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Under the glacier, the groundwater - the case of Skálafell area, Iceland

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The research addressing glaciers evolution under climate change is well developed, and is now looking not only at their mass balance, but also at the associated subsurface hydrology and downstream hydrology. However, the groundwater component is rarely considered, even though it will be required to forecast the evolution of water resources and of water linked hazards under climate change. The few available studies demonstrate the existence of sub-or pro-glacial aquifers. Some of them suggest strong coupling between rivers and the aquifer, observe the flooding due to water table rising following enhanced glacier melting, or expect stronger recharge in the future due to glacier melting.

The present study is the first step of a wider project, GlacAq, aiming at filling this knowledge gap, by characterizing the particular hydrogeology encountered under and downstream of glaciers of alpine type, i.e. sub-, pro- and periglacial hydrogeology, and its sensibility to climate change, in order to provide operational management directions.

Skálafell glacier area (Iceland) has been chosen as it has already been followed for climatic, glaciological, and surface hydrology data (Hart et al. (2015), Young et al. (2015)). The present work will use those data, as well as topographic and surface data from the National Land Survey of Iceland, and geological data, to run a comprehensive numerical modelling.

The work conducted on the Skálafell site will lead both to the achievement of an operational understanding of a poorly known underground system, and to the anticipation of its hydrodynamic response to climate change. The foreseen mechanisms include an enhanced sub-glacial aquifer recharge, intense surface water bodies-aquifer exchanges, and the aquifer discharge either through springs, or to an offshore system. Those offshore stocks are being increasingly recognised, but their origins are still only guessed at. Skálafell site allows the exploration of the potential role of the glacier-aquifer pairing in the mechanism of deep recharge and formation of offshore fresh groundwater stocks in littoral areas will be performed.