



The Impact of Deep Fjord Water Temperatures on the Ice Flow Velocities of Helheim Glacier, Greenland

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Increasing ice flow velocities of marine terminating glaciers are often linked to rising ocean temperatures. Unfortunately, direct comparisons between glacier velocity and ocean temperatures are impeded by the fact that few oceanographic datasets span multiple years or contain temperatures at depth.

Here, we use an oceanographic dataset collected in Helheim Fjord over several years (described in Straneo et al., 2011, Nat. Geoscience) in both shallow and deep waters. We compare the water temperatures at different depths with ice flow velocities that have been calculated from feature-tracking of LandSAT 7 and 8 images.

Our results cover the period 2009–2013 and show both seasonal and inter-annual variability. We find that the velocity of Helheim glacier is likely influenced by the deep ocean water temperatures, namely the influx of warm Atlantic water, whereas water temperature at shallower depths do not have a significant influence on glacier speed. This is in contrast with findings from, for example, Svalbard. Our study demonstrates the need for multiple-year ocean datasets at different depths, if we are to disentangle the complex interactions between glaciers and ocean.