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Probabilistic forecasting at ungauged basins: using neighbour catchments for model calibration and updating

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This study evaluates the quality of probabilistic streamflow forecasts at ungauged basins when using neighbour catchments for model calibration and updating. Many studies have been carried out to estimate the local parameters at ungauged basins for flow simulation and flow quantile estimation. However, approaches devoted to the question of streamflow forecasting at ungauged basins are rarer. In fact, in flow forecasting, additionally to the need of long time series of historic discharges for model setup and calibration, hydrological models also need real-time discharge data for the updating of initial conditions at the onset of the forecasts. Updating forecasts is an essential step to improve forecast quality in the routine of real-time forecasting, mainly for short-range forecasting. In this study, we test the performance of different choices of parameters and updates (last observed discharge) to run a forecasting model at ungauged sites. We use a cross-validation approach over 211 catchments in France (170 to 9390 km^2) and a 17-month forecasting period. Over this period, skill scores are calculated to evaluate the quality of the forecasts. In our methodology, we compare a reference situation, where local information is available, to three alternative situations, which include scenarios where no local data is available at all, and scenarios where local data started to be collected at the time of the forecasting. The three alternative situations are: 1) the model is set up with parameters from neighbour catchments and forecasting is performed without updating; 2) both model parameters and updates are based on information from neighbour catchments; 3) the model is set up with neighbour parameters but forecasting is performed with updating based on local discharge data. The GRP forecasting system developed at Cemagref, a lumped soil-moisture-accounting type rainfall-runoff model, is used. To cope with uncertainties from rainfall forecasts, the model is driven by ensemble weather forecasts from the PEARP-Météo-France ensemble prediction system (11 possible future scenarios). Skill scores are computed for the first two days of forecast range and the performance obtained from the different tested situations is compared.