



Ecologically relevant flow metrics for intermittent rivers and ephemeral streams

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The COST-Action SMIRES brings together scientists from various disciplines to foster a common understanding of hydrology, hydrochemistry and ecology of intermittent rivers and ephemeral streams. Such rivers are characterized by episodes of stagnant waters or drying-off, occurring either annually during the drought season or exceptionally during extreme drought years. Since intermittency can be seen as a special case of low-flow regimes that reach zero-flow, relevant low flow characteristics exist but need to be adopted to characterise ecologically relevant features of the particular flow regime.

In this paper we present a set of metrics for characterizing flow intermittency in an ecologically relevant way, stemming from interdisciplinary discussions among SMIRES experts of various disciplines. The indices are compatible with standard low flow indices of the WMO manual on low flow estimation and prediction (Gustard and Demuth, 2008) and the handbook Hydrological Drought (Tallaksen and Van Lanen, 2004), extending these indices to no-flow conditions. The metrics characterise the statistical distribution including mean and variance of the proportion of no-flow years, the annual number of no-flow-days, the duration of no-flow spells and the timing of seasonality of onset and termination of no-flow spells. In addition, the dynamics of drying-off and rewetting are characterized. An R software package (Gauster and Laaha, 2017) has been compiled that enables uniform calculation of indices at the annual, seasonal and monthly scale, suitable for a broad range of hydrological regimes. The paper concludes with illustrating examples of how the metrics can be applied in eco-hydrological studies of rivers that cease to flow.

References:

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