AIRCRAFT, SCIENCE AND ICEBRIDGE

NASA's Operation IceBridge (OIB) campaign used aircraft to capture regional-scale changes in glaciers, ice sheets, sea ice and snow cover, which satellites and ground instruments alone could not.

National Aeronautics and Space Administration

WHEN IT COMES TO MELTING ICE, IS THERE MORE THAN MEETS THE EYE?

The Arctic and Antarctic poles are rapidly changing. Sea ice extents are decreasing and glaciers are retreating. However, many of the processes that influence these large-scale changes are difficult to see and scientists still don't completely understand.

Aircraft data collected during OIB is helping to uncover some of the previously unseen mechanisms driving this global change. In addition to bridging the gap between ICESat (2003-2009) and ICESat-2 (2018-2021), NASA satellites that track these large-scale changes, OIB also leveraged its unique aerial view to conduct detailed studies of the smaller-scale processes that satellites can't see.

Here are three things we wouldn't know without OIB aircraft data:

- **IT'S NOT JUST ICE: THE ARCTIC IS LOSING SNOW, TOO:** OIB provided the first detailed view of snow cover across large portions of the Arctic Ocean, revealing there's actually around 30% less snow on sea ice than previously thought. This decrease is largely attributed to the later refreezing and formation of Arctic sea ice in the fall, when the majority of snow accumulates. Less snow means sea ice is more susceptible to melting during the spring and summer, further exacerbating diminishing sea ice extents.
- **THE GREENLAND ICE SHEET IS MORE VULNERABLE THAN WE THOUGHT:** OIB data is being used to more accurately predict the shape of bedrock trapped under ice. The new method—mass conservation—showed that fjords, or narrow inlets of sea, extend farther into Greenland's interior beneath the ice than previously thought. Therefore, the Greenland ice sheet will remain in contact with warmer ocean currents as it retreats, making it more vulnerable to disappearing.
- **THE OCEAN FLOOR MAY HELP SLOW ADVANCING GLACIERS:** OIB data show that areas offshore of the Thwaites Glacier in Antarctica may provide what scientists call stabilization points: basically, the glacier catches on parts of the ocean floor as it tries to retreat. This new finding could help improve sea level rise predictions.

PLATFORMS

Primary

DC-8

P-3

C-130

Secondary

Gulfstream V

Falcon

B200 King Air

Single Otter

SENSORS

Radars

- MCoRDS
- HiCARS
- UHF Accumulation Radar
- SHF Snow Radar
- Ku-Band Radar Altimeter

Lidars

- UTIG lidars
- UAF airborne scanning lidar

Laser Altimeters

- ATM
- LVIS
- Riegl

Cameras

- DMS
- FLIR
- CAMBOT
- GPS
- KT-19 skin surface temperature sensor

Gravimeters

- AIRGRav

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