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Using hydrological modelling for a preliminary assessment of under-catch of precipitation in some Alpine Catchments of Sierra Nevada (Spain). Sensitivity to different conceptual approaches and spatio-temporal scale

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Precipitation (P) measurements show important biases due to under-catch, especially in windy conditions. Gauges modify the wind fields, producing important under-catch in solid P. In this work we intent to perform a global assessment of the under-catch phenomenon in some alpine catchments of Sierra Nevada Mountain Range (Spain) by using different conceptual hydrological models. They are based on the available information about daily natural streamflow and daily fields of P and temperature (T) in each catchment. We want to analyse long time periods (more than 20 years at daily scale) in order to obtain conclusions taking into account the stochastic behaviour of the natural streamflow and P and T variables. The natural streamflowin each basin has been obtained from the streamflow measurements in the gauges by making some simple mathematical operations to eliminate the anthropic influences. The daily climatic fieldswere estimated with spatial resolution of 1kmx1km by applying geostatistic techniques using data coming from 119climatic gauges existing in the area.We have considered to model options: Monthly and yearly variogram to characterize the spatial data correlation. The Elevation has been considered as secondary variable for the estimation. The analysis of the experimental data showed a linear relationhip between mean T and elevation. Therefore, we decided to apply a kriging with linear external drift to estimate the P and T fields. The mean daily P data show a quadratic relationship with the elevation. Different hypothesis have been considered to approach these P fields by applying kriging with linear drift, with quadratic drift, and regression kriging. A cross-validation analysis showed that the best approximation to the data is obtained with the kriging with linear drift. The P and T fields obtained with this technique were employed to feed different hydrological models in which different conceptual approaches of the hydrological processes related with the snow are considered. Correction factors of the solid & liquid P fields have been included in the formulation. We intend to perform an automatic calibration of the parameters of these models. A detailed analysis of global optimization techniques has been performed in order to identify the best possible optimization algorithm (Classic Informed Local Search, Simulated Annealing, Genetic Algorithm and Memetic algorithm) which is important due to the high computational cost of our optimization problems with many parameters and noisy inputs and outputs. Finally with the best calibration algorithm we have performed different optimization experiments (20 realizations). It allows us to obtain a distribution function of the correction factor for the solid and liquid P for each catchment, which can be useful as a preliminary assessment of the global under-catch in the basins. We have also analysed the sensitivity of the results to the spatio-temporal scale (grid with cells of 1x1 kms or 12.5x12.5 Kms; daily or monthly approaches) employed to approach different hydrological processes. We are also working in the analysis of these issues considering multi-objective evolutionary optimization approaches for calibration using multiple target criteria in which the transient calibration try to minimize differences with both, stream flow and snow cover area observations.

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