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The internal structure and subglacial topography of the NE outlet of Eyjabakkajökull glacier, East Iceland.

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Eyjabakkajökull is a surge-type outlet glacier that drains the NE part of Vatnajökull ice cap in Iceland. The glacier is characterized by three distinct outlets, separated by medial moraines in the ablation zone, and the glacial landsystem consists of subglacial landforms including flutes and drumlins, ice-cored moraines, hummocky moraine, crevasse-fill ridges, outwash plains, end moraines, and concertina eskers (Schomacker et al., 2014). While the historically documented surges occurred in 1890, 1931, 1938 and 1972–1973, the surging of Eyjabakkajökull has started since 2200 cal a BP (Striberger et al., 2011).

In this study, we investigated the internal structure and subglacial topography of the NE outlet of the Eyjabakkajökull. As the glacier is retreating rapidly in recent years, we aim to understand if the ice structure and subglacial topography have an influence on this.

The ice structure and thickness measurements were done by ground penetrating radar (GPR) Zond 12-e with 38 MHz antenna. Fifteen profiles were recorded perpendicular to the glacier flow direction, as well as four profiles, were recorded parallel to the glacier flow direction, 20 km in total from 825 m a.s.l. to 665 m a.s.l. at the ice margin covering the approximately 1.5 km2. The coordinates of each GPR profiles and ground control points were determined with GNSS system EMLID Reach RS+. Drone DJI Phantom 4 Pro v2.0 was used to capture aerial photographs of the glacier. The control of drone and mission generation was done by Drone Harmony mobile application. Flight altitude was 50-70 m with 85% image overlap. The digital elevation model and orthophoto map with the pixel size of 3 to 8 cm was created with Agisoft PhotoScan Pro software. Model of the ice surface and subglacial topography was created by interpolation tools in ArcMap software.

In obtained GPR b-scans the reflection from the glacier bed is clearly visible up to the depth of 140 m. Accordingly, the ice thickness in the surveyed area varies from 140 m approximately 2.1 km from glacier margin to approximately 15 m at the glacier margin. Obtained data show crevasses, as well as numerous englacial channels across the surveyed area of the glacier. As the englacial reflections are more pronounced and scarcer downstream we assume that closer to ice margin the number of channels is smaller than upstream and they are possibly bigger. We present the model of the subglacial topography allowing discussing its implications on the glacier dynamics.

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References

Schomacker, A., Benediktsson I.Ö., Ingólfsson, Ó. 2014. The Eyjabakkajökull glacial landsystem, Iceland: Geomorphic impact of multiple surges. Geomorphology, 218, 98–107.

Striberger, J., Björck, S., Benediktsson, Í. Ö., Snowball, I., Uvo, C. B., Ingólfsson, Ó., Kjær, K. H. 2011. Climatic control of the surge periodicity of an Icelandic outlet glacier. Journal of Quaternary Science, 26(6), 561–565.