



Study of Changes in the Frequencies of Unusual Hydrological and Meteorological Events

Y. Yulizar, S. Kumar Singh, and A. Bárdossy

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

As the water cycle is an important part of the global climate system, it is almost sure that the frequencies of hydrological events will change as a consequence of climate change. These changes might not only affect means, variances, and other at single location, but the dependence between parameter measured at different locations. This can lead to the occurrence of unusual events for multivariate sense, where for example at the same time, one area is very warm and other is very cold. The purpose of this study is to investigate the occurrence of unusual hydrological and meteorological events in the multi site sense. The unusual events are defined based on their geometrical position in a multivariate set using the depth function. The main concept of depth function is to measure the centrality of a point with respect to multivariate dataset. The unusual events are those events which lie on or near the boundary of the multivariate set. Hence the unusual events can be defined by low depth points. A bootstrap method was developed to investigate the statistical significance of changes in the frequency of unusual events. Long daily time series of temperature, antecedent precipitation index, and sea level pressure from European region (regional and continental) were analyzed. The result shows the numbers of unusual days of appearing and disappearing are vary for each of time period. It has been found that frequency of unusual events in mean temperature is increasing in continental scale (Europe) and decreasing in regional scale (Baden Württemberg). Sea level pressure also shows the similar behaviour that frequency of unusual events is increasing in continental scale and decreasing in region scale (Germany). Antecedent precipitation index shows the different behaviour that frequency of unusual events is increasing in region scale (Germany) and decreasing in continental scale (Europe).