



Glacier beds that will be exposed in the future: How will geomorphologic and hydrologic processes develop?

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The rapid shrinkage of glaciers in the Alps has widespread impacts on relief development and hydrology. Slope failures, collapse of lateral moraines, loose debris in glacier fore-fields, new lakes and changing river beds are among the most visible impacts. They already require increased attention by tourists, monitoring by local authorities and mitigation measures (e.g. www.gletschersee.ch). A view into potential future developments (after glaciers have disappeared) is thus of high interest. With recently developed models that reconstruct glacier bed topography from easily available datasets (e.g. glacier outlines and a DEM) over entire mountain ranges, potential developments of the landscape and hydrology can be quantitatively determined. The modelled glacier beds - though they must be seen as a rough first order approximation only - also allows the investigation of a wide range of glaciological relations and dependencies that have been widely applied but were never investigated for a large sample of glaciers so far. A key reason is that information on glacier thickness distribution and total ice volume is sparse and that the future development of glaciers can only be modelled realistically when a glacier bed is available. Hence, with the glacier beds now available there is a larger number of geomorphological, glaciological and hydrological studies ahead of us.

This presentation is providing an overview on the lessons learned about glaciers and their future development from the modelled glacier beds, the expected changes in hydrology (e.g. decreasing glacier volume and formation of new lakes) and potential impacts from the altered geomorphology (e.g. debuitressing of rock walls). In particular the flat tongues of larger valley glaciers are rather thick and leave oversteepened lateral moraines or rock walls behind, towering above overdeepenings in the glacier bed that might be filled with water. It is thus expected that the hazard potential will further increase in the future, partly also due to a combination of processes that can only be assessed with an integrative view that also considers the historic perspective.