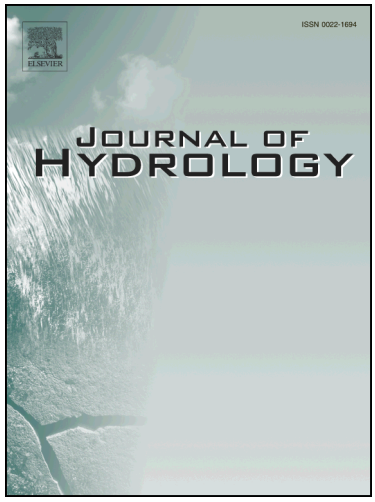

Research papers

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Multiple Şen-innovative trend analyses and partial Mann-Kendall test

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Abstract

The climate change is an important event that affects hydrological, agricultural and water resources planning variables, and therefore, the hydrologists and meteorologists frequently try to identify trend possibilities especially in rainfall, runoff and temperature time series. For this purpose, the classical Mann-Kendall (MK), Spearman's rho (SR), Sen's slope, and linear regression approaches are applied frequently in the literature. Recently, innovative trend analysis (ITA) provides visual inspection and identification of categorical trends, which is one of the main concerns in this paper. On the basis of ITA methodology, several improvements namely double-ITA (D-ITA) and triple-ITA (T-ITA) procedures are suggested using with simple ITA together. These methods are attractive for the trend stability assessment by comparing partial trend components during different sub-periods of a given record series. Furthermore, partial MK test approach is proposed in this paper for the same purpose. These procedures and approach are applied to a set of annual rainfall records at many stations in different regions of Turkey. As a result, the comparison of the suggested methods based on partial sub-series of the same time series helps to improve trend detection with stability identification.

Keywords: 1:1 straight-line; Mann-Kendall; rainfall; Şen's method; time series; trend analysis.

1. Introduction