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Probabilistic modelling of drought events in China via 2-dimensional joint copula

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Abstract

Probabilistic modelling of drought events is a significant aspect of water resources management and planning. In this study, popularly applied and several relatively new bivariate Archimedean copulas were employed to derive regional and spatial based copula models to appraise drought risk in mainland China over 1961 - 2013. Drought duration (Dd), severity (Ds), and peak (Dp), as indicated by Standardized Precipitation Evapotranspiration Index (SPEI), were extracted according to the run theory and fitted with suitable marginal distributions. The maximum likelihood estimation (MLE) and curve fitting method (CFM) were used to estimate the copula parameters of nineteen bivariate Archimedean copulas. Drought probabilities and return periods were analysed based on appropriate bivariate copula in sub-region I-VII and entire mainland China. The goodness-of-fit tests as indicated by the CFM showed that copula NN19 in sub-regions III, IV, V, VI and mainland China, NN20 in sub-region I and NN13 in sub-region VII are the best for modeling drought variables. Bivariate drought probability across mainland China is

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