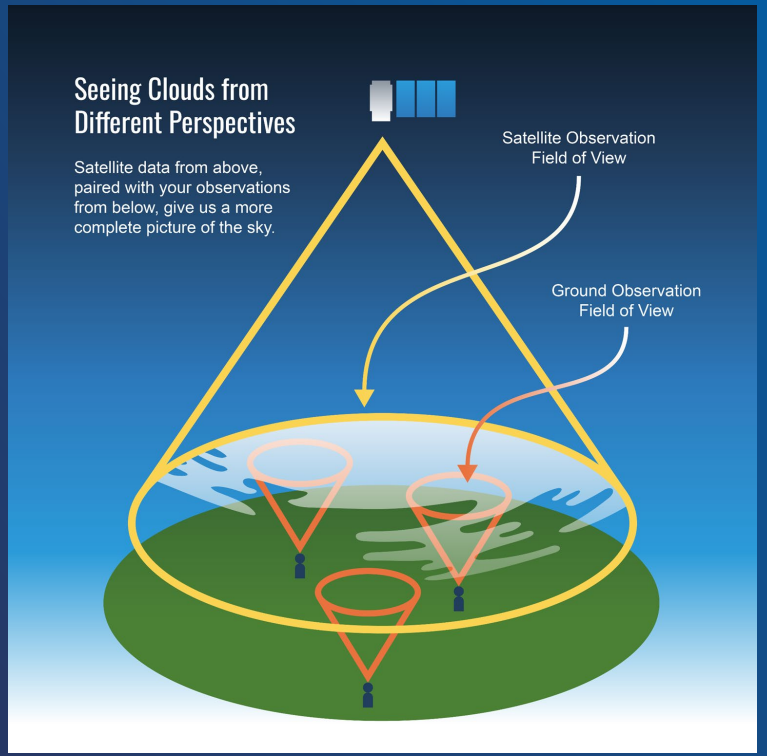


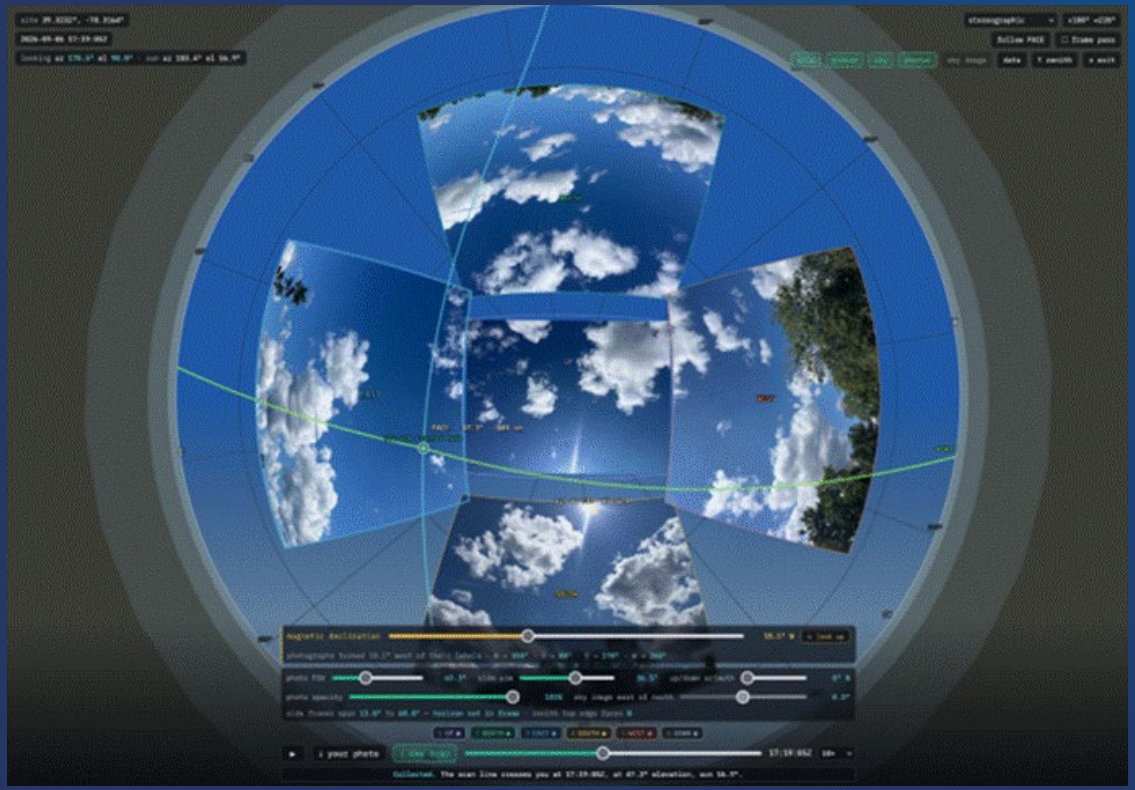
Image of icebergs circulate in the South Atlantic Ocean currents near the island of South Georgia. Around them, phytoplankton is blooming, creating large green-tinted swirls. This image was taken by the OCI sensor aboard PACE on January 5, 2025.

PACE Cloud Challenge: Time is Critical

- Set the PACE overpass alert (daytime only).
- Be in position 5 minutes before the overpass time.
- Start your observation.
  - **Critical time window**:
    5 minutes before to 5 minutes after the time on the overpass tool.
- Collect all six photos, emphasis on Up.
- Hit submit observation when you have strong WiFi or cell service.
- Make as many PACE observations per day as possible.



PACE Cloud Challenge: Time is Critical



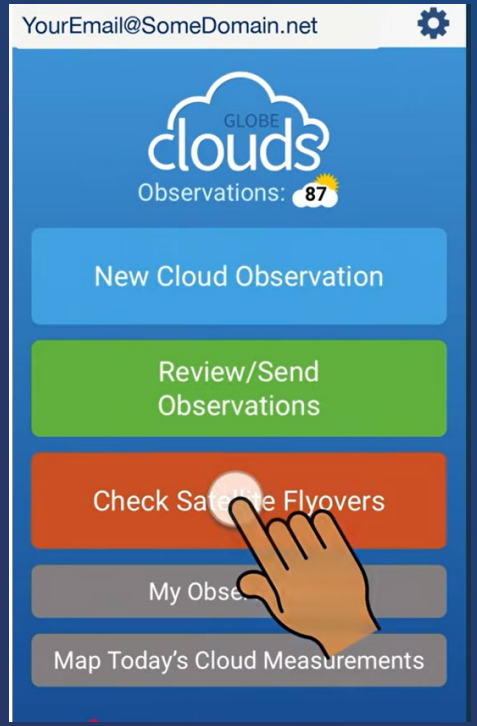
A GLOBE Clouds observation collected in the time critical window with all sky photos (up, north, south, west, and east photos) mapped to a sky view of the PACE satellite (green dot) passing overhead.

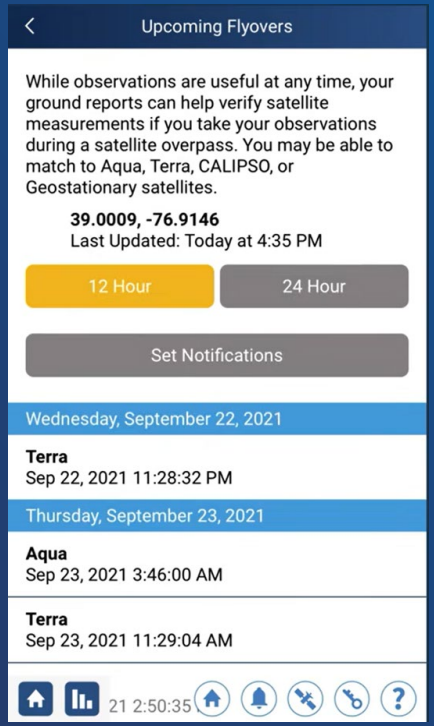
Step 1 - Set the PACE Overpass Notification (Internet or cell service required)

Go to the Clouds tool.



Tap “Check Satellite Flyovers.”

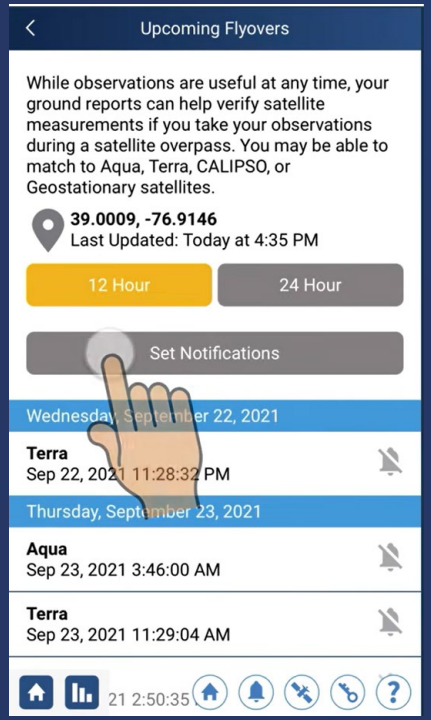


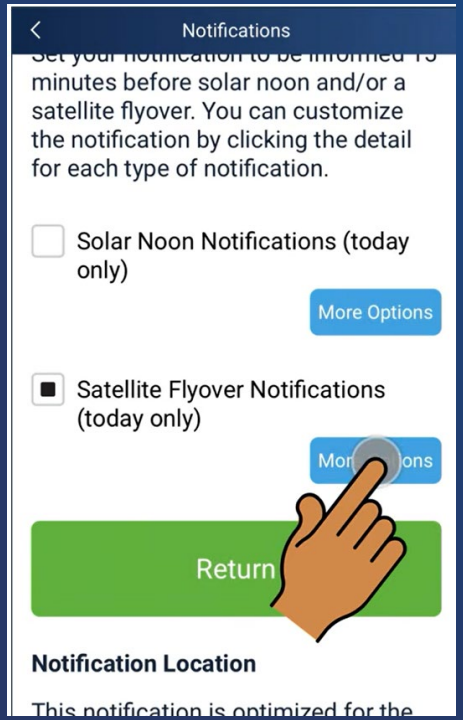


The app will check for the latest information at your current location.

Step 1 - Set the PACE Overpass Notification (Internet or cell service required)

Tap on “Set Notifications.”





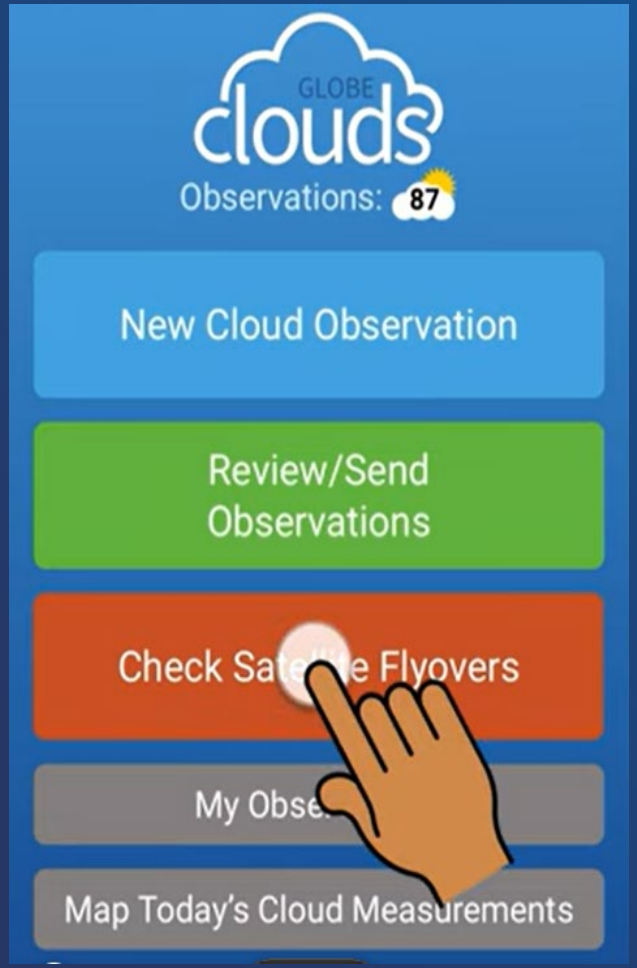
Set notifications for today only or multiple days with “More Options.”

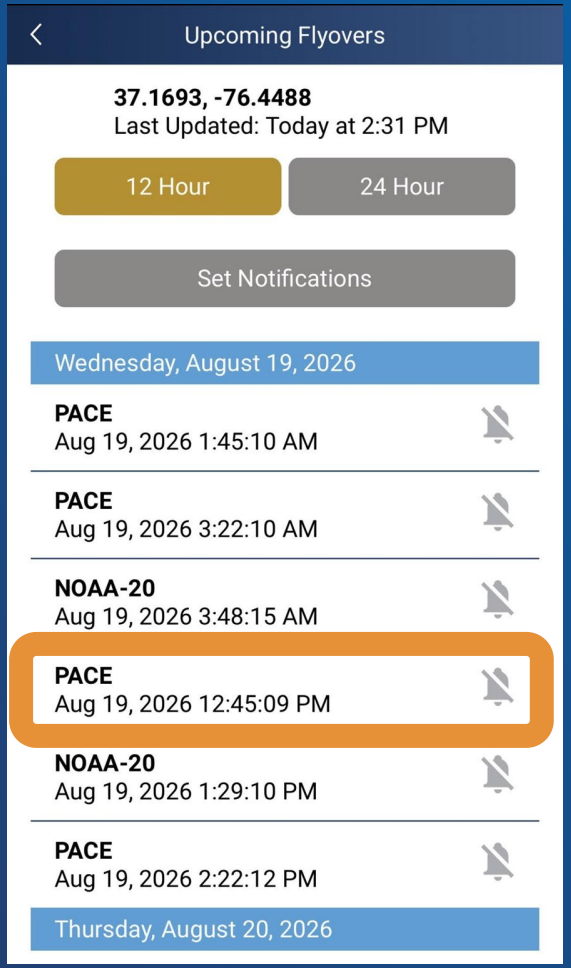
Under “More Options” you can also set starting and ending hours for notifications and specify which satellites to notify.

Once done, click save.

NOTE:

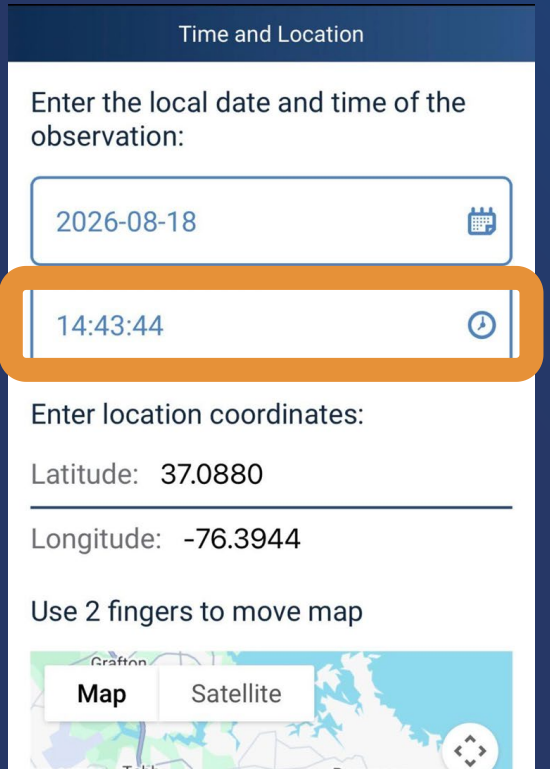
For the PACE Clouds Challenge, only send daytime observations.





Step 2 - Be in position

Be ready to make an observation 5 minutes before the PACE overpass time.





Step 3 - Collect all 6 photos

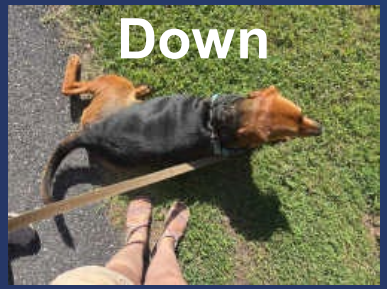






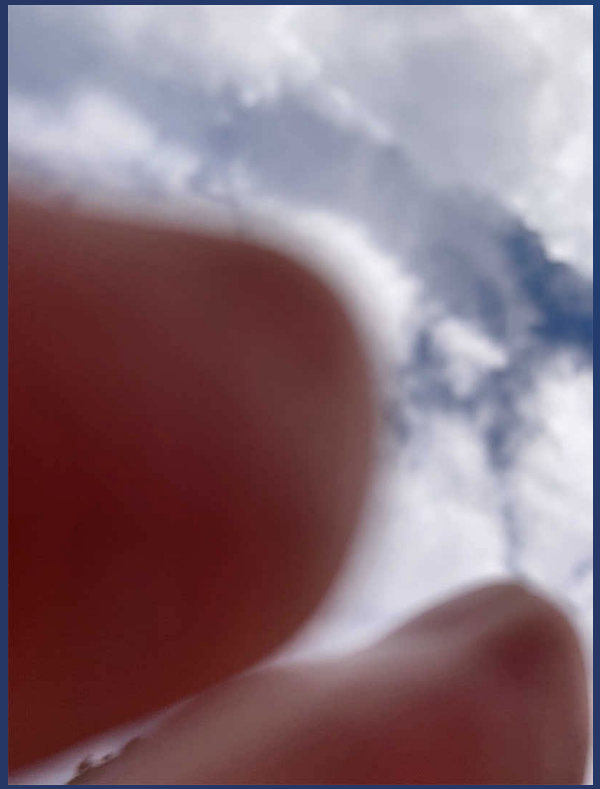




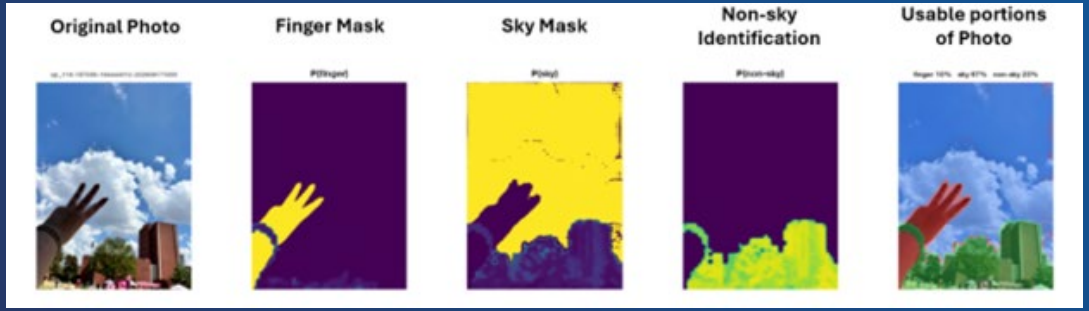




Up Photo is High Priority - Avoid Thumbs and Blurry Photos



All submitted observations pass through a computer vision algorithm to identify how much of the sky is visible in the photos. Scientists need to see as much of the sky as possible.

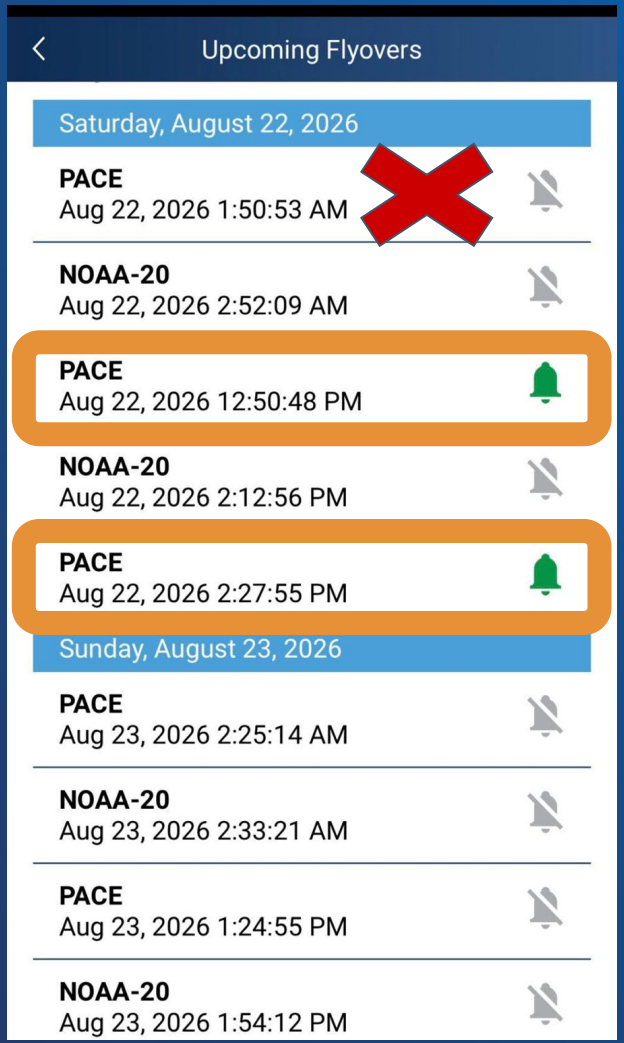


Examples of portions of the sky being removed because of distraction added to the photographs.

Unique to Antarctica: Two Flyovers per Day

You will see two flyovers or overpasses during daylight hours on the same day. It is best if you make observations during both times.

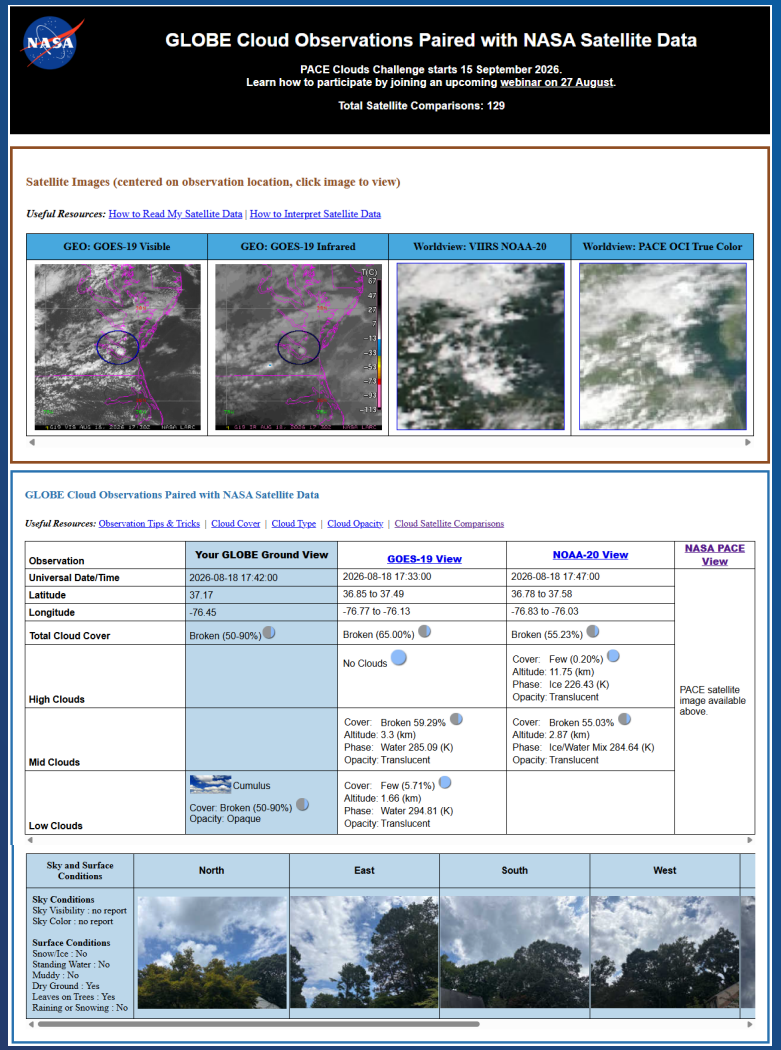
Tip: Overpasses are usually about 98 minutes (or 1.6 hours) apart from each other.



Your Personalized NASA Satellite Match

A personalized email from NASA is sent as soon as the day after your observation was sent to GLOBE with a satellite match table that has:

- Clickable satellite images centered on observation location
- Summary of satellite data
- Your photographs submitted with the observation



GLOBE Cloud Observations Paired with NASA Satellite Data

PACE Clouds Challenge starts 15 September 2026.
Learn how to participate by joining an upcoming webinar on 27 August.

Total Satellite Comparisons: 129

Satellite Images (centered on observation location, click image to view)

Useful Resources: How to Read My Satellite Data | How to Interpret Satellite Data

GEO: GOES-19 Visible	GEO: GOES-19 Infrared	Worldview: VIIRS NOAA-20	Worldview: PACE OCI True Color

GLOBE Cloud Observations Paired with NASA Satellite Data

Useful Resources: Observation Tips & Tricks | Cloud Cover | Cloud Type | Cloud Opacity | Cloud Satellite Comparisons

Observation	Your GLOBE Ground View	GOES-19 View	NOAA-20 View	NASA PACE View
Universal Date/Time	2026-08-18 17:42:00	2026-08-18 17:33:00	2026-08-18 17:47:00	
Latitude	37.17	36.85 to 37.49	36.78 to 37.58	
Longitude	-76.45	-76.77 to -76.13	-76.83 to -76.03	
Total Cloud Cover	Broken (50-90%)	Broken (65.00%)	Broken (55.23%)	
High Clouds		No Clouds	Cover: Few (0.20%) Altitude: 11.75 (km) Phase: Ice 226.43 (K) Opacity: Translucent	PACE satellite image available above.
Mid Clouds		Cover: Broken 59.29% Altitude: 3.3 (km) Phase: Water 285.09 (K) Opacity: Translucent	Cover: Broken 55.03% Altitude: 2.87 (km) Phase: Ice/Water Mix 284.64 (K) Opacity: Translucent	
Low Clouds	Cumulus Cover: Broken (50-90%) Opacity: Opaque	Cover: Few (5.71%) Altitude: 1.66 (km) Phase: Water 294.81 (K) Opacity: Translucent		

Sky and Surface Conditions	North	East	South	West
Sky Conditions Sky Visibility : no report Sky Color : no report **Surface Conditions** Snow/Ice : No Standing Water : No Muddy : No Dry Ground : Yes Leaves on Trees : Yes Raining or Snowing : No				

KEEP COLLECTING OBSERVATIONS EVEN WHEN THE CHALLENGE IS OVER.



