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Long Term Precipitation Pattern Identification and Derivation of Non Linear Precipitation Trend in a Catchment using Singular Spectrum Analysis

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Precipitation is the major component in the hydrologic cycle. Awareness of not only the total amount of rainfall pertaining to a catchment, but also the pattern of its spatial and temporal distribution are equally important in the management of water resources systems in an efficient way. Trend is the long term direction of a time series; it determines the overall pattern of a time series.
Singular Spectrum Analysis (SSA) is a time series analysis technique that decomposes the time series into small components (eigen triples). This property of the method of SSA has been utilized to extract the trend component of the rainfall time series. In order to derive trend from the rainfall time series, we need to select components corresponding to trend from the eigen triples. For this purpose, periodogram analysis of the eigen triples have been proposed to be coupled with SSA, in the present study.
In the study, seasonal data of England and Wales Precipitation (EWP) for a time period of 1766-2013 have been analyzed and non linear trend have been derived out of the precipitation data. In order to compare the performance of SSA in deriving trend component, Mann Kendall (MK) test is also used to detect trends in EWP seasonal series and the results have been compared. The result showed that the MK test could detect the presence of positive or negative trend for a significance level, whereas the proposed methodology of SSA could extract the non-linear trend present in the rainfall series along with its shape. We will discuss further the comparison of both the methodologies along with the results in the presentation.