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Seasonal ensemble streamflow forecasting to assess low flows and drought risks

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This study presents the results of recent research aiming at assessing the skill of ECMWF System 4 seasonal precipitation forecasts in France and evaluating how conditioning methods based on the Standardized Precipitation Index (SPI) from bias-corrected GCM precipitation forecasts can be useful to select relevant historical time series and further improve the forecast of droughts. We evaluated several bias correction approaches and conditioned precipitation scenarios in sixteen catchments in France, with the help of the GR6J hydrological model. The results show that, in most catchments, raw seasonal precipitation and streamflow forecasts are often sharper than the conventional ESP method. However, they are not significantly better in terms of reliability. Forecast skill is generally improved when applying bias correction. Conditioning past observations on the three-month SPI can be beneficial for several catchments at lead times longer than 15 to 30 days. The conditioned ensembles could be as sharp as the GCM-based forecasts while also being, in most cases, more reliable than or as reliable as these forecasts. Forecast attributes from conditioned and unconditioned ensembles are illustrated for a case of drought-risk forecasting: the 2003 drought in France. In the case of low-flow forecasting, conditioning results in ensembles that can better assess weekly deficit volumes and durations over a wider range of lead times.

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