

# An ice-dammed lake in Jökulsárgil: predictive modelling and geomorphological evidence

Fiona S. Tweed

*Division of Geography, Staffordshire University, College Road, Stoke-on-Trent, Staffordshire, ST4 2DE, U.K.*

**Abstract** — *At Sólheimajökull, southern Iceland, a river has previously been dammed by the glacier, forming an ice-dammed lake in Jökulsárgil from which major jökulhlaups last occurred in the 1930s. Currently, the river maintains a tunnel through the glacier for most of the year. Geomorphological evidence indicates that an ice-dammed lake is occasionally formed in Jökulsárgil at present, probably when the river discharge is low. This indicates that tunnel closure occurs for a part of the year, resulting in the formation of an ice-dammed lake that could present the risk of flooding on drainage. This paper discusses tunnel closure processes and ice-dammed lake formation using models of tunnel dynamics, in conjunction with field data, and identifies the physical conditions required for tunnel closure at Sólheimajökull. The models predict that tunnel closure is most likely in the winter when river discharges are low enough to be incapable of offsetting conduit closure by ice overburden pressure. Ice conduit cross-sectional geometries commonly specified in existing models are unrepresentative of the tunnel at Sólheimajökull which has a broad and low cross-sectional form with a much lower strength than the circular or semi-circular tunnels often used in existing models.*