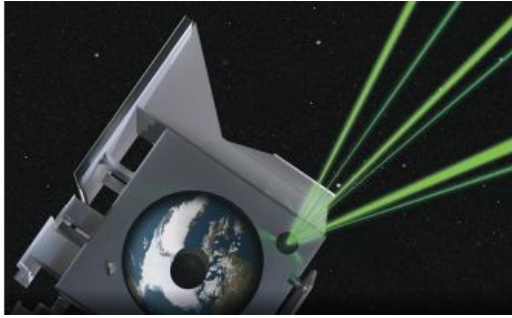


# NASA IceSat-2 Satellite Measures Ice Sheets and Creates Height Maps



[IceSat-2](#) (one of the most powerful Earth observation tools ever put in orbit) was launched recently to measure the shape of the ice sheets to a precision of 2cm. In addition to this, the satellite is now returning a whole raft of other information.

It is mapping the height of land, rivers, lakes, forests, and even the depth of the seafloor. Nasa has been showcasing the early data at the AGU meeting.

The satellite carries a single instrument - a half-tonne green laser that fires about 10,000 pulses of light every second. Each of those shots goes down to the Earth and bounces back up on a timescale of about 3.3 milliseconds. The exact time equates to the height of the reflecting surface.

Scientists will be using this optical "tape measure" to look for the elevation changes in Antarctica and Greenland that might indicate melting. And the great advantage of the new laser system is that it can detect behaviour in areas that have been beyond the vision of previous satellites.

"We're resolving every valley in the mountains," said team-member Ben Smith from the University of Washington, Seattle. "These have been really difficult targets for altimeters in the past, which have often used radar instead of lasers and they tend to show you just a big lump where the mountains are. But we can see very steeply sloping surfaces; we can see valley glaciers; we'll be able to make out very small details."

Heights are calculated from just 150 photons, or particles, of reflected light, but even from just this small number, IceSat-2 can produce an elevation number to an accuracy of a little over 2cm. The AGU meeting was shown some of the first efforts to build a sea-ice thickness map for the Arctic.

Sample data was also presented of forested areas. The laser sees the tree canopy and the ground underneath, which will enable new assessments to be made of the amount of carbon stored in vegetation across the Earth.

On the note of bathymetry, it was suspected that the laser might be able to measure the depth of shallow coastal waters, but not this well. A project is already being developed to use IceSat to map the near-shores of about 100 small islands in the Pacific.

"You need to know the bathymetry to understand how waves will move on to the reefs and atolls," explained Sinéad Farrell from the University of Maryland. "If you have storm surges, for example, you need to know those depths to accurately model what those waves will do; and currently there's almost no bathymetry data at all for these islands."