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Uncertainty of climate change impact on groundwater resources considering various uncertainty sources

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Abstract Many studies have highlighted that climate change will have a negative impact on groundwater. However, in previous studies, the estimation of uncertainty around projections was very limited. In this study, the impact of climate change on groundwater resources is estimated for the Geer basin using a surface–subsurface integrated model. The uncertainties around impact projections are evaluated from three different sources. The uncertainty linked to the climate model is assessed with six contrasting RCMs and two GCMs. The uncertainty linked to the natural variability of the weather is evaluated thanks to a weather generator which enables production of a large number of equiprobable climatic scenarios. The uncertainty linked to the calibration of the hydrological model is assessed by a coupling with UCODE_2005 and by performing a complete linear uncertainty analysis on predictions. A linear analysis is approximate for this nonlinear system, but provides some measure of uncertainty for this computationally demanding model. Results for this study show that the uncertainty linked to the hydrological model is the most important.

Key words groundwater; climate change; uncertainty; stochastic scenarios; calibration; UCODE; integrated modelling; HydroGeoSphere; Geer basin, Belgium