

Little Ice Age advance of Kvískerjajökklar, Öræfajökull, Iceland. A contribution to the assessment of glacier variations in Iceland since the late 18th century

Snævarr Guðmundsson^{1*} and Helgi Björnsson²

¹South East Iceland Nature Research Center, Litlubrú 2, Höfn í Hornafirði, Iceland

²Institute of Earth Sciences, Science Institute, University of Iceland, Sturlugata 7, 101 Reykjavík, Iceland

*Corresponding author: snaevarr@nattsa.is

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Abstract — We describe the changes of the Kvískerjajökklar outlet glaciers in SE Iceland (presently ranging 600–1600 m a.s.l.), from their Little Ice Age maximum (LIA_{max}) to the present. We assume that glacier extent of the late 19th century approximately describes LIA_{max} although the glaciers already reached their peak extent in the 18th century. The former glacier margins were delineated from moraines, historical descriptions, topographical maps, aerial and oblique photographs, Landsat images and a lidar DEM. Along the previous glacier margins, elevation differences with respect to the lidar DEM of 2011 were estimated and contour maps of the glacier drawn at selected dates, maintaining the shape of the glacier surface as available maps. During the period ~1890 to 2011, the outlets lost -0.4 m a^{-1} water equivalent evenly distributed over their surface and their area was reduced by 37% (from $\sim 10 \text{ km}^2$ to 6.4 km^2 , $0.03 \text{ km}^2 \text{ a}^{-1}$, 0.43 km^3 water equivalent in total, i.e. $0.003 \text{ km}^3 \text{ w.e. a}^{-1}$).

INTRODUCTION

The Kvískerjajökklar outlet glaciers (6.4 km^2 in 2011) drain the steep, eastern flanks of Öræfajökull stratovolcano, SE-Vatnajökull ice cap. The outlets are divided in two segments, the North and South glacier by a volcanic fissure ridge which can be traced up to the caldera rim of the volcano (1800 m a.s.l.), containing the prominent nunataks of Hellutindar (1142 m a.s.l.) and Rótarfjallshnúkur (1026 m a.s.l.), Figure 1. The North glacier was 4.3 km long in 2011, terminating at 580 m a.s.l. whereas the South glacier was 2.8 km long, ending at 700 m a.s.l. The estimated total volume of the glaciers is approximately 2 km^3 (Magnússon *et al.*, 2012). Like other outlets of Vatnajökull, they have retreated considerably since their maximum extent during the Little Ice Age (LIA_{max}).

Most of the larger outlet glaciers in Southeast Iceland reached their LIA_{max} in the 1880s to 1890s, whereas some of the small and steepest glaciers already may have reached their outermost position in the 18th century and thereafter remained close to that location until the late 19th century. Based on written and oral records about marginal moraines of Kvískerjajökklar, we contribute to the discussion on of glacier variations in Iceland since the late 18th century to the present.

Synopsis of glaciers and climatic variations during the Little Ice Age

The climate in Iceland was relatively cold from the 13th century to the 1920s, a period often called the Little Ice Age (LIA), but was however, interrupted by frequent warm spells. The account of the climate