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Pathways of warm water to the Northeast Greenland outlet glaciers

Janin Schaffer (1), Ralph Timmermann (1), Torsten Kanzow (1), Jan Erik Arndt (1), Christoph Mayer (2), and Ursula Schauer (1)

(1) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany (janin.schaffer@awi.de), (2) Bavarian Academy of Sciences and Humanities, Commission for Geodesy and Glaciology, Munich, Germany (christoph.mayer@lrz.badw-muenchen.de)

The ocean plays an important role in modulating the mass balance of the Greenland Ice Sheet by delivering heat to the marine-terminating outlet glaciers surrounding the Greenland coast. The warming and accumulation of Atlantic Water in the subpolar North Atlantic has been suggested to be a potential driver of the glaciers' retreat over the last decades. The shelf regions thus play a critical role for the transport of Atlantic Water towards the glaciers, but also for the transfer of freshwater towards the deep ocean.
A key region for the mass balance of the Greenland Ice Sheet is the Northeast Greenland Ice Stream. This large ice stream drains the second-largest basin of the Greenland Ice Sheet and feeds three outlet glaciers. The largest one is Nioghalvfjerdsfjorden (79°N-Glacier) featuring an 80 km long floating ice tongue. Both the ocean circulation on the continental shelf off Northeast Greenland and the circulation in the cavity below the ice tongue are weakly constrained so far.
In order to study the relevant processes of glacier-ocean interaction we combine observations and model work. Here we focus on historic and recent hydrographic observations and on the complex bathymetry in the Northeast Greenland shelf region, which is thought to steer the flux of warm Atlantic water onto the continental shelf and into the sub-ice cavity beneath the 79°N-Glacier. We present a new global topography data set, RTopo-2, which includes the most recent surveys on the Northeast Greenland continental shelf and provides a detailed bathymetry for all around Greenland. In addition, RTopo-2 contains ice and bedrock surface topographies for Greenland and Antarctica.
Based on the updated ocean bathymetry and a variety of hydrographic observations we show the water mass distribution on the continental shelf off Northeast Greenland. These maps enable us to discuss possible supply pathways of warm modified Atlantic waters on the continental shelf and thus potential ways of heat transport towards the base of the 79°N-Glacier.