



Warming Beneath the 79°N Glacier in Northeast Greenland and Warm Atlantic Water in Fram Strait

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Time series measurements of temperature beneath the 79°N glacier, over the East Greenland Continental Shelf and in Fram Strait suggest that recently observed warming beneath the glacier may be caused by warm recirculating Atlantic water from Fram Strait.

CTD profiles close to the 79°N glacier collected between 1997 and 2015 (5 cruises) are compared with CTD profiles over the East Greenland Shelf collected between 1980 and 2015 (15 cruises) and with repeated transects across Fram Strait between 1983 and 2015 (24 cruises). The 2009 and 2014 cruises exploited a rift in the 79°N glacier to access the cavity below without the need for drilling.

The time series of observations shows that the temperature of water in the cavity beneath the 79°N glacier is rising. This warm water likely reaches the cavity via the Norske-Westwind trough on the East Greenland Shelf. The temperature of water in the southern part of this trough responded quickly to the temperature of water in Fram Strait, showing a distinct peak in 2006-8. The northern part of the trough responded less strongly, probably because it is upstream of the region where the bulk of the Atlantic Water recirculates in Fram Strait. Subsurface warm water at the northern end of the trough also had a colder signature suggesting it originates from Atlantic Water that has recirculated further into the central Arctic.

We are concerned that the trough system on the East Greenland Shelf provides a short-circuit allowing heat transported from low latitudes by northward flowing Atlantic water to directly affect the Greenland Ice Sheet. If our assumptions are correct, the rising temperature of water in the Norwegian Atlantic Current potentially threatens the 79°N glacier, which drains a major part of the Northeast Greenland Ice Sheet.