Geophysical Research Abstracts
Vol. 14, EGU2012-173, 2012
EGU General Assembly 2012

Controls on the location and geometry of glacial overdeepening

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Overdeepening is an important glaciological and geomorphological process that has the potential to influence the response of ice masses to climatic changes. We have examined several hundred glacial overdeepenings in the Labrador Province of Canada to investigate the controls on overdeepening location and geometry. Our analyses show that overdeepening appears to correlate strongly with glacial confluence and, importantly, the correlation is strongest where confluence-geometry indicates ice-flow speed-up. Further, we find that the magnitude of ice-flow speed-up correlates with overdeepening depth only for confluences situated in or near major geological fault-zones. Our findings therefore support the hypothesis that overdeepening can be initiated by an increase in ice velocity. Further, we conclude that overdeepening is most efficacious where fractured bedrock enables efficient quarrying.