Airborne Campaign to Map Summer Melt of Greenland Ice Sheet

For the first time, a NASA airborne campaign will measure changes in the height of the Greenland Ice Sheet and surrounding Arctic sea ice produced by a single season of summer melt. NASA’s C-130 research aircraft flew from the Wallops Flight Facility in Virginia, USA, to Greenland on 30 October 2013. Survey flights are now being conducted to collect data that will improve the understanding of seasonal melt and provide baseline measurements for future satellite missions. Flights are scheduled to continue until 16 November.

The land and sea ice data gathered during this campaign will give researchers a more comprehensive view of seasonal changes and provide context for measurements that will be gathered during NASA’s ICESat-2 mission, which is scheduled for launch in 2016.

The more ground that is covered the more comparison points available for ICESat-2, said Bryan Blair of Goddard Space Flight Center in Greenbelt, Maryland, principal investigator for the Land, Vegetation and Ice Sensor, or LVIS.

Surface Melt

Warm summer temperatures lead to a decline in ice sheet elevation that often can be significant in low-lying areas along the Greenland coast. In past years, the Jakobshavn Glacier, located in the lower elevations of western Greenland, has experienced declines of nearly 100 feet in elevation over a single summer. Higher elevations farther inland see less dramatic changes, usually only a few inches, caused by pockets of air in the snowpack that shrink as temperatures warm.

Surface melt is more than half of the story for Greenland’s mass loss, said Ben Smith, senior physicist at the University of Washington’s Advanced Physics Laboratory, Seattle, and member of the science team that selected flight lines for this campaign. The rest of Greenland’s mass loss comes from ice flowing downhill into the ocean, often breaking off to form icebergs, and from melting at the base of the ice sheet.

Researchers will measure ice elevation using the LVIS laser altimeter and the LVIS-GH, a new, smaller version designed to fly on NASA’s Global Hawk unmanned aerial vehicle. LVIS and LVIS-GH will measure separate but overlapping swaths of the ice from an altitude of 28,000 feet.

The C-130 carrying both instruments will fly out of Thule and Kangerlussuaq, Greenland, allowing researchers to sample both high- and low-elevation ice and a variety of geographic areas.

Image Credit: NASA / Michael Studinger.