



Direct data-transformation calculation of Standardised Precipitation Indices.

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Standardised Precipitation Indices (SPIs), a form of Drought Index, were first proposed by McKee, Doesken and Kleist in 1993. In using SPIs calculated according to their original specification, we observed that SPI-sets for UK precipitation data in general are negatively skewed and have non-zero means and non-unity standard deviations, i.e. are not standard-normally distributed. We also observed that the deviations of SPIs from the standard normal distribution increase with increasing magnitude, positive or negative. We attribute these observations to the equiprobability mapping between the cumulative Gamma distribution, used to fit the precipitation data, and the cumulative standard normal distribution, from which the SPIs are derived as abscissae.

We present a new method for calculating SPIs. This is based on a generalisation of the square-root normal and cube-root normal distributions used elsewhere to model precipitation data. The resulting sets of SPIs are standard-normally distributed, having (very close to) zero skewness, zero mean and unity standard deviations. The resulting root-normal distributions are, in general, also better fits to the data than the Gamma distribution used by McKee et al. For small-magnitude SPIs, these root-normal SPIs are in agreement with those calculated according to McKee et al.'s specification, but that agreement decreases with increasing SPI magnitude, in accordance with our observations of SPI distributions which triggered the research..