

Terminus lakes on the south side of Vatnajökull ice cap, SE-Iceland

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Abstract — Many ice-marginal lakes have formed in front of glacier termini in Iceland in recent decades due to climate warming, particularly at the southern margin of Vatnajökull ice cap where several such lakes grow year-by-year at present. At the same time, most glacier-dammed lakes at the lateral ice margins have shrunk or disappeared because of glacier thinning, and jökulhlaups released from them have become smaller. This paper describes changes in glacial lakes in SE-Iceland, from Skeiðarárjökull west of Öraefi to Hoffellsjökull in Hornafjörður. Lakes started to form in front of several glaciers in this area in the 1930s but most did not grow much until the 1990s, except for Jökulsárlón by Breiðamerkurjökull, which has grown steadily since before the middle of the last century. Currently, there are growing terminus lakes by all the main south-flowing outlet glaciers of Vatnajökull, with a combined area of ~60 km². The subglacial landscape upstream of the termini indicates that the lakes will continue to grow in the coming decades as a consequence of glacier downwasting if the climate warms as projected. These lakes affect the ice flow and the mass and energy balance of the respective glaciers because of their effect on the force balance of the terminus region, the calving of ice into the lakes, and the absorption of heat spent for melting of calved ice fragments and the terminus ice front. The lakes can cause hazard to settlements and travellers in the adjacent area, as landslides on the glaciers that propagate into the lakes can create tsunami waves with a high run-up and sudden, very dangerous flash floods in the glacier forelands.

INTRODUCTION

Several ice-marginal lakes were formed in front of glacier termini in SE-Iceland in the first half of the 20th century (F. Björnsson, 1993; H. Björnsson, 1976a, 2009a). Glacier-dammed lakes at the lateral ice margins, such as Grænalón by Skeiðarárjökull and Vatnsdalslón by Heinabergsjökull, releasing regular jökulhlaups (glacier outburst floods), and Vatnsdalslón by Brókarjökull, that had released jökulhlaups more or less annually before 1870, were well known at this time (Thorarinsson, 1939; Rist

and Þórarinnsson, 1970; Rist 1973, 1981, 1984a; H. Björnsson, 1976a, 2002, 2009a,b; Sigurðsson and others, 1992; Jónsson, 2004). The retreat of the glacier termini accelerated in the 1930s and 1940s, producing ice-marginal lakes in depressions evacuated by the glaciers. Most of the lakes grew slowly at first and some stopped growing when the glaciers were separated from the lakes as they retreated farther. Lakes formed in deep troughs carved by the glaciers continued to grow, however, in particular Jökulsárlón by Breiðamerkurjökull.