

Channel cross-sectional area changes and peak discharge calculations in the Gígjukvísl river during the November 1996 jökulhlaup, Skeiðarársandur, Iceland

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Abstract — *This paper presents the results of fieldwork undertaken before and immediately after the November 1996 jökulhlaup on Skeiðarársandur, Iceland, to determine both the geomorphic impact of this spectacular flood on the Gígjukvísl river channel and to provide an independent estimate of peak jökulhlaup discharge in this channel. This study provides a new perspective on the wide range of peak discharge estimates published for the November 1996 jökulhlaup. The primary geomorphological impact of the November 1996 jökulhlaup on the Gígjukvísl river catchment was erosion of the narrow channel through the moraines to create a much wider channel with a less sinuous course. Channel enlargement, downstream of the moraines, was accompanied by net aggradation in the bed of the former channel thalweg. Waning stage flow and hence erosion was concentrated on the eastern bank of the Gígjukvísl river. Peak jökulhlaup discharge reconstructed for the Gígjukvísl river using the slope-area technique amounts to $19,500 \text{ m}^3 \text{ s}^{-1} \pm 5,000 \text{ m}^3 \text{ s}^{-1}$. The Gígjukvísl river is therefore thought to have carried between forty and fifty percent of the peak jökulhlaup discharge. Calculated Manning's n values of 0.045–0.152, normally associated with very high resistance in rivers, suggest that ice blocks significantly retarded the flow in this relatively low gradient channel. Removal of substantial volumes of glacier ice within the nearby push-moraines acted as an important additional supply of ice to the Gígjukvísl channel. The impact of the November 1996 jökulhlaup was severe, due both to this being the largest ever flow through this river course and the deposition of large numbers of ice blocks within the river channel.*