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Statistical seasonal forecasting of Portuguese river flows

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We develop experimental statistical forecasting models of monthly dam flows for the main Portuguese rivers (Tagus, Douro, Guadiana, Cávado) in order to get seasonal outlooks of the potential hydro electrical power. Two types of model outputs are available: a) Continuous deterministic values, obtained trough a multilinear regression model using robust predictors and b) Forecasted probabilities of flow distribution quantiles. Forecasts are made for the period of October to May and lags ranging from one to three months. Predictors for both forecast approaches (deterministic and probabilistic) include: the trend; the North Atlantic Oscillation index, strongly affecting river flows and precipitation in Portugal; the flow in previous months and a set of lagged monthly spatial averages of surface quantities including snow depth, surface temperature and 2m humidity. These last predictors were chosen from global correlation maps, from which we have chosen the areas with relevant, statistically significant and temporally stable correlations. The probabilistic forecasts were obtained trough randomization of the Gaussian anamorphosis of the deterministic flow error. Then, probabilities of each quantile are obtained. Cross-validation forecast skills are obtained for all cases for a period of about 50 years.