Testing physiographic and climatic controls on glacier retreat

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Motivation

Glacier melt provides an important part of the summer discharge of many European rivers. The understanding of the processes behind the glacier mass losses and glacier retreats observed during the last century is therefore relevant for a sustainable management of the water resources and reliable models for the prediction of future changes.

An overall retreat of all glaciers in the glacierized sub-basins of the Swiss Alps was observed from 1850 to 2010 with some variations in the sub-periods. However, the relative changes in glacier area compared to 1850 differed for every sub-basin and some glaciers decreased much faster than others. This raises the question:

What are the potential controls on glacier retreat?

Hypothesis and Objectives

**H1:** The relative changes in glacier area compared to 1850 differ regionally.

**H2:** These differences can be related to several physiographic and climatic controls.

The aim of this study was to empirically investigate the controls of glacier retreat and to identify regional differences for all glacierized sub-basins of the Swiss Alps for the time period 1850 to 2010.

**Results**

The fitted model explains more than 75% of the observed variance of the relative change in the glacier area.

**Conclusion and Outlooks**

H1: Regional differences in the relative changes in glacier area could be observed for the time period 1850 - 2010.

H2: These differences were related to several physiographic and climatic controls, and the model was able to explain more than 75% of the observed variance.

The important role of the physiographic controls in the model prediction indicates that snow redistribution may play an important role for the glacier mass balances and needs to be considered appropriately in hydrological models. The derived predictors will be further analysed and the observed patterns will be compared to modelling studies.