

Lateral migration of a flowstripe on the ice shelf of Shirase Glacier, East Antarctica

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The Antarctic ice sheet discharges ice into the ocean through outlet glaciers. On the surface of the outlet glaciers, surface structures parallel to flow direction are frequently observed and referred to "flowstripes". The flowstripes form in (1) a confluence area of tributaries, (2) lateral shear margins and (3) where glaciers flow over undurated bedrock (Glasser and Gudmundsson, 2012), suggesting the relevance with a glacier flow regime. Thus, studying flowstripes gives insight into the glacier dynamics. Here, we report recent dynamic behaviour of a flowstripe on Shirase Glacier in Antarctica.

Shirase Glacier is one of the fastest outlet glaciers in East Antarctica (Fig. 1). Ice flow converges from a vast accumulation basin into a ~10 km wide trough before feeding into the ocean, reaching a speed of 2200 m a⁻¹ near the grounding line. We found on satellite imagery an intriguing lateral migration of a flowstripe near the margin of the ice shelf. The flowstripe located 4 km from the western ice margin began westward migration in 2013 and merged with another flowstripe generated at the confluence with a tributary (Fig. 2). The migration of the flowstripe was associated with a change in the ice flow pattern. Ice flow velocity across the ice shelf 10 km downstream from the grounding line showed an acceleration of a section 3–5 km from the western margin, where the flowstripe was observed (Fig. 3). Ice speed of the section increased from 2050 to 2400 m a⁻¹ during the migration of the flowstripe in 2013–2018. We propose two possible drivers of this lateral migration of the flowstripe as: (1) detachment of basal ice from underlying bedrock and (2) changes in the ice rheology. Numerical experiments with an ice flow model is planned to investigate the mechanism of the observed changes in the ice shelf dynamics.

(Figures are included in the PDF version of this abstract.)

Reference:

Glasser, N. F. and Gudmundsson, G. H. (2012), Longitudinal surface structures (flowstripes) on Antarctic glaciers, *The Cryosphere*, **6**, 383–391.

キーワード：南極、氷床、氷河

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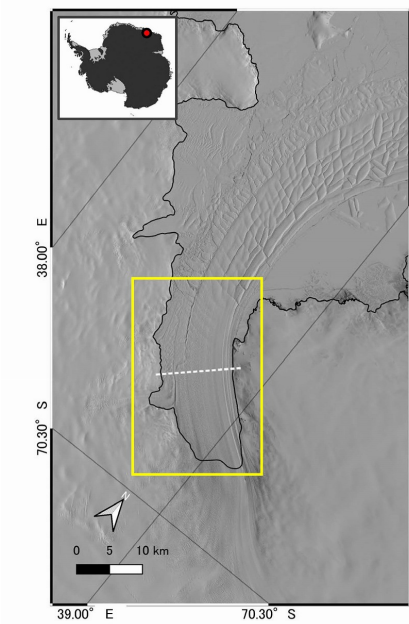


Figure 1. Landsat 8 OLI image on 26 November 2013 showing Shirase Glacier, East Antarctica. Dashed line shows the profile used in the velocity plot in Figure 3. A box indicates the area shown in Figure 2.

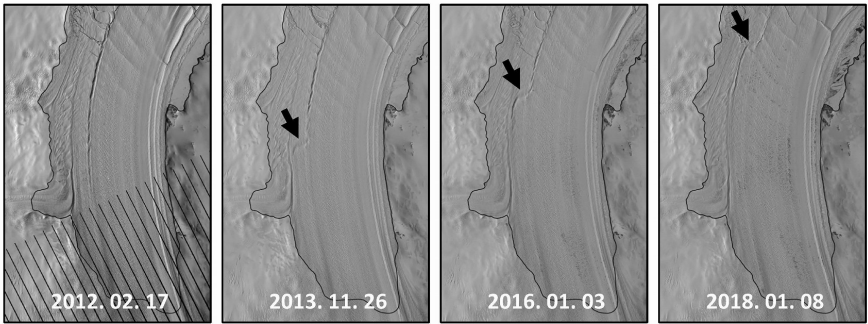


Figure 2. Landsat 7/8 imagery showing the migration of the flowstripe in 2013-2018 (black arrows).

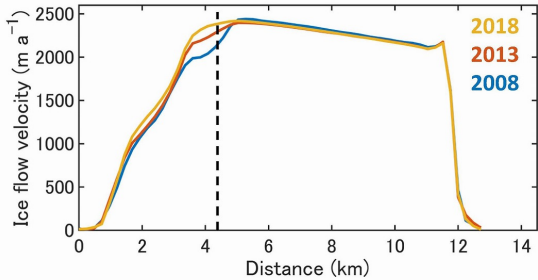


Figure 3. Annual ice flow velocity along the cross-sectional profile shown in Figure 1 (dashed line). Dashed line shows the location of the flowstripe before 2013.