

グリーンランド北西部 Prudhoe Land 沿岸における溢流水河の末端変動と流動変化

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Ice front and flow speed variations of marine terminating outlet glaciers along the coast of Prudhoe Land, northwestern Greenland

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Greenland ice sheet is losing mass as a result of increased melting and ice discharge (e.g. Enderlin et al., 2014). This mass loss significantly contributes to sea level rise. After retreat, thinning and acceleration of marine-terminating outlet glaciers in southern Greenland, similar changes are recently observed in northwestern coast (Khan et al., 2010). Thus, it is increasingly important to study glaciers in northwestern Greenland. We analyzed satellite images to measure frontal positions and ice speeds of 19 marine-terminating outlet glaciers along the coast of Prudhoe Land over the period from 1988 to 2014.

All the studied glaciers retreated at a median rate of 38 m a^{-1} in 1999–2013. The greatest rate of retreat (423 m a^{-1}) was observed at Tracy Gletscher (Figure 1). Ice speed along a centerline within 20 km from the front ranges between 7 ± 6 and $2070 \pm 90 \text{ m a}^{-1}$ (Figure 2). More than 50% ice speed increase was observed in 2000–2013 at glaciers retreating at a rate greater than 50 m a^{-1} . Similar to the previous studies, there is a relationship between frontal retreat and flow speedup. In a shorter time scale, however, there is no clear relationship between frontal retreat and speedup. Hubbard, Morris Jesup, and Verhoeff Gletscher showed similar variations in the ice speed. Ice speed of these glaciers shifted from acceleration phase to deceleration phase before and after mid-2000s. It is suggested that a change in drainage system beneath the glaciers controlled the ice speed changes. Tracy Gletscher significantly increased its flow speed in 2000–2007 and 2012–2014. These periods correspond to the rapid retreat of the terminus. Several studies suggest that the speedup and thinning are driven by ice front retreat and subsequent reduction in the back-stress (e.g. Howat and others, 2005). Thus, it is suggested that the significant speedup of Tracy Gletscher is due to disintegration of the frontal ice.

References

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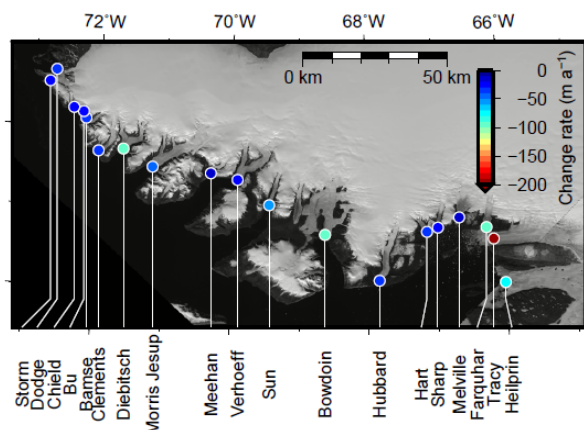


Figure 1. Changing rate in the ice front positions of studied glaciers from 1999 to 2013.

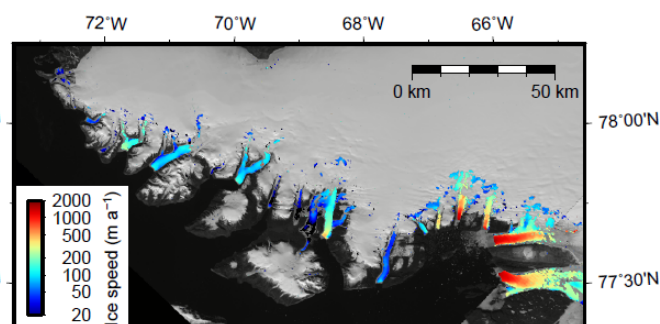


Figure 2. Ice speed distributions of the glaciers along the coast of Prudhoe Land in 2010.