

Proglacial icing: chemical characteristics and source of water at the Foxfonna glacier, Svalbard

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Icings, also naledi or Aufeis, are extrusive ice bodies which form during winter when water emerges to the surface and freezes under sub-zero atmospheric temperatures. Proglacial icings are considered paraglacial processes and can be found in front of many glaciers, but especially in the Arctic. They have long been interpreted as evidence for warm-based polythermal glacial conditions that release subglacial water throughout the year. However, icings can also be found in front of cold-based glaciers, as the case of the Foxfonna glacier in Central Spitsbergen. Cold-based glaciers are frozen to their bed and are not thought able to provide meltwater during winter through pressure-melting. Little research has been conducted on icings in front of cold glaciers so far, but it is believed they represent water release from large englacial channels. A notable knowledge gap exists regarding the source of water, its flow paths and residence time. This research aims to determine the source of water feeding the icing adjacent to Foxfonna. We are evaluating the possibility of ground water as the source of water rather than englacially stored meltwater. Natural and artificial tracers are used to reconstruct water flow paths during the accumulation and ablation season. Preliminary results from the first winter fieldwork campaign, looking at chemical and morphological characteristics of the icing, will be presented. Ice core samples collected from several areas of the icing were chemically analysed for their pH, conductivity and the concentration of the major cations (Ca^{2+} , Mg^{2+} , Na^+ , K^+) and anions (SO_4^{2-} , Cl^-), acting as natural tracers of water source and flow paths. GPR surveys were performed to obtain information about the internal morphology of the icing along with existing channels and water reservoirs within the icing and the glacier front. By analysing the concentration of the major ions in the ice samples via ion chromatography, we will test if the ion concentration varies within the icing spatially and vertically. The chemical composition of the icing and variations within provide information about the evolution of the icing and the source of water. Results from the GPR survey can be linked to springs known to exist in the proglacial area during summer.