



Retrieving Ice-avalanche basal friction law parameters from a back-analysis of the collapse of Altels glacier (1895, Bernese Alps, Switzerland). Application to Taconnaz glacier instability (French Alps).

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High-elevation glaciers are undergoing substantial warming in response to current climate change. This warming is affecting the ice/rock interface temperature, the primary control of glacier stability on steep slopes. Instability may give rise to the collapse of large parts of hanging glaciers. The rheology of ice avalanches is at present poorly known but expected to deviate from snow avalanches rheology due to their granular feature, the sizes of flowing ice grains and blocks, their temperature and their expected volumes, larger by one or two orders of magnitude. Here we retrieve the avalanche basal friction law parameters (Voellmy model) from a back-analysis of the largest historical ice-avalanche which occurred in the Alps at Altels glacier in 1895 (Bernese Alps, Switzerland). Prior simulations with the (1-D) sliding block model are performed to initiate 2-D simulations with a Saint-Venant (shallow-flow) model. The parameters found to fit of the avalanche runout are associated to a very low basal friction compared to snow avalanches. These friction parameters are applied to possible ice avalanches released from a glacier in the French Alps (Taconnaz) that may become temperate and potentially unstable over large areas by the end of the 21st century. The risk induced by this glacier hazard is high for the populated region below and makes the understanding of such avalanches a priority.