

## Spatiotemporal Variability in Rainfall Trends over Sinai Peninsula Using Nonparametric Methods and Discrete Wavelet Transforms

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**Abstract :** Knowledge of the temporal and spatial variability of rainfall trends has been of great concern for efficient water resource planning, management. In this study annual, seasonal and monthly rainfall trends over the Sinai Peninsula were analyzed by using absolute homogeneity tests, nonparametric Mann-Kendall (MK) test and Sen's slope estimator methods. The homogeneity of rainfall time-series was examined using four absolute homogeneity tests namely, the Pettitt test, standard normal homogeneity test, Buishand range test, and von Neumann ratio test. Further, the sequential change in the trend of annual and seasonal rainfalls is conducted using sequential MK (SQMK) method. Then the trend analysis based on discrete wavelet transform technique (DWT) in conjunction with SQMK method is performed. The spatial patterns of the detected rainfall trends were investigated using a geostatistical and deterministic spatial interpolation technique. The results achieved from the Mann-Kendall test to the data series (using the 5% significance level) highlighted that rainfall was generally decreasing in January, February, March, November, December, wet season, and annual rainfall. A significant decreasing trend in the winter and annual rainfall with significant levels were inferred based on the Mann-Kendall rank statistics and linear trend. Further, the discrete wavelet transform (DWT) analysis reveal that in general, intra- and inter-annual events (up to 4 years) are more influential in affecting the observed trends. The nature of the trend captured by both methods is similar for all of the cases. On the basis of spatial trend analysis, significant rainfall decreases were also noted in the investigated stations. Overall, significant downward trends in winter and annual rainfall over the Sinai Peninsula was observed during the study period.

**Keywords :** trend analysis, rainfall, Mann-Kendall test, discrete wavelet transform, Sinai Peninsula

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