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Assessing the skill of seasonal precipitation and streamflow forecasts in sixteen French catchments

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Meteorological centres make sustained efforts to provide seasonal forecasts that are increasingly skilful. Streamflow forecasting is one of the many applications than can benefit from these efforts. Seasonal flow forecasts generated using seasonal ensemble precipitation forecasts as input to a hydrological model can help to take anticipatory measures for water supply reservoir operation or drought risk management.

The objective of the study is to assess the skill of seasonal precipitation and streamflow forecasts in France. First, we evaluated the skill of ECMWF SYS4 seasonal precipitation forecasts for streamflow forecasting in sixteen French catchments. Daily flow forecasts were produced using raw seasonal precipitation forecasts as input to the GR6J hydrological model. Ensemble forecasts are issued every month with 15 or 51 members according to the month of the year and evaluated for up to 90 days ahead. In a second step, we applied eight variants of bias correction approaches to the precipitation forecasts prior to generating the flow forecasts. The approaches were based on the linear scaling and the distribution mapping methods. The skill of the ensemble forecasts was assessed in accuracy (MAE), reliability (PIT Diagram) and overall performance (CRPS).

The results show that, in most catchments, raw seasonal precipitation and streamflow forecasts are more skilful in terms of accuracy and overall performance than a reference prediction based on historic observed precipitation and watershed initial conditions at the time of forecast. Reliability is the only attribute that is not significantly improved. The skill of the forecasts is, in general, improved when applying bias correction. Two bias correction methods showed the best performance for the studied catchments: the simple linear scaling of monthly values and the empirical distribution mapping of daily values.

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