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

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Groundwater hydrodynamic understanding
Hydrodynamic response to climate change?

Objectives
Role in the formation of offshore fresh groundwater stocks in littoral areas?

Hydrological balance

Glacier area

M: Glacial melt (mm/y) minus sublimation, ie en- and subglacial flow
R: Runoff (mm/y)
RCH: recharge (mm/y)

2012-2013:
M – R = 803 - 118 = 685 mm/year
Recharge to groundwater

Ice-free area

P: precipitation (mm/y)
ETP: evapotranspiration (mm/y) from Thornthwaite
S: soil storage

2012-2013:
P – ETP - S = 1283 -172 -70
R+ RCH = 1043 mm/year

Model results
• Reasonable piezometry with K = 2.10^{-4} m.s^{-1}
• Rivers network correction thanks to topographic map and satellite image, necessary to get a reasonable piezometry, and extrapolation of a drain under the glacier:
  Strong surface hydrology-hydrogeology coupling
• Water going to the sea through offshore spring or forming an offshore freshwater stock: 16 Mm³/year

Perspectives
Till grain texture currently studied: precision of permeability value
Field observations and measurements to be carried out: Onland/offshore springs? Piezometry? Geological geometry?
Effective connection of lakes and rivers to groundwater?
Further modelling: precision and test of others hypothesis, e.g. existence of a regional groundwater reservoir inland, under the Vatnajökull?
Ongoing application for funding (ANR): GlacAq project.