

ICESat-2

ICE, CLOUD, AND LAND ELEVATION SATELLITE-2

ICESat-2 will use rapid-firing lasers to measure the height of Earth's changing glaciers, ice sheets and sea ice, all in unprecedented detail.

The Ice, Cloud and land Elevation Satellite-2, or ICESat-2, will orbit Earth carrying a photon-counting laser altimeter. This instrument will measure height by timing how long it takes light to travel from the spacecraft to Earth and back, with a precision better than a billionth of a second.

The mission will provide insight into Earth's frozen regions – the cryosphere – which are rapidly changing with our warming climate. Melting glaciers and polar land ice contribute to rising sea levels. Shrinking sea ice changes Earth's energy budget and can modify ocean circulation patterns that buffer climate extremes.

With ICESat-2's frequent and precise measurements of elevation, scientists will be able to see where ice is flowing, melting or growing and to investigate the global impacts of these changes.

ICESat-2 continues key elevation observations of the cryosphere begun by the original ICESat mission (2003 to 2009) and Operation IceBridge airborne efforts (2009 through present), to provide a continuous long-term record of change in the beginning of the 21st century.

Beyond the cryosphere, ICESat-2 will also survey heights of the world's forests, lakes, urban areas, cloud cover and more, adding a detailed third dimension to flat images of Earth from space. In forested areas, height information will help researchers calculate how much carbon is stored in trees.



NASAfacts

SCIENCE OBJECTIVES

- ▶ Measure how much ice sheets and glaciers are gaining or losing mass at a regional level
- ▶ Measure how much melting the ice sheets of Greenland and Antarctica contribute to sea level changes
- ▶ Estimate the thickness of sea ice and monitor any changes
- ▶ Measure the height of forests to calculate the amount of carbon stored in vegetation

ICE, CLOUD, AND LAND ELEVATION SATELLITE-2

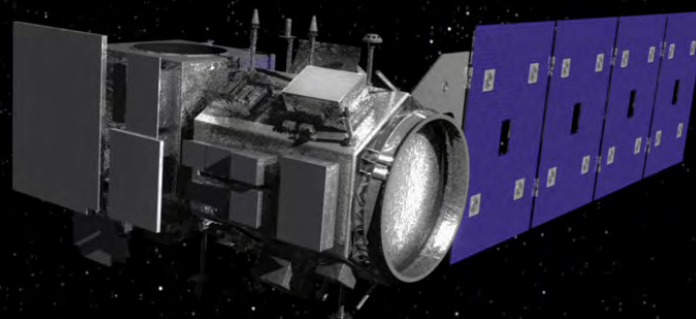
Technological Leap

ICESat-2 will carry a single instrument, the Advanced Topographic Laser Altimeter System, or ATLAS. ATLAS features new technologies that allow it to collect more detailed and precise measurements of the heights of the planet's ice, vegetation, land surface, water and clouds.

ATLAS carries two lasers, one primary and one backup, to measure height. The instrument precisely times the round-trip of individual laser photons that reflect off the ground and return to the satellite's receiver telescope. By matching those times with the satellite's location in space, ICESat-2 will determine the elevation of features on Earth below.

The laser sends 10,000 pulses of green light per second. With this incredibly fast pulse rate, ATLAS can take measurements every 2.3 feet along the satellite's ground path. With six beams arranged in pairs, ATLAS will also be able to estimate the slope of the surface it flies over. The mission will gather enough data to estimate the annual elevation change in the Greenland and Antarctic ice sheets even if it's as slight as 4 millimeters – the width of a No. 2 pencil.

ICESat-2 advances laser technology from the first ICESat, which was launched in 2003 and operated until 2009.



Engineers work on ATLAS in the clean room at NASA's Goddard Space Flight Center, Greenbelt, Maryland

Spacecraft Dimensions: 12.5 feet tall with an 8.2-foot-by-6.2-foot base when stowed for launch to fit within the rocket fairing. This is about the size of a small camper trailer. After separation from the launch vehicle, the solar array extends, which increases the 6.2-foot dimension to 32.8 feet.

Science Instruments: ICESat-2 will carry a single instrument, the Advanced Topographic Laser Altimeter System, or ATLAS, built by NASA Goddard Space Flight Center. ATLAS generates a single laser beam, which is split into six as it exits the instrument, arranged in three pairs to better gauge the slope of Earth's surface.

Mission Management and Operations: NASA's Goddard Space Flight Center manages development of the ICESat-2 mission, including mission systems engineering and mission operations on behalf of the Earth Science Division at NASA Headquarters, Washington, DC.

For more about ICESat-2, go to:
icesat-2.gsfc.nasa.gov

Total Weight: 3,483 pounds (1,580 kilograms)

Power: 1374 Watts

Mission Lifetime: The spacecraft has a design life of 3 years and enough fuel for 7 years

Spacecraft Provider and Observatory Integrator: Northrop Grumman Innovation Systems

Orbit Altitude: ~310 miles (~500 kilometers)

Orbit Inclination: 92 degrees, providing coverage up to 88° N and 88° S

Orbit Repeat Pattern: 1387 orbits, repeating seasonally every 91 days

Launch Vehicle: United Launch Alliance's Delta II rocket

Launch Site: Vandenberg Air Force Base, California