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# Pathways and transit time of meltwater in the englacial drainage system of Rabots Glacier, Kebnekaise, Sweden

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Following the crash of a Norwegian Hercules plane in the Kebnekaise mountain range in March 2012, a field campaign was initiated in order to assess the fate of the hydrocarbon pollution in the glacial system. Monitoring of pollution was conducted in the snow pack of Rabots glacier, as well as in the proglacial stream, and the preferential pathways for transport of pollutants were assessed. Since it is likely that soluble components of the aircraft fuel are transported within the glacial meltwater, our study focuses on constraining the likely transit time and dispersion of these components. The hydrologic configuration of Rabots glacier was thus studied during the 2013 ablation season by means of dye tracing experiments and discharge monitoring in the proglacial stream.

The analyses of the dye return curves and stream monitoring suggest different hydrological configurations on the north and south side of the glacier, perhaps influenced by shading and the ice thermal structure. The system on the north side seems to be distributed, with extensive interaction of meltwater with the bed, as typified in the turbid proglacial outlet. The distinct peaks of the return curves on the south side indicate efficient transport, perhaps largely through englacial channels, given the relatively clear nature of the proglacial outlet. The evaluation of transit speed along a longitudinal profile contributed to the understanding of drainage efficiency with distance upglacier. The higher up the injection location on the glacier, the more distributed and less efficient the system. The seasonal evolution of efficiency was also assessed, showing an increase inefficiency with time. Furthermore, we hypothesize a disconnect in the glacial hydrological systems on the north and south side of the glacier. Pollution that is transported with the meltwater down from the crash site on the southern side most likely does not reach the drainage system on the northern side. Besides revealing potential pathways for soluble hydrocarbon pollutants, this case study adds to our general understanding of polythermal glacier hydrology.