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Role of a supraglacial snowpack in mediating the delivery of melt water to the glacier system: implications for glacier dynamics?

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The flow of water through glacier systems plays a critical role in controlling glacier dynamics, and hydrological conditions in the supraglacial snowpack will act to mediate the delivery of melt water to the rest of the glacier system. However, the seasonal evolution of supraglacial snowpack hydrology has not yet been investigated in conjunction with season-long information on glacier velocity.

Data collected during the 2004 melt season at Haut Glacier d'Arolla, Valais, Switzerland, provides information on the hydrological behaviour of the supraglacial snowpack and its evolution over the course of the melt season. Observations of the movement of dye-stained water show the complexity of flow patterns and the influence of ice layers in delaying percolation through the snowpack, while fluorometric techniques yield average flow rates for percolation through the snowpack of between 0.12 and 0.38 mhr^{-1}.

Seasonal records of glacier surface velocity and proglacial stream turbidity and EC indicate the occurrence of a speed-up or 'spring event' in late June, when the glacier was still covered by a significant snowpack measuring over 0.90m deep across the snout. It is therefore clear that it is not the onset of highly peaked input to the en/subglacial system caused by the exposure of bare ice that initiates the spring event. Instead, changes in hydrological conditions in the snowpack may act as the triggering mechanism. Links between the evolution of snowpack hydrology and glacier dynamics through

the season are investigated to determine how changes in runoff from the snowpack impact on ice dynamics.