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A new technical framework for probability analysis of hydrological wet and dry encounter in changing environment

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The calculation of hydrological encounter probability is of great significance to formulating joint prevention schemes for flood and drought disasters. Under the combined influence of global climate change and human activities, the consistency of hydrological processes has been destroyed, and the frequency and intensity of hydrological wet and dry encounters between river basins have become more complex, significantly impacting regional water resources security. Thus, this study provides a high precision hydrological wet and dry encounter probability analysis technology coupled with efficient dimensionality reduction theory:(1)The optimal distribution model of each marginal distribution is selected in the distribution model selector.(2)The cumulative distribution function(CDF1) and cumulative experience frequency calculated by the optimal distribution model are loaded into the regular feature learner to obtain the relationship function (RF) between the cumulative distribution function and the cumulative experience frequency.(3)The indexes reflecting the impact of climate change and human activities are loaded into the efficient dimensionality reduction tool to obtain the comprehensive and human activity indexes.(4)After considering the influence of the changing environment, the cumulative distribution function (CDF2) of the marginal distribution is analyzed using the GAMLSS model, and it is substituted into the RF to obtain the final cumulative distribution function (CDF_final). (5)Finally, the CVINECopula function and the encounter probability calculation method are used to calculate the probability of encountering wet and dry. This study fully considers the impact of climate change and human activities on hydrology and effectively avoids the problem of dimension disaster through an efficient dimension reducer. In addition, the coupled distribution model selector and the rule feature learner can significantly improve the calculation accuracy of the encounter probability of water resources.