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CHINA'S CLIMATE CHANGE CHARACTERISTICS AND TREND PREDICTIONS

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Based on the daily data of 2255 weather stations in the 60 years from 1961 to 2020, the annual potential evapotranspiration was used to calculate the drought index, analyze the change and prediction data of China's dry and wet climate, and analyze the possible changing trends of China's dry and wet climate at the end of this century. The results show that China's climate will have a general trend of drying out. Dry areas are mainly concentrated in central and eastern China, while the western region continues to maintain a wet trend.

Keywords: China; climate change; trends; drought; humidity.

ХАРАКТЕРИСТИКИ ИЗМЕНЕНИЯ КЛИМАТА В КИТАЕ И ПРОГНОЗЫ ТЕНДЕНЦИЙ

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На основе ежедневных данных 2255 метеостанций за 60 лет с 1961 по 2020 гг. получено годовое потенциальное суммарное испарение, которое использовалось для расчета индекса засухи и анализа данных об изменениях и прогнозах сухого и влажного климата Китая, а также анализа возможных тенденций изменения климата. Сухой и влажный климат ожидается в Китае в конце этого столетия. Результаты показывают, что климат Китая будет иметь общую тенденцию к высыханию. Засушливые районы в основном будут сосредоточены в центральном и восточном Китае, тогда как в западном регионе продолжит сохраняться влажный климат.

Ключевые слова: Китай; изменение климата; тенденции; засуха; влажность.

Introduction. In the context of global warming, the issue of warming and humidification in northwest China has been widely discussed. Due to limitations in data and other factors, some studies have limited time and spatial scales and cannot determine the spatial scope and time scale of this change. Therefore, it is necessary to use observational data over a longer period to explore the spatiotemporal characteristics of this change on a larger scale. This study is based on daily data from 2255 weather stations in the 60 years from

1961 to 2020, uses annual potential evapotranspiration to calculate the drought index, and uses the drought index to analyze China's dry and wet climate changes. It also uses the drought index to predict The data analyzed the possible changing trends of China's dry and wet climate at the end of this century.

Data and Methods. This paper uses data on air temperature, precipitation evaporation, from National Meteorological Information Center of China.

The drought index is calculated by annual potential evapotranspiration and annual precipitation. The calculation formula is as follows: $AI=E_o/P$. The annual average drought index was computed for 2255 sites across China.

The projections of arid conditions are presented for RCP4.5 and 8.5 scenario based on air temperature and precipitation changes over China for period of 2020-2100.

Results. It can be seen that the degree of drought in China showed a downward trend from 1961 to 2020, and the climate became increasingly humid (Figure 1).

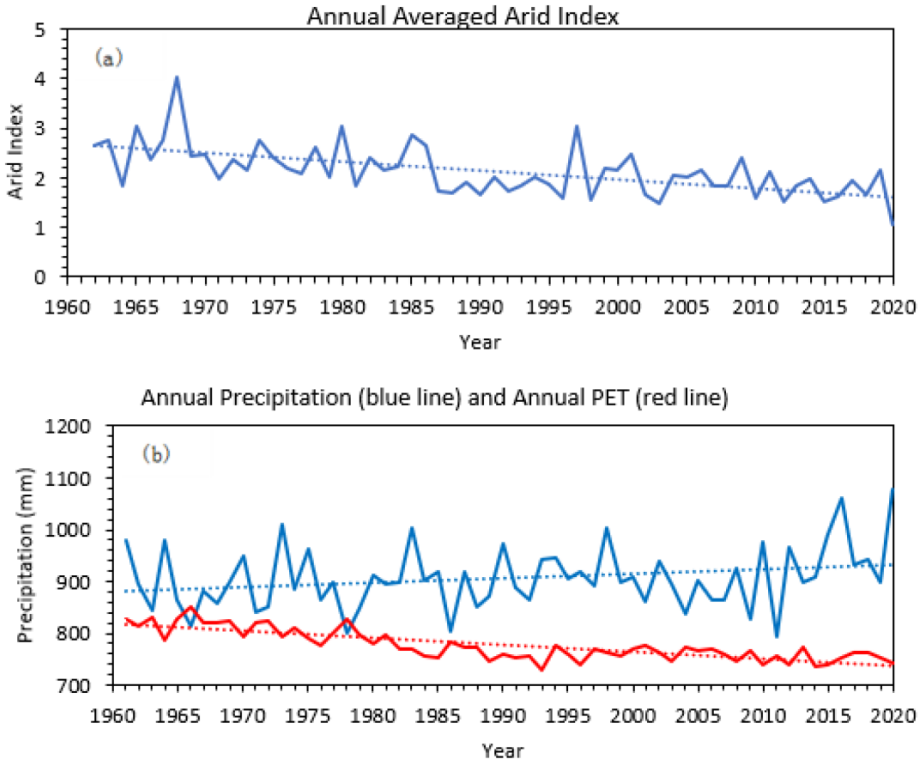

Fig.1. Changes in Annual Arid Index (top) and Annual Precipitation (bottom)
Source: https://data.cma.cn/site/subjectDetail/id/101.html

The linear trend of drought index in each period is a decrease of 0.17 every 10 years ($p<0.01$). The influencing factors of wet and dry climate change are different in different regions of China. The decrease in drought index (climate wetting) in the west, southeast, and northeast is the combined effect of increased

precipitation and decrease in potential evaporation (PET), while North China, northern central China, and northern southwest China are mainly caused by the decrease in PET.

Forecast of future wet and dry climate change trends in China. The future drought index shows an upward trend under both RCP4.5 and RCP8.5 scenarios, which means that China's climate will become drier in the future (Figure 2). The drought index increases by 0.008 per 10 years under the RCP4.5 scenario and by 0.01 per 10 years under the RCP8.5 scenario, indicating a trend towards drought under the high emissions scenario than under the medium concentration's scenario. Under the RCP4.5 scenario, the drought index is low in 2021-2040, high in 2040-2080, and shows a downward trend after 2080, indicating that the climate will be relatively humid in the last 20 years of this century. Under the RCP8.5 scenario, the rising trend of the national drought index is not obvious before 2060, but will increase significantly from 2060 to the end of this century.

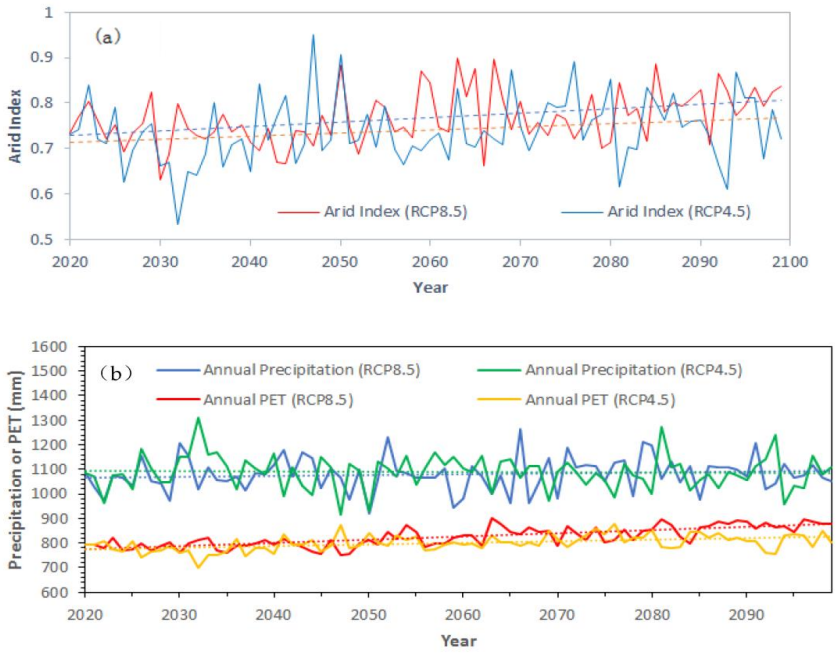

Fig. 2. The Projections of drought indexes over China for 2020-2100
Source: https://data.cma.cn/site/subjectDetail/id/101.html

Summary. In the past 60 years, China's climate has been on a humid trend, especially in the western region, and in the past 10 years, the climate has become wetter. Compared with the 1960s, the dry area has decreased by approximately 650,000 square kilometers. Analysis of GCM model prediction data shows that China's climate will have a general trend of drying out by the end of this century. Dry areas are mainly concentrated in central and eastern China, while the western region continues to maintain a wet trend.

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