Geophysical Research Abstracts
Vol. 14, EGU2012-12916, 2012
EGU General Assembly 2012
© Author(s) 2012

Comparing different methods to model scenarios of future glacier change for the entire Swiss Alps

A. Linsbauer, F. Paul, and W. Haeberli

University of Zürich, Glaciology, Geomorphodynamics & Geochronology, Geography, Zürich, Switzerland (andreas.linsbauer@geo.uzh.ch)

There is general agreement that observed climate change already has strong impacts on the cryosphere. The rapid shrinkage of glaciers during the past two decades as observed in many mountain ranges globally and in particular in the Alps, are impressive confirmations of a changed climate. With the expected future temperature increase glacier shrinkage will likely further accelerate and their role as an important water resource more and more diminish. To determine the future contribution of glaciers to run-off with hydrological models, the change in glacier area and/or volume must be considered. As these models operate at regional scales, simplified approaches to model the future development of all glaciers in a mountain range need to be applied.

In this study we have compared different simplified approaches to model the area and volume evolution of all glaciers in the Swiss Alps over the 21st century according to given climate change scenarios. One approach is based on an upward shift of the ELA (by 150 m per degree temperature increase) and the assumption that the glacier extent will shrink until the smaller accumulation area covers again 60% of the total glacier area. A second approach is based on observed elevation changes between 1985 and 2000 as derived from DEM differencing for all glaciers in Switzerland. With a related elevation-dependent parameterization of glacier thickness change and a modelled glacier thickness distribution, the 15-year trends in observed thickness loss are extrapolated into the future with glacier area loss taking place when thickness becomes zero.

The models show an overall glacier area reduction between 60-80% until 2100 with some ice remaining at the highest elevations. However, compared to the ongoing temperature increase and considering that several reinforcement feedbacks (albedo lowering, lake formation) are not accounted for, the real area loss might even be stronger. Uncertainties in the modelled glacier thickness have only a small influence on the final area loss, but influence the temporal evolution of the loss. In particular the largest valley glaciers will suffer from a strong volume loss, as large parts of their beds have a small inclination and are thus located at low elevations.