

# Analysis of drought characteristics and risks in plateau area of central Yunnan

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## Objectives

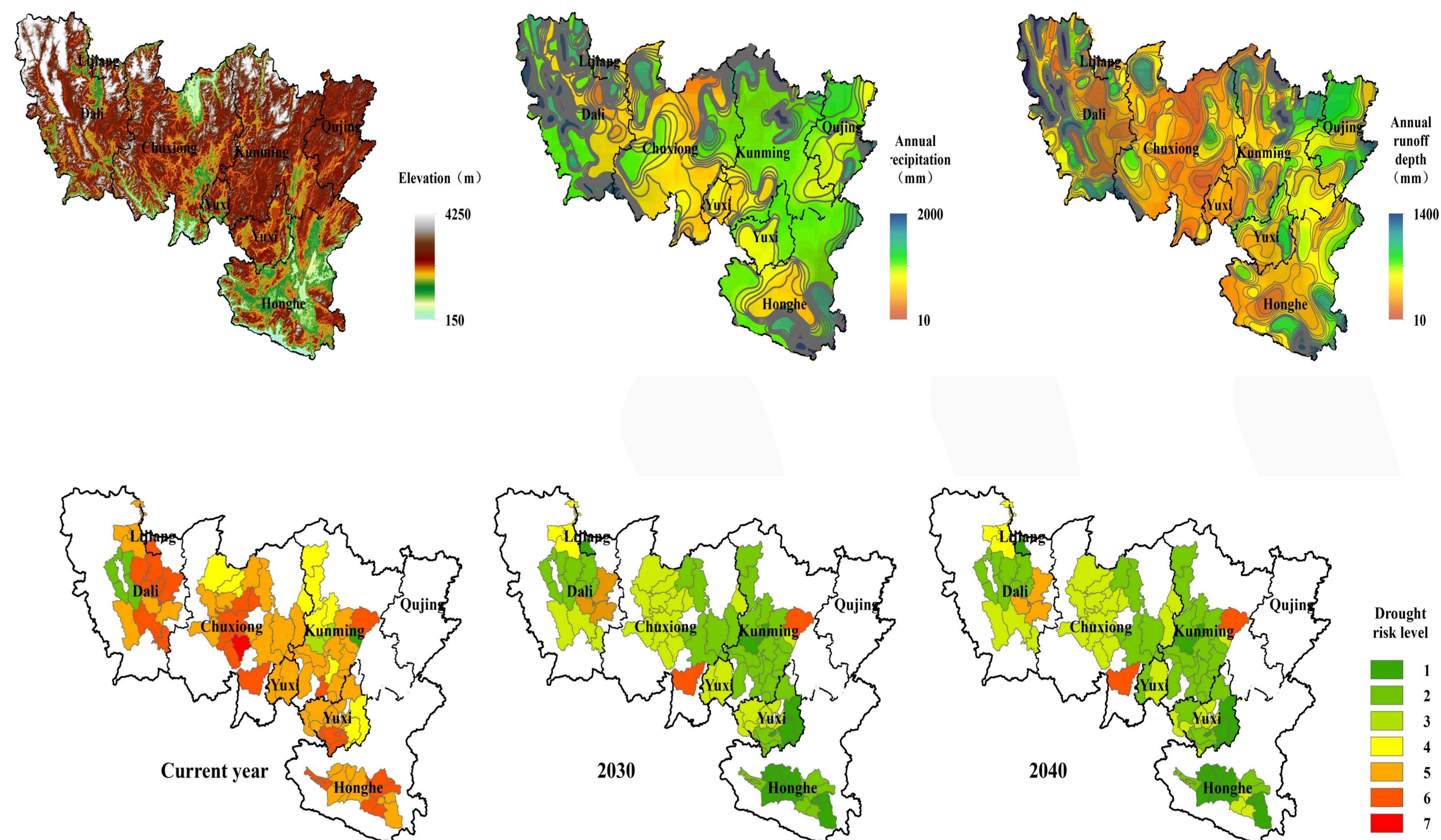
The frequency of drought in the central Yunnan Plateau is relatively high. On the one hand, it has a significant impact on regional agricultural production. On the other hand, it will also affect the operation of the water diversion project in central Yunnan. In this paper, the central Yunnan Plateau is taken as the analysis object to analyze and evaluate the spatial and temporal variation characteristics of regional drought events and their influence range and frequency ( return period ). On this basis, based on the theory of natural disaster risk, a drought disaster risk assessment method is proposed, and the changes of regional drought risk before and after the water diversion project in central Yunnan are compared and analyzed. Therefore, it provides a scientific basis for the comprehensive response to regional drought disaster risk, as well as the water resources allocation and water supply benefit analysis of the water diversion project in central Yunnan.

## Methods

The runoff characteristics of the water source area and the water receiving area of the water diversion project in central Yunnan were analyzed. The Gumbel Copula function was used to analyze the probability of wet and dry encounters of runoff in the water source area and the water receiving area. The standardized runoff index ( SRI ) was used to identify the two characteristic variables of duration D and intensity S of hydrological drought events. Morlet wavelet analysis was used to obtain the periodic variation characteristics of drought duration and intensity, so as to compare and analyze the regional hydrological drought events before and after the water diversion project in central Yunnan.

## Results

Using the monthly average, maximum, and minimum temperature datasets with a 1 km resolution from the National Tibet Plateau Scientific Data Center in China, the average daily solar radiation dataset from China Meteorological Station, and the precipitation and runoff data from 59 hydrological stations in the central plateau region, the SPI, SRI, and Ia index were calculated to identify meteorological, hydrological, and agricultural drought events. The MDI index was constructed using the multivariate Copula function to determine the overall drought characteristics of the central plateau region. On the basis of the drought characteristics analysis, a risk assessment method for drought disasters was proposed based on natural disaster risk theory. The drought risk levels were divided into four categories based on the level of danger, implantation rate, affected rate, and water shortage rate, and the impact of the central Yunnan water transfer project on regional drought was evaluated.



## Conclusions

This paper analyzes the overall drought characteristics in the central Yunnan Plateau and finds that the mean drought duration / intensity in the central and southern parts of the region is longer / stronger, and the joint return period is longer. The mean drought duration / intensity in the western part is shorter / weaker, and the joint return period is also shorter. It is found that the project can significantly reduce the regional drought risk and further enhance the ability of the region to resist natural disasters by studying the changes of drought risk in the water receiving areas of the Central Yunnan Plateau before and after the water supply of the Central Yunnan Water Diversion Project. The regional drought characteristics analysis and drought disaster risk assessment carried out in this paper can provide technical support for regional drought disaster risk response to a certain extent, and also have certain reference significance for regional water resources allocation.

