



## **Investigation of the factors that affect the auto-correlation structure of annual river runoff**

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The auto-correlation structure of annual river runoff is a topic of ongoing hydrological research, due to its implications to water resources management. Most studies have concluded that there is medium to strong long-term persistence (LTP), measured by the Hurst coefficient  $H$ . Here, we determine  $H$  by three different estimation methods (maximum likelihood estimator, Whittle estimator and least squares variance), in 696 annual, globally distributed, streamflow records with at least 80 years of data. Subsequently, we explore potential factors influencing  $H$  by two linear (Spearman's rank correlation, multiple linear regression) and two non-linear (self-organizing maps, random forests) techniques. Catchment area is found to be crucial for medium to larger watersheds, while climatic controls, such as aridity index, have higher impact to smaller ones. Our findings indicate that long-term persistence is weaker ( $H = 0.65$ ) than found in other studies, suggesting that enhanced LTP is encountered in large-catchment rivers, where the effect of spatial aggregation is more intense. However, we also show that the estimated values of  $H$  can be reproduced by a short-term persistence stochastic model such as an auto-regressive AR(1) process. A direct consequence is that some of the most common methods for the estimation of  $H$  coefficient, might not be suitable for discriminating short- and long-term persistence even in long observational records.