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Effects of input data information content on the uncertainty of simulating water resources

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Hydrological models like the Soil and Water Assessment Tool (SWAT) demand a large variety of spatial input data. These are commonly available in different resolutions and result from different preprocessing methodologies. Effort is made to apply the most specific data as possible for the study area, which features heterogeneous landscape elements. Most often, modelers prefer to use regional data, especially with fine resolution, which is not always available. Instead, global datasets are considered that are more general. This study investigates how the use of global and regional input datasets may affect the simulation performance and uncertainty of the model. We analyzed eight different setups for the SWAT model, combining two of each Digital Elevation Models (DEM), soil and land use maps of diverse spatial resolution and information content. The models were calibrated to discharge at two stations across the mesoscale Haute-Sûre catchment, which is partly located in the north of Luxembourg and partly in the southeast of Belgium. The region is a rural area of about 743 km2 and mainly covered by forests and complex agricultural system and arable lands. As part of the catchment, the Upper-Sûre Lake is an important source of drinking water for Luxembourgish population, satisfying 30% of the country's demand. The Metropolis Markov Chain Monte Carlo algorithm implemented in the SPOTPY python package was used to infer posterior parameter distributions and assess parameter uncertainty. We are optimizing the mean of the Nash-Sutcliffe Efficiency (NSE) and the logarithm of NSE. We focused on soil physical, groundwater, main channel, land cover management and basin physical process parameters. Preliminary results indicate that the model has the best performance when using the regional DEM and land use map and the global soil map, indicating that SWAT cannot necessarily make use of additional soil information if they are not substantially effecting soil hydrological fluxes. Further, the configurations with lowest parameter uncertainty are the ones using global DEM and soil map reflecting that increased model performance can concurrently result in larger model uncertainty.