Geophysical Research Abstracts
Vol. 18, EGU2016-1622-2, 2016
EGU General Assembly 2016

The role of glaciers for Swiss hydropower production

Bettina Schaefli (1,2), Pedro Manso (2), Mauro Fischer (3), Matthias Huss (3,4)

(1) University of Lausanne, IDYST, Lausanne, Switzerland (bettina.schaefli@epfl.ch), (2) School of Architecture, Civil and Environmental Engineering, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerlandeering (ENAC), Ecole Polytechnique Fédérale de Lausanne (EPFL), Switzerland, (3) Department of Geosciences, University of Fribourg, Switzerland, (4) Laboratory of Hydraulics, Hydrology and Glaciology, ETH Zurich, Switzerland

In Switzerland, hydropower represents over 50% of the total annual electricity production. Given the Alpine setting of the country, this **h**ydro**p**ower **p**roduction (**HPP**) strongly relies on the natural storage of discharge in form of ice and snow over months to decades. The sensitivity of glacier-fed HPP systems with respect to climate change depends on how the today's production and the infrastructure design relies on the seasonal streamflow delay expected from the natural storage effect of snow and ice. For l*ow-head run-of-river* HPP plants built on large lowland rivers, the ongoing glacier retreat (resulting in strong summer melt) currently sustains higher flows during summer months, an effect that will certainly be reduced once the glaciers will have reached a critical size. This effect will also modify the inflow to the *large storage HPP plants* that have been designed to shift large amounts of meltwater inflows from summer to winter. The management of these reservoirs will certainly have to be adapted to future inflow patterns. An interesting case are *high-head run-of-river plants* (with heads from 100 to 1100 m) that short-circuit a given river reach. Future regime shifts with less sustained summer flow and more concentrated spring melt flows might critically reduce the annual production due to intake overflow during spring and reduced flow during summer.

In this work, we discuss the role of glaciers for these different HPP types in detail, including an overview of how glacier retreat might influence their production. This comprehensive study synthesizes up-to-date estimations of glacier mass change since the 1980s and its influence on high Alpine discharge regimes and state-of-the art simulations of potential future glacier discharge regimes. We also attempt an extrapolation to the country level based on a hydropower GIS database that has been developed for economic purposes. Ongoing Swiss research on sediment production and management might complete this picture with the role of glacier sediment delivery for hydropower operation.