

Drought Analysis based on Copulas and Poisson Process

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Drought is a regular and recurring climatic phenomenon. Because of climate change and the increasing water demand, we have experienced higher drought deficit and severity in recent years. To evaluate the impact of the trend of drought, this study aims to develop an improved framework for streamflow drought analysis and simulation of the future conditions. Based on our proposed framework based on Copulas and Poisson process, this study firstly analyzes historical inflow data to estimate statistical parameters of drought. Secondly, we calculate three defined indices of the drought, drought duration, drought deficit, and interval time between droughts respectively. With statistical test, these three indices are found to be correlated. Following, the marginal distributions of these indices are estimated. Accordingly, this study constructs a stochastic model by three-dimensional Gaussian copulas to simulate the occurrence of drought events. In addition, to more appropriately simulate drought occurrences, a Poisson process is applied in this study to describe the occurrence between drought events. This simulation is based on the stationary assumption in current stage. In the future, we will consider the influence of climate change and simulate drought events under non-stationary condition. The results of this work can be utilized to support the decision or policy making processes in drought management.

Keywords: drought analysis, copulas, poisson process