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Identification of temporal trends in Canadian low flow indices in the presence of short- and long-term persistence

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In order to investigate trends in time series of hydrological variables, the assumption of independent and identically distributed (IID) observations or short-term persistence (STP) is generally made, as opposed to long-term persistence (LTP). This study investigates the suitability of these assumptions for estimating significance of temporal trends in low flow regimes in Canadian rivers. For the analyses, nonparametric methods are combined with the block bootstrap resampling approach to take into account the effect of STP on trend significance as realistically as possible and with the fractional autoregressive integrated moving average modeling approach for the case of LTP. It is found that the trend significance is highly sensitive to the assumptions of STP and LTP. The implication of this finding is that the number of sites identified with significant trends under the assumption of IID or STP is considerably higher than those obtained under the assumption of LTP. However, for the majority of the time series analyzed, the assumption of IID or STP appears to be valid. In contrast, the fluctuating behavior of trends observed in longer time series using moving window technique does support the hypothesis of LTP. Therefore, for reliable trend investigation, satisfactory identification of LTP in typical length hydrological time series, which seldom exceed 100 years, is important and must be ascertained with the help of

suitable statistical tests.