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Projected changes in hydrological regimes and glacier coverage in the Ötztal Alps (Austria) based on a multi-model approach

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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. Quantifications of the uncertainties included in predictions of future runoff regimes are important for long-term water resources planning.
We present a multi-model investigation of the effects of future climate change on glaciers and hydrology for the Rofenache headwater catchment (98 km^2, approx. 1/3 glacierized) in the Ötztal Alps (Austria). Two independent glaciohydrological modeling approaches with differing complexity are applied: i) the semi-distributed hydrological model HQsim coupled to a zero-dimensional glacier evolution model, operating on daily time steps, and ii) the fully distributed energy and mass balance model AMUNDSEN extended with an empirical glacier retreat parameterization (Δh approach), operating on 3-hourly time steps.
Statistically downscaled, bias-corrected, and (for the sub-daily model runs) temporally disaggregated EURO-CORDEX regional climate simulations covering the RCP2.6, RCP4.5, and RCP8.5 scenarios are used as meteorological forcing. 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. The bandwidth of the results allows to analyze and quantify both the uncertainties induced by the different RCM forcing data sets as well as by the two glaciohydrological modeling approaches.