

# Stationary or Nonstationary? Annual Maximum Streamflow of Canada

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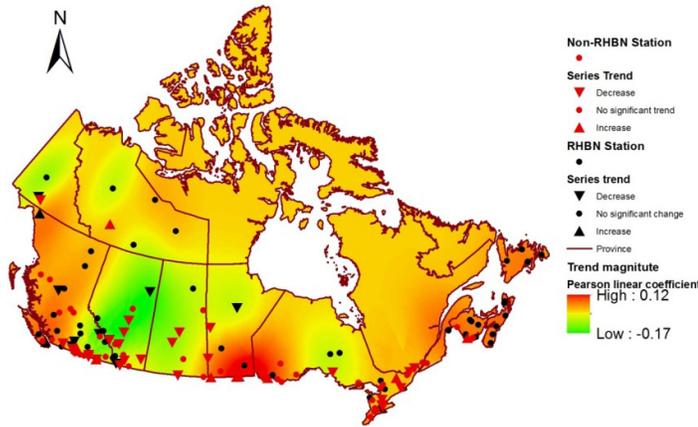


## Research Summary



Both natural climate change and anthropogenic impacts may cause nonstationarities in hydrological extremes. In this study, long-term annual maximum streamflow (AMS) records from 145 stations over Canada were used to investigate the nonstationary characteristics of AMS, which include abrupt changes

more likely to show temporal trends in AMS, compared to pristine basins with stable land-use conditions. The nonstationary characteristics of AMS were accounted for by fitting the data with probability distributions with time-varying parameters. Large H found in almost 2/ 3 of the Canadian AMS dataset indicates strong LTP, which may partly represent the presence of long-term memories in many Canadian river basins. Furthermore, H values of AMS data are positively correlated with the basin area of Canadian rivers. It seems that nonstationary frequency analysis, instead of the traditional stationary hydrologic frequency analysis, should be employed in the future.



and monotonic temporal trends. The nonparametric Pettit test was applied to detect abrupt changes, while temporal monotonic trend analysis in AMS series was conducted using the nonparametric Mann–Kendall and Spearman tests, as well as a parametric Pearson test. Nonstationary frequency analysis of the AMS series was done using a group of nonstationary probability distributions. The nonstationary characteristics of Canadian AMS were further investigated in terms of the Hurst exponent (H), which represents the long-term persistence (LTP) of streamflow data. The results presented here indicate that for Canadian AMS data, abrupt changes are detected more frequently than monotonic trends, partly because many rivers began to be regulated in the twentieth century. Drainage basins that have experienced significant land-use changes are

