Geophysical Research Abstracts
Vol. 18, EGU2016-2798, 2016
EGU General Assembly 2016

Simulations of future runoff conditions for glacierized catchments in the Ötztal Alps (Austria) using the physically based hydroclimatological model AMUNDSEN

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Assessing the amount of water resources stored in mountain catchments as snow and ice as well as the timing of meltwater production and the resulting streamflow runoff is of high interest for glaciohydrological investigations and hydropower production. Climate change induced seasonal shifts in snow and ice melt will alter the hydrological regimes in glacierized catchments in terms of both timing and magnitude of discharge.
We present the setup of the hydroclimatological model AMUNDSEN for a highly glacierized (24 %) 558 km2 large study area (1760–3768 m a.s.l.) in the Ötztal Alps (Austria), and first results of simulated future runoff conditions. The study region comprises the headwater catchments of the valleys Ötztal, Pitztal, and Kaunertal, which contribute to the streamflow of the river Inn.
AMUNDSEN is a fully distributed physically based model designed to quantify the energy and mass balance of snow and ice surfaces in complex topography as well as streamflow generation for a given catchment. The model has been extensively validated for past conditions and has been extended by an empirical glacier evolution model (Δh approach) for the present study. Statistically downscaled EURO-CORDEX climate simulations covering the RCP4.5 and RCP8.5 scenarios are used as the meteorological forcing for the period 2006–2050. Model results are evaluated in terms of magnitude and change of the contributions of the individual runoff components (snowmelt, ice melt, rain) in the subcatchments as well as the change in glacier volume and area.