Geophysical Research Abstracts
Vol. 12, EGU2010-4566, 2010
EGU General Assembly 2010

Quantifying landscape change following the 1999 jökulhlaup at Sólheimajökull, southern Iceland

Kate E. H. Staines
School of Geography, University of Leeds, Leeds, United Kingdom (gykehs@leeds.ac.uk)

Glacial outburst floods (jökulhlaups) occur periodically in glaciated areas worldwide as the result of subglacial volcanism, geothermal activity, natural dam-failures, high rainfall events and the release of stored meltwater. Despite their relative low frequency, the high discharge magnitudes and flow velocities can lead to widespread, intensive and long-lasting landscape change. Indeed, in the jökulhlaup-prone regions of southern Iceland, outburst floods are hypothesised to largely control long-term proglacial landscape evolution, with low-magnitude/high-frequency ablation-controlled meltwater flow having a minimal impact. Jökulhlaups also pose a major threat to populations, infrastructures and property. It is predicted with climate change that the frequency and potentially the magnitude of jökulhlaups will increase. It is therefore important to study jökulhlaup flow processes and understand how landscapes are impacted by and recover from these floods. Ultimately, this will better inform policy, flood prediction and hazard management in populated regions at risk from jökulhlaups.

Currently, our understanding of jökulhlaup flow processes and the links between these processes and resulting landforms is limited. This is in parts due to the difficulty in directly measuring these high-magnitude, high-velocity floods. Research into jökulhlaup flow characteristics has consequently focussed on reconstructing flow parameters through a variety of palaeohydraulic techniques. However, these often produce conflicting and inaccurate reconstructions of flow inundation, peak discharge and flow rheology as key characteristics of jökulhlaups are frequently neglected (e.g. sediment transport, flow attenuation, sediment bulking and de-bulking). Furthermore, there has been little research into quantifying landscape change, response and recovery following jökulhlaups. The degree of preservation of flood deposits is determined in large parts by the pre-flood sensitivity of the landscape and its recovery potential. Factors controlling these include the recurrence interval and magnitude of past jökulhlaups, glacier surging, glacial advance and retreat cycles and fluctuations in glacier discharge.

This study aims to quantify the immediate landscape change associated with a jökulhlaup and examine the response of the landscape in the years following the flood. The study site is the outwash plain (sandur) of Sólheimajökull, an outlet glacier of the Mýrdalsjökull ice cap in southern Iceland. The most recent jökulhlaup, triggered by the eruption of the subglacial volcano Katla, was in July 1999. Field surveys of a boulder fan deposited during the flood at the snout of Sólheimajökull will be used to reconstruct flow palaeocompetence, with cross-sections of the river channel used to calculate peak discharge. From orthorectified pre- and immediate post-flood aerial imagery, digital elevation models will be generated and used to quantify net elevation change (i.e. sediment loss or gain) across the flooded area. Geomorphological maps of the proglacial area from before and in the decade following the flood have been produced and will be used to quantify changes in the main river channel, in terms of braiding and sinuosity parameters.