



## **A race for ice discharge between ice streams on glaciated continental shelves**

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Ice-streaming is one of the most efficient mechanisms through which glacial ice can be exported from the interior of ice sheets to the ocean. The stability of ice sheets is therefore intrinsically linked to the activity of their ice stream networks. Changes in the drainage network of ice streams were inferred from modern and palaeo-ice sheet studies, and usually result in ice streams switching trajectory and/or shutting down. Switching of ice streams, which corresponds to a reorganization of ice-flow patterns, can have a major impact on ice sheet dynamics as it determines active vs. passive pathways for ice to the ocean. While some hypotheses for reorganization of ice streams have emerged, the mechanisms that control flow-switching remain poorly understood. Here, we report the flow-switch of an ice stream that occurred during the last glaciation on the northeastern Baffin Island shelf (Arctic Canada) through glacial erosion and overdeepening of marginal troughs, i.e. deep bedrock moats connected up-ice to a cross-shelf trough extending parallel-to-coast. Shelf geomorphology imaged by high resolution swath bathymetry and seismostratigraphic data provides evidence for propagation of ice streams up-ice Scott and Hecla & Griper cross-shelf troughs. This up-ice propagation along a marginal trough caused flow-switching and the shut-down of the neighbouring Sam Ford ice stream. These results indicate that competition for ice discharge between ice streams, which implies piracy of ice-drainage basins through marginal troughs, was the driving mechanism behind ice flow-switching. This race for ice discharge is responsible for the presence of abandoned and less eroded cross-shelf troughs along glaciated continental shelves.