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Prediction of climate change impacts on Alpine discharge regimes under A2 and B2 SRES emission scenarios for two future time periods (2020-2049, 2070-2099)

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The present work analyzes the climate change impacts on the runoff regimes of mountainous catchments in the Swiss Alps having current glaciation rates between 0 and 50 %. The hydrological response of 11 catchments to a given climate scenario is simulated through a conceptual, reservoir-based precipitation-runoff transformation model called GSM-SOCONT (Schaefli, 2005). For the glacierized catchments, the glacier surface corresponding to this future scenario is updated through a conceptual glacier surface evolution model. The analyzed climate change scenarios were derived from 19 climate experiments obtained within the EU research project PRUDENCE (Christensen et al. 2002). They are the results of 9 state-to-the-art Regional Climate Models (RCMs) driven by three coupled Atmosphere-Ocean General Circulation Models (AOGCMs), respectively HadCM3/HadAM3H, ECHAM4/OPYC3 and ARPEGE. The two first families of climate change scenarios correspond to changes in seasonal temperatures and precipitations simulated for the period 2070-2099 under the two green house gas emission scenarios A2 and B2 defined by the Intergovernmental Panel on Climate Change (12 experiments are available for A2 and 7 for B2). From the 19 PRUDENCE experiments 19 climate changes scenarios were additionally developed for a transient period (2020-2049) corresponding in first approximation to a global warming scenario of +1°C. For each climate change scenario analyzed in this work, the modifications of annual discharges and hydrological regimes simulated for the different RCM runs are significantly variable. The large prediction variability induced by the 19 RCM experiments considered here is partly induced by the underlying driving AOGCMs. The results presented in this study show however clearly that the differ-

ences between different RCM experiments with the same driving AOGCM can result in comparably high impact differences as the use of different AOGCMs to drive a given RCM. This result suggests that the inter-RCM variability should always be considered in climate change impact studies. Note than despite this large variability of results, all scenarios and all models predict however changes of same trend; only amplitude and timing of these changes differ.