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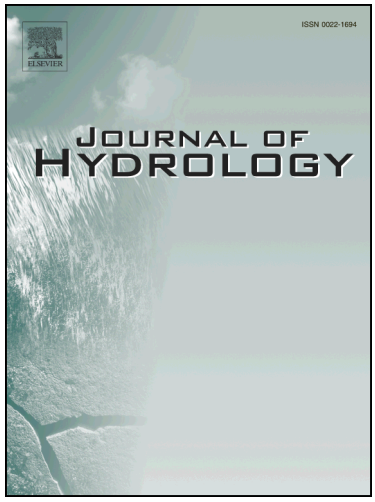

Research papers

Optimizing streamflow monitoring networks using joint permutation entropy

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ACCEPTED MANUSCRIPT

Optimizing streamflow monitoring networks using joint permutation entropy

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Abstract

Using joint permutation entropy we address the issue of minimizing the cost of monitoring, while minimizing redundancy of the information content, of daily streamflow data recorded during the period 1989–2016 at twelve gauging stations on Brazos River, Texas, USA. While the conventional entropy measures take into account only the probability of occurrence of a given set of events, permutation entropy also takes into account local ordering of the sequential values, thus enriching the analysis. We find that the best cost efficiency is achieved by performing weekly measurements, in comparison with which daily measurements exhibit information redundancy, and monthly measurements imply information loss. We also find that the cumulative information redundancy of the twelve considered stations is over 10% for the observed period, and that the number of monitoring stations can be reduced by half bringing the cumulative redundancy level to less than 1%.

Keywords: Permutation entropy, transinformation, mutual information, network, streamflow, Brazos River

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