



Estimating inter-annual runoff variability from global hydroclimatic data

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Inter-annual variability of runoff, measured by the coefficient of variation of annual runoff (RCv), is an important constraint on reservoir yield and storage size for water resources management. For a catchment with a fixed storage capacity, any increase in reservoir inflow RCv translates into reduced reservoir yield for a given reliability of supply. Developing an improved understanding of the physical influences on inter-annual runoff variability around the world and how these may change in future is of vital importance to achieving on-going robust water and catchment management. Here we take a large-scale Comparative Hydrology approach to develop empirical relationships for RCv using a global hydroclimatic data set of 588 catchments. Empirical RCv relationships are developed for the World and catchments experiencing predominantly ($\geq 75\%$ catchment area) tropical, arid, temperate or cold climate types. The RCv relationships are developed specifically using non-streamflow based predictor variables so they can be used for predicting RCv in ungauged basins (the PUB problem – Prediction in Ungauged Basins) and or ungauged climates (the PUC problem – Prediction in Ungauged Climates) if past or future projections of the required predictor variables are available. Empirical relationship predictor variables are based on precipitation, evaporative demand, vegetation and topography. Key variables that contribute to explaining RCv in each relationship will be assessed to identify the dominant drivers of RCv and how the contribution of those drivers varies between regions and climate types, with particular focus on inter-annual climate variability.