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# Impact of climate model uncertainty for a small scale groundwater system

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We aim to understand how changes in climatic forcing functions affect groundwater recharge in a small-scale aquifer in northern Switzerland. Given the complexity of the system, a physically based model, which accounts for heterogeneity, processes in the unsaturated and saturated zone is required. The fully coupled hydrological model HydroGeoSphere was used to construct a 3-D model of the study area. The model is based on a wide range of data, including extensive geophysical data, information from drill logs, pumping tests as well as tracer tests in both the saturated and unsaturated zone. Calibration was carried out using PEST using a combination of pilot points and mathematical regularization to obtain model parameter sets. Delta change factors for three time periods of the A1B Scenario in combination with a stochastic weather generator (LARS-WG) was used to produce different input parameters for the physically based model. For the applied scenario 10 different climate model chains were used in order to estimate the predictive uncertainty coming from different GCM (Global Circulation Model) x RCM (Regional Climate Model) combinations.

Results indicate a general decrease of recharge for all simulated future climate periods but with small variation between them. The main reason for less annual recharge is an increase in mean air temperature and a decrease in precipitation from summer to autumn. Current groundwater droughts will likely be more frequent under future climatic conditions if precipitation distribution will not change dramatically. Simulations indicate that during winter and spring little or no change in groundwater recharge rates occurs. However, the decrease in groundwater recharge rates, especially during summer and autumn, depends strongly upon the applied climate model chains. Large differences in the downscaled output of the 10 climate model chains are observed, especially for precipitation, and lead to high predictive uncertainty of future groundwater recharge rates.