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The propagation of uncertainty: from input to flows in a lumped hydrological model

Lorenzo Campo
CIMA Research Foundation, Savona, Italy (lorenzo.campo@cimafoundation.org)

The dense meteorological sensors networks available in large areas, in synergy with other sources of observations (satellite, meteorological radar, etc.) allow to represent with increasing detail the main micrometeorological variables that typically constitute the input for the hydrological modelling: rainfall height, surface air temperature, air humidity, etc.. However, this information is often subject to errors (measure precision, lack of data in sub-region, data loss, interpolation error, resolution, etc..), especially when distributed models are taken into account. In this work a simple scalar rainfall-runoff model with lumped parameters was used as toy-model in order to investigate the errors produced in the reconstruction of the flows time series starting from artificially "flawed" input time-series. The reference (control run) was constituted by a run of at least a complete seasonal cycle with inputs given by time series of rainfall heights, air temperature and humidity, wind speed and solar radiation.
Subsequently, these variable were, in different combinations, perturbed in several experiments in order to investigate the effects in terms of results. In particular it was of interest to study the effects in terms of hydrological balance (soil moisture, evapotranspiration fluxes) and of extreme flows (peak flows, droughts). The results are discussed in terms of probability distributions of the errors.