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Surging glaciers in Iceland – research status and future challenges

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Twenty six Icelandic outlet glaciers, ranging from 0.5-1.500 km2, are known to surge, with terminal advances ranging from of few tens of meters to about 10 km. The geomorphic signatures of surges vary, from large-scale folded and thrusted end moraine systems, extensive dead-ice fields and drumlinized forefields to drift sheets where fast ice-flow indicators are largely missing. Case studies from the forefields of Brúarjökull, Eyjabakkajökull and Múlajökull surging glaciers will be presented. At Brúarjökull, extremely rapid ice flow during surge was sustained by overpressurized water causing decoupling beneath a thick sediment sequence that was coupled to the glacier. The ice-marginal position of the 1890 surge is marked by a sedimentary wedge formed within five days and a large moraine ridge that formed in about one day („instantaneous end-moraine“). Three different qualitative and conceptual models are required to explain the genesis of the Eyjabakkajökull moraines: a narrow, single-crested moraine ridge at the distal end of a marginal sediment wedge formed in response to decoupling of the subglacial sediment from the bedrock and associated downglacier sediment transport; large lobate end moraine ridges with multiple, closely spaced, asymmetric crests formed by proglacial piggy-back thrusting; moraine ridges with different morphologies may reflect different members of an end moraine continuum. A parallel study highlighting the surge history of Eyjabakkajökull over the last 4400 years suggests climate control on surge frequencies. The Múlajökull studies concern an active drumlin field (>100 drumlins) that is being exposed as the glacier retreats. The drumlins form through repeated surges, where each surge causes deposition of till bed onto the drumlin while similtaneously eroding the sides. Finally, a new landsystem model for surging North Iceland cirque glaciers will be introduced.

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