

Via research aircraft instead of dog sled

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With dog food and a pack of huskies Dr. Veit Helm would not get far on his Antarctic expeditions. Instead, the geophysicist at the Alfred Wegener Institute for Polar and Marine Research in the Helmholtz Association conducts research on the icy continent from on board an aircraft and successfully completed the first measurement campaign of the new Polar 6 research plane a few days ago.

The flights were part of the "CryoSat-2 validation experiment", which scientists of the Alfred Wegener Institute carried out together with colleagues from the Australian University of Tasmania in East Antarctica. They received support from the Australian Antarctic Division (AAD) and the [European Space Agency](#) (ESA). "We surveyed the Totten Glacier and the Law Dome to acquire data that will enable us to check the accuracy of ESA's [CryoSat satellite](#)," says Dr. Veit Helm.

The CryoSat-2 satellite has been orbiting around the Earth since 8 April 2010. It records changes in [sea ice thickness](#) and changing surface heights of land ice in the Arctic and Antarctic and in this way supplies important data for [climate research](#). Over Antarctica, for instance, it measures to an accuracy of a few centimetres how high glaciers rise up from the surface using its two radar antennas. Researchers utilise these regularly collected data to check whether and to what extent the inland ice masses of the Antarctic increase or shrink.

To make sure that the satellite is collecting data with maximum precision, however, the scientists regularly conduct comparative measurements from the air and on the ground. "The CryoSat-2 validation

experiment examines the influence that physical properties of the top snow and ice layer exert on the radar signal that the satellite emits and receives. Depending on such factors as the particle size of the snow, the extent to which it has compacted and how it is layered, the radar signal can penetrate deeper or less deep and is thus reflected differently. If we ignore these factors in the data evaluation, it may result in misinterpretations," explains Veit Helm.

To understand the significance of such influencing variables, the scientists have to conduct validation experiments in the field. The measurements of the Polar 6, the research aircraft newly put into service and sponsored by the Federal Ministry of Education and Research, form a link between the satellite measurements from space and corroborative investigations on the ground. "Polar 6 not only has the same radar system as the satellite. We also have a laser scanner on board that scans the ice surface at a high resolution so we can develop highly precise elevation models, which in turn serve as comparative figures for the CryoSat measurements," states Veit Helm.

While the German geophysicist circled over the two glaciers in the aircraft, his Australian colleagues drove through the selected investigation areas in snowmobiles. "The snowmobiles were equipped with a GPS system that recorded the surface topography of the terrain. In addition, the ground team dug shafts in the top snow and ice layer to study its physical properties," says Veit Helm.

The Totten Glacier near Casey, the Australian research station, is considered to be the region with the greatest surface changes in East Antarctica. It is undergoing surface lowering and is therefore perfectly suited for the validation measurements. For the geophysicists the goal of the CryoSat mission is to record changes in the polar ice masses down to the smallest possible detail via satellite.

In this way the researchers not only have a significant edge over South Pole conqueror Roald Amundsen in terms of knowledge and a helper in space. On every measurement flight of the Polar 6 the scientists and crew can also trust in warm polar suits and a well devised emergency pack. For each person the latter contains, for example, a sleeping bag and sleeping pad, socks, gloves, sunscreen, cutlery, toilet paper, dry food rations for seven days and a portable satellite telephone that the crew always keeps handy.

Provided by Helmholtz Association of German Research Centres

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