

Glacial meltwater and groundwater interactions: evidence from the Virkisjökull observatory in Iceland

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There is growing recognition of the important role that groundwater may have in buffering changes in river discharge due to increased melting of glaciers. The multidisciplinary BGS observatory at Virkisjökull in Iceland provides an excellent opportunity to characterise and quantify glacial meltwaters and groundwater. Glacier meltwater has been measured since September 2011, and precipitation and temperature from weather stations at varying altitudes since September 2009. Initial findings show that the outwash plain provides a significant highly permeable aquifer, and is recharged locally from precipitation, with a growing influence of the glacier close to the meltwater channel.

Virkisjökull



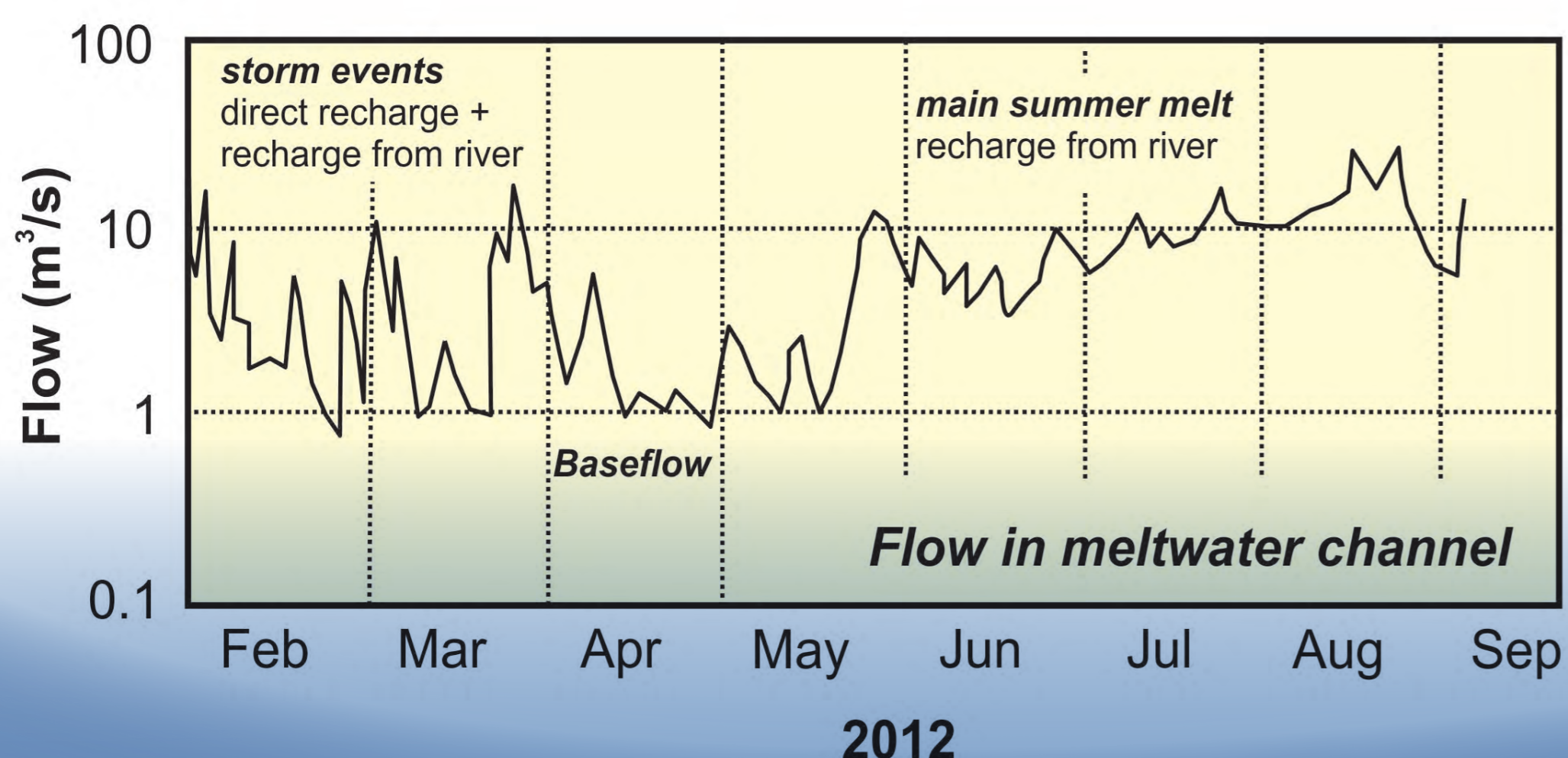
Virkisjökull is an outlet glacier draining the western flanks of Oraefajökull, the southern extremity of the Vatnajökull ice cap in southeast Iceland. With a low accumulation to ablation ratio, and a large altitude difference from summit to margin, it is highly sensitive to environmental change.

Measurements of meltwater

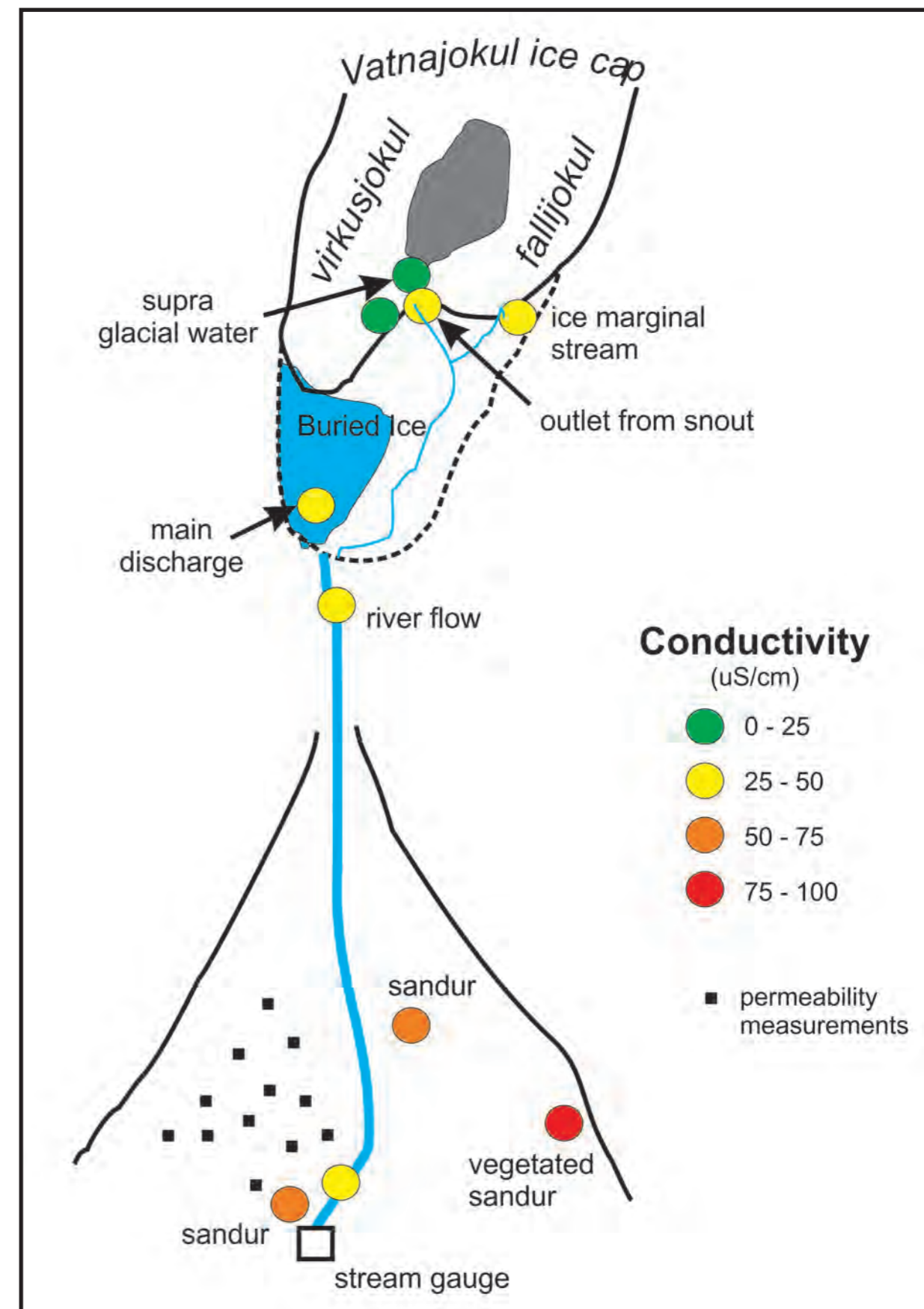


Gauging Station

A years with of measurements of meltwater from Virkisjökull has proved challenging, but given valuable insight into the behaviour of the glacier, and possible influence of groundwater.



Groundwater in the Virkisjökull glacial environment



Geophysical and permeability surveys, water sampling for stable isotopes and residence time indicators have helped characterise groundwater in the ice marginal area and sandur.

Ice marginal

- there is an extensive conduit system in buried ice in the glacier foreland, which has a controlling influence on glacier dynamics;
- the glacier sits on a moderately permeable base, which again impacts glacier dynamics;
- most of the water in the meltwater stream originates from the icecap;
- there is water storage within the upper catchment, possibly groundwater, or basal melt.

Groundwater in the outwash plain (sandur)

- the outwash plain is highly permeable >40 m/d and more than 100 m thick in places;
- groundwater is recharged locally from precipitation, with a growing influence of meltwater close to the meltwater channel.

The future

In August/September 2012, a series of piezometers were drilled in the outwash plain from Virkisjökull in three transects. These will be used to measure the residence times of groundwater in the outwash plain, and also directly monitor the response of groundwater to changes in river stage and precipitation.

Further research is also planned for the ice-marginal area to directly investigate the development of the conduit system and its effect on glacier dynamics.



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