



## **Estimating seasonality in river flows**

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Seasonal flow prediction is crucial for various aspects of intra-annual water resources management, including flood protection and drought management. To exploit the degree of predictability encompassed in the seasonal flow formation processes, one needs first and foremost a characterization of the seasonality of the process of interest both in terms of timing and magnitude. Yet there exists no single approach but several methodologies varying in scope and characteristics. In this study, we compare two approaches of different rationale in their performance as part of a seasonal flow prediction scheme. The first one identifies high and low flow periods within a year through a fixed time-window method centered around the months receiving the majority of maximum and minimum flows respectively, while the second is based on the identification of an optimal number of seasons allowed to have varying lengths. We characterize the seasonal regime within the year by means of the two methods and we employ a meta-Gaussian bivariate model to condition selected flow signatures in the seasons of interest, i.e. peak or mean flows, on the mean flows observed in the previous season. The model is used to update the flow distribution one season in advance upon observance of a mean flow of certain magnitude in the previous season. In this framework, we compare the two seasonality approaches in terms of robustness, objectivity, efficiency and in their overall relevance for the purpose of seasonal flood and drought prediction.