

グリーンランド北西部における海洋性溢流水河の季節的流動変化

榊原大貴^{1,2}、杉山慎²

¹北海道大学北極域研究センター

²北海道大学低温科学研究所

Control on seasonal flow speed variation of marine-terminating outlet glaciers in northwestern Greenland

Daiki Sakakibara^{1,2} and Shin Sugiyama²

¹Arctic Research Center, Hokkaido University

²Institute of Low Temperature Science, Hokkaido University

The Greenland ice sheet is losing mass under the influence of increase in surface melting and ice discharge from marine-terminating outlet glaciers (e.g. Enderlin et al., 2014). The mass loss from the Greenland ice sheet accounts for a substantial part of global sea level rise over the last decades. To accurately project future global sea level rise, better understanding of the dynamics of marine-terminating outlet glaciers is required. Thus, it is important to study ice velocity changes of marine-terminating outlet glaciers in connection with atmospheric and ocean conditions. For this purpose, we analysed Landsat 8 images to measure flow speeds of 10 marine-terminating outlet glaciers along the coast of the Prudhoe Land, northwestern Greenland from 2014 to 2015. Relationships among flow speed, frontal position, sea ice condition in front of glacier terminus, and air temperature were investigated with focus on seasonal variations.

All of the studied glaciers showed speedup from May to July and slowdown from July to September in 2014 and 2015. Magnitude of the speedup was between 80 and 440 m a⁻¹. There is a clear relationship between seasonal variations in flow speed and positive-degree day sum (PDD). Flow speed for the studied glaciers rapidly increased as PDD increased. The speedup stopped when PDD reached about 100 K d. Then the speed gradually decreased to the rate before the speedup. Similar relationship was found for all of the studied glaciers both in 2014 and 2015. These results suggest that seasonal flow speed variation is controlled not simply by the volume of surface meltwater production, but rather by subglacial water pressure, which is controlled by meltwater input to the glacier bed and the efficiency of the subglacial drainage system. There were no general relationships among flow speed, frontal position and sea ice condition in front of the glacier termini. Thus, our study suggested subglacial water pressure as a dominant control on seasonal variation in flow speed of marine-terminating outlet glaciers along the coast of Prudhoe Land in northwestern Greenland.

References

Enderlin, E. M., I. M. Howat, S. Jeong, M. J. Noh, J. H. van Angelen, and M. R. van den Broeke, An improved mass budget for the Greenland ice sheet. *Geophys. Res. Lett.*, 41, 866–872, 2014.

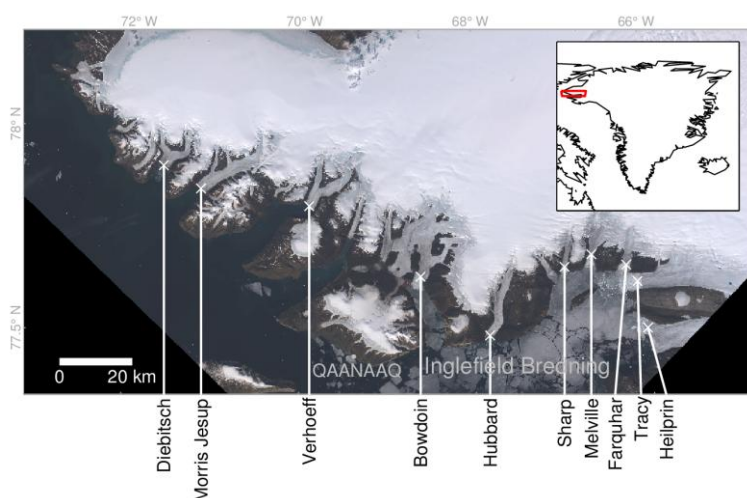


Figure 1. Studied 10 marine-terminating outlet glaciers in northwest Greenland. Background is a Landsat 8 OLI band 8 image acquired on July 9 2014. The inset shows the location of study area in Greenland.