



Discharge and Sediment Monitoring of the 2004 glacial Outburst Flood Event (Jökulhlaup) on Skeidara Sandur Plain, South Iceland

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Widespread interaction of volcanic and glacial processes in Iceland provides exceptional conditions for generating glacial outburst floods (jökulhlaups). Some are caused by gradual melting of ice within subglacial geothermal areas, whereas others, and usually larger, originate from subglacial eruptions. Furthermore, occasional jökulhlaups derive from small outlet glacier reservoirs or marginal lakes.

In late October 2004, a jökulhlaup initiated from the Grimsvötn caldera in Vatnajökull glacier in South Iceland. Scientists from the Hydrological Service and the Institute of Earth Sciences reached river Skeidara a day later and performed discharge measurements and took samples for analysis of suspended sediment and chemistry. The discharge in the flood was augmented with a small subglacial eruption within the Grimsvötn caldera that started on November 2nd; the same day as the calculated flood peak reached values of 3300 m³/s. Although the main flood had decreased to about 500 m³/s two days later, on the evidence of conductivity measurements geothermal water was present in river Skeidara until early December, suggesting jökulhlaup water within the catchment.

Using an exponential model based on the discharge measurements, the cumulative volume of the jökulhlaup within the main flood peak was 0.45 km³ (Oct. 28 to Nov. 4). However, if the discharge until December is added, the total volume of water in the jökulhlaup was 0.8 km³.

Suspended sediment samples were taken over the flood peak and analyzed for total sediment concentration and grain size. Most of the sediment was fine grained with 40 to 60% within the 0.002–0.02 mm fraction. The total sediment load during the main flood peak was 4 million tons, but 4.9 million tons if the sediment load is calculated until December. These numbers are, however, only minimum approximations as the sediment sampler does not reach deep into the water column where the sediment is coarser and has greater concentration.

The jökulhlaup in the fall of 2004 is one of the smaller jökulhlaups monitored on the Skeidara sandur plain, especially if compared to an extreme flood at the same site in 1996 when the total jökulhlaup volume was estimated to be 3.4 km³ and suspended sediment load approx. 180 million tons. However, even the small jökulhlaups can greatly affect structural constructions on the sandur plain; hence, the Public Road Authority of Iceland has great interest in monitoring such events and has, subsequently, funded this study.