

## Submitted Abstract

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<b>First Author</b> First Name Last Name	Sarah (1) Hanus
<b>Submitting Author</b> First Name Last Name	Sarah Hanus
<b>Correspondence</b>	sarah.hanus@geo.uzh.ch
<b>Co-Authors</b> >> E-Mails will be not listed	Schuster, Lilian (2); Burek, Peter (3); Maussion, Fabien (2); Seibert, Jan (1); Marzeion, Ben (4); Wada, Yoshihide (3); Viviroli, Daniel (1)
<b>Organisations</b>	1: University of Zurich, Switzerland 2: University of Innsbruck, Austria 3: International Institute for Applied Systems Analysis, Austria 4: University of Bremen, Germany
<b>Country</b>	Switzerland
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## Abstract

In high mountain areas, glaciers can be considered an important part of the hydrological cycle and contribute significantly to runoff in the summer months. Due to climate change, the annual runoff volumes originating from glaciers are undergoing considerable change, making it essential to consider glacial melt in hydrological models when we want to model future hydrological changes realistically, especially with regard to mountain water resources. On a catchment scale, routines are available for incorporating glaciers. On a global scale, however, glaciers have been largely neglected so far. This is an important limitation of large-scale hydrological models often used for global climate change impact studies.

We present a framework to couple the global glacier model OGGM (Open Global Glacier Model) and the hydrological model CWatM (Community Water Model) on 5arcmin resolution globally. Both models are openly available. This framework facilitates an explicit inclusion of glacier runoff in large-scale hydrological modelling through dynamic modelling of glaciers and allows research into the hydrological importance of changing glaciers. Specifically, we evaluate how the inclusion of glaciers changes the amount and seasonality of simulated runoff in a large-scale hydrological model in the past and the future. Using selected major river basins in Europe and North America as study areas, benefits, challenges and limitations of the coupling are pointed out.

The large-scale glacio-hydrological modelling framework will be openly available to facilitate further research and the inclusion of glaciers in future large-scale hydrological studies. It can potentially also be used with other global hydrological models.