

Origin and significance of lateral meltwater channels formed along a temperate glacier margin, Glacier Bay, Alaska

KENT M. SYVERSON AND DAVID M. MICKELSON

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Pleistocene lateral meltwater channels are commonly used as evidence of cold-based or polythermal ice. However, lateral meltwater channel formation has been observed for 440 years along the margins of a rapidly thinning temperate glacier in Glacier Bay, Alaska. Flights of nested linear lateral meltwater channels and in-and-out channels have formed on the sides of emerging nunataks. Nested channels at Burroughs Glacier are up to 200m long; they are good proxies for the slope of the ice margin along the land surface and are terminated by subglacial chutes. A perched water table associated with precipitation and high ablation rates in the temperate ice causes surface meltwater to flow toward the margin above less permeable ice. The water flows along the margin and erodes lateral meltwater channels until a subglacial chute carries the water into the subglacial water system. Rates of channel formation range from 0 to 8 channels/year. Spacing and rates of channel formation are controlled by the landsurface slope, ablation rate, erodibility of the substrate and stream discharge. Because lateral meltwater channels have been observed forming along a temperate glacier margin, care must be exercised when using the presence of lateral meltwater channels as definitive evidence of cold-based or polythermal ice.

Kent M. Syverson (e-mail: syverskm@uwec.edu), Department of Geology, University of Wisconsin, Eau Claire, WI 54702, USA; David M. Mickelson, Department of Geology and Geophysics, University of Wisconsin-Madison, Weeks Hall for Geological Sciences, Madison, WI 53706, USA; received 4th February 2008; accepted 11th May 2008.