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Mesoscale hydrology-oriented verification of different probabilistic precipitation forecasts: highlighting their complementarity

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Probabilistic Quantitative Precipitation Forecasts (PQPF) are nowadays widely used as input of rainfall-runoff models in order to issue probabilistic hydrological forecasts. However, despite progress achieved in the last decades, biases in their mean and spread still remain, depending on the considered source of precipitation forecast and on the predicted weather conditions. For the presented study, a verification framework was set up in order to assess the attributes (in terms of overall quality, reliability, resolution and discrimination) of different PQPF issued from the Ensemble Prediction Systems of NCEP, ECMWF and Meteo-France (namely, GEFS, ECMWF-EPS and PEARP) and from analogy-based post-processing of the deterministic run of the ECMWF and the NCEP Numerical Weather Prediction models (IFS-ana and GFS–ana, respectively). In order to assess the hydrological relevance of such forecasts, verification was made on precipitation spatially averaged over 10 catchments (from 300 to 3700 km^2) of the French upper Rhone River. The considered time step is 6-hour, with a lead time up to 120 hours ahead. Forecasts are evaluated over the 2010-2014 period. Results are conditioned by precipitation ranges and periods, highlighting different strengths and weaknesses among the considered forecasts. These results exhibit the complementary qualities of the different PQPF and raise the possibility of merging ensemble and analogy-based forecasts. Furthermore, the diurnal cycle observed in forecasting skills and its potential impact in an operational context is discussed.