

**Project title:** Impacts of rapid proglacial lake formation on glacial and proglacial systems in SE Iceland

**Ref:** OP2438

**Keywords:** Proglacial lakes, Iceland, glacier dynamics, hazard cascades

**One Planet Research Theme:**

Climate & Climate Change  | Earth System Processes  | Anthropocene  | Environmental Informatics

**Lead Supervisor:**

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**Key Research Gaps and Questions:**

- To what extent do proglacial lakes impact glacial dynamics and enhance glacial recession rates?
- How do proglacial lakes impact sediment dynamics and modulate downstream fluvial and coastal systems?
- How do the formation, growth and dynamics of proglacial lakes impact hazard cascades and risk mitigation strategies?



*Proglacial lake fronting Skeiðarárjökull (Photo: Andy Russell)*

**Project Description:** Many temperate glaciers world-wide are retreating in response to climate change resulting in the formation and expansion of ice-contact proglacial lakes. Proglacial lakes can influence glacial dynamics, lead to the 'decoupling' of glaciers from their outwash plains and cause complex hazard cascades that pose risk to life and infrastructure. Despite their importance, there have been few detailed studies of proglacial lake formation and associated impacts. Numerous lake-terminating, actively receding glaciers in SE Iceland provide a perfect natural laboratory to investigate the impact of climate on proglacial lake dynamics and consequent impacts on glacial and proglacial systems.

Geophysical surveys (swath bathymetry, acoustic sub-bottom profiling), drone surveys, and sediment cores collected on proglacial lakes will be used to: characterise lake bathymetry, map proglacial lake system geomorphology, calculate stored lake sediment volume and to visualise the acoustic stratigraphy of lacustrine sediments. Thermistor and electrical conductivity strings will be used to characterise lake thermal regime and identify en- and subglacial meltwater inputs. Suspended sediment, turbidity measurements and repeat bathymetric surveys will allow determination of sediment flux.

The student will gain skills in; processing, interpreting, and analysing geophysical, bathymetric, sedimentary, hydrological data and data synthesis. Experience will be gained in the use of key industry standard geophysical, geomorphological and geological software. The candidate will link with the Icelandic Meteorological Office (IMO).

References: Carrivick, J.L., Tweed, F.S., 2013. Proglacial lakes: character, behaviour and geological importance. *Quaternary Sci. Rev.*, 78, 34-52; Guðmundsson *et al.*, 2019. Terminus lakes on the south side of Vatnajökull ice cap, SE-Iceland. *Jökull*, 69, 1-34

**Prerequisites:** A good knowledge of proglacial/glacial environments, experience in computing (e.g., GIS, Geophysical processing or interpretation) is desirable.

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