Generating Daily Precipitation Time Series Using Spectral Methods

Masoud Mehrvand and András Bárdossy

University of Stuttgart, Institute for Modelling Hydraulic and Environmental Systems, Hydrology and Geohydrology, Stuttgart, Germany (Masoud.Mehrvand@iws.uni-stuttgart.de)

Many hydrological applications require high-resolution precipitation time series, however, most of the available observed precipitation time series are available in coarse time resolution. In addition, observations of the precipitation are taken at selected locations different from the point of interest. Generating precipitation time series in finer resolutions can provide the time series for the particular study location and also in desired time resolutions. This paper introduces the precipitation time series generation using the phase randomization of daily precipitation. The values are first transformed to truncated normal distribution. As the power spectrum of the observed truncated and the truncated phase- randomized series differ, an iterative procedure is applied to correct this deficiency. Fourier Transform (FT), which is capable of capturing long-term and short-term wavelengths of time series, applied for the transformed time series. Results confirmed that the phase randomization coupled with the FT was not only capable of the generating high-resolution precipitation time series, but also the generated time series were capable of maintaining the statistical and stochastic characteristics of the original precipitation time series. This method can also be applied for simultaneous generation of precipitation time series at different locations. In this case, spatial characteristics have to be taken into the consideration.