Geophysical Research Abstracts
Vol. 18, EGU2016-5705, 2016
EGU General Assembly 2016

Future glacier runoff at the global scale

Matthias Huss (1,2) and Regine Hock (3)

(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) Geophysical Institute, University of Alaska Fairbanks, Fairbanks, Alaska, USA

Water resources in mountain areas worldwide importantly depend on the runoff contribution by glaciers. Glacial water storage acts as an equilibrating element in the global hydrological cycle on various temporal scales. With ongoing and future glacier retreat a growing concern regarding water supply security in glacier-fed basins arises. However, glacier runoff projections at the regional or global scale are still rare and better models are urgently needed for planning and adaptation measures to cope with a changing seasonal distribution of water yields. Moreover, it is still an open debate in which region ”peak water” – the maximum contribution of melting glaciers to runoff – has already been reached, i.e. whether increasing or declining annual runoff volumes must be expected.

Here, we present results of a novel global glacier model for calculating the 21st century response of surface mass balance, three-dimensional glacier geometry and monthly water discharge for each individual glacier around the globe. The current surface geometry and thickness distribution for each of the world’s roughly 200’000 glaciers is extracted from the Randolph Glacier Inventory and terrain models. Our simulations are driven with 14 Global Circulation Models from the CMIP5 project using the RCP4.5, RCP8.5 and RCP2.6 scenarios.

We focus on the timing of peak water from glacierized catchments in all climatic regions of the earth and the corresponding importance of changes in the runoff regime on hydrological stress. The maximum rate of water release from glacial storage is subject to a high spatio-temporal variability depending on glacier characteristics and the transient response to climatic change. Furthermore, we discuss the significance of projected variations in glacier runoff in relation to the hydrology of the world’s large-scale drainage basins and population distribution, and highlight ’hot spot’ regions where the wastage of current ice volume is particularly relevant.