Geophysical Research Abstracts
Vol. 21, EGU2019-5375, 2019
EGU General Assembly 2019

One century of direct mass balance observations on Claridenfirn, Switzerland

Matthias Huss (1,2), Andreas Bauder (1), Andreas Linsbauer (2,3), Daniel Farinotti (1,4)

(1) Laboratory of Hydraulics, Hydrology and Glaciology (VAW), ETH Zurich, Zurich, Switzerland (huss@vaw.baug.ethz.ch), (2) Department of Geosciences, University of Fribourg, Fribourg, Switzerland, (3) Department of Geography, University of Zurich, Zurich, Switzerland, (4) Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), Birmensdorf, Switzerland

Mass balance observations at seasonal resolution are performed at two measurement sites since 1914 on Claridenfirn, Switzerland. The series is known as the worldwide longest uninterrupted measurements of glacier mass balance.

Here, provide a complete re-analysis of the 104-year series of both point and glacier-wide mass balance. We include a detailed description of the approaches to evaluate and homogenize the direct observations, and perform a comprehensive estimation of the uncertainties. Particular attention is payed to losses due to ice avalanches from an ice cliff at the glacier terminus, i.e. an ablation process different from melting, which complicates the determination of glacier-wide mass balance. Long-term variations in mass balance components at the point-scale are interpreted in relation to ongoing changes in meteorological forcing.

Multi-decadal glacier-wide mass balances are discussed in the context of comparable observations throughout the European Alps. Based on conservative assumptions, an overall average random uncertainty in annual glacier-wide mass balance of ± 0.25 m w.e. a^{-1}, and of ± 0.10 m w.e. a^{-1} at the decadal scale is found. Significant trends in melt and mass balance are observed since the 1980s with a 38% increase in melting compared to 1961-1990 over the last decade. Long-term variability in snow accumulation at the elevation of 2700-2900 m a.s.l. is small except for a sharp decrease in the first years of the 21st century.