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Assessment of the added value of using statiscally downscaled precipitation fields for hydrological forecasting

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When an extreme precipitation event is imminent, meteorological forecasts may be used as input to a physically-based, distributed, hydrological models to estimate the resulting peak flow. However, meteorological forecasts are generally available on mesoscale grids (102 – 103 km2), which might not be accurate enough to simulate local-scale stream flows. Statistical disaggregation models can rapidly provide several series of high-resolution precipitation data while preserving the total amount of precipitation at the mesoscale grid. The aim of the present work is to evaluate the potential of using precipitation series from a recently developed disaggregation model in a distributed hydrological model to predict local stream flows within a watershed. As a case study, we analyze the June 2002 flood on the Des Anglais watershed (730 km2), located in the Saint Lawrence Lowlands, Quebec, Canada, using HYDROTEL. Results show that disaggregation of mesoscale precipitation from 52.8 to 4.4-km fields produces a large spectrum of runoff estimations, especially on the smaller hydrological units, and reduces rain and runoff biases. For this extreme-event case study, runoff estimation also strongly depends on soil types and the set of estimated parameter values of HYDROTEL.