Geophysical Research Abstracts
Vol. 19, EGU2017-7176, 2017
EGU General Assembly 2017
© Author(s) 2017. CC Attribution 3.0 License.

Exploring the hydropower potential of future ice-free glacier basins

Vanessa Round (1), Daniel Farinotti (1,2), Matthias Huss (2,3)

(1) Swiss Federal Institute for Forest, Snow and Landscape Research (WSL), 8903 Birmensdorf, Switzerland, (2) Laboratory of Hydraulics, Hydrology and Glaciology (VAW), ETH Zurich, 8093 Zurich, Switzerland, (3) Department of Geosciences, University of Fribourg, 1700 Fribourg, Switzerland

The retreat of glaciers over the next century will present new challenges related to water availability and cause significant changes to the landscape. The construction of dams in areas becoming ice-free has previously been suggested as a mitigation measure against changes to water resources in the European Alps. In Switzerland, a number of hydropower dams already exist directly below glaciers, and the hydropower potential of natural lakes left by retreating glaciers has been recognised. We expand these concepts to the regional, and ultimately global, scale to assess the potential of creating hydropower dams in glacier basins, encouraged by advantages such as relatively low ecological and social impacts, and the possibility to replicate the water storage capabilities of glaciers.

In a first order assessment, dam volumes are computed using a subglacial topography model and dam walls simulated at the terminus of each glacier. Potential power production is then estimated from projected glacier catchment runoff until 2100 based on the Global Glacier Evolution Model (GloGEM), and penstock head approximated from a global digital elevation model. Based on this, a feasibility ranking system is presented which takes into account various proxies for cost, demand and impact, such as proximity to populations and existing infrastructure, geological risks and threatened species. The ultimate objective is to identify locations of glacier retreat which could most feasibly and beneficially be used for hydropower production.