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基于Copula的鄱阳湖流域水文干旱频率分析

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Title: Copula-based analysis of hydrological drought frequency in Poyang Lake Basin

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关键词: 水文干旱; 频率分析; Copula函数; 鄱阳湖流域

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摘要: 选用游程理论识别了水文干旱特征变量,运用Mann-Kendall(M-K)方法分析了水文干旱特征的趋势变化,并运用柯尔莫哥洛夫—斯米尔诺夫方法(K-S法)选出了最适合的8个概率分布函数;引入当前多变量分析中较常用的Copula函数,分析了中国最大淡水湿地鄱阳湖流域主要支流“五河”的干旱历时和干旱烈度的联合概率特征,并对引起该流域水文干旱特征频率变化的原因及影响作了有益的探讨。研究表明:(1)对数正态分布是用于研究鄱阳湖流域水文干旱特征的最佳概率分布函数。(2)赣江流域和饶河流域发生的干旱次数最少,干旱历时最长;抚河流域发生干旱次数最多,干旱历时最短。(3)抚河流域的李家渡干旱历时和干旱烈度发生的频率高于其他地区,饶河流域的干旱历时和干旱烈度发生的频率在鄱阳湖流域是最低的。水利设施和森林覆盖率对干旱烈度降低起到了一定的作用,而农业用地的变化对干旱烈度的加强起到了一定的作用。

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Abstract:

In this study, hydrological drought characteristics were identified using run-length theory and analyzed using Mann-Kendall method. Meanwhile, the Kolmogorov-Smirnov (K-S) method was employed to evaluate the goodness-of-fit of the eight probability functions. The multivariate analysis method, copula function, was introduced with aim to investigate joint probability behaviors of drought-duration and drought-severity of the major tributaries of the Poyang Lake Basin, the largest fresh-water wetland in China, and the cause and influence of probability change of hydrological characteristics was explored meaningfully. The results indicate that: (1) Lognormal distribution is the candidate distribution function with the highest goodness-of-fit in the study of hydrological drought over the Poyang Lake basin. (2) The number of drought is the least and the drought-duration is the longest in Ganjiang River Basin and Raohe River Basin, while the number of drought is the most and the drought-duration is the shortest in Fuhe River Basin. (3) The frequency of drought-duration and drought-severity in Fuhe River is higher than other River Basin, but the frequency of drought-