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The impact of dam construction on the water cycle

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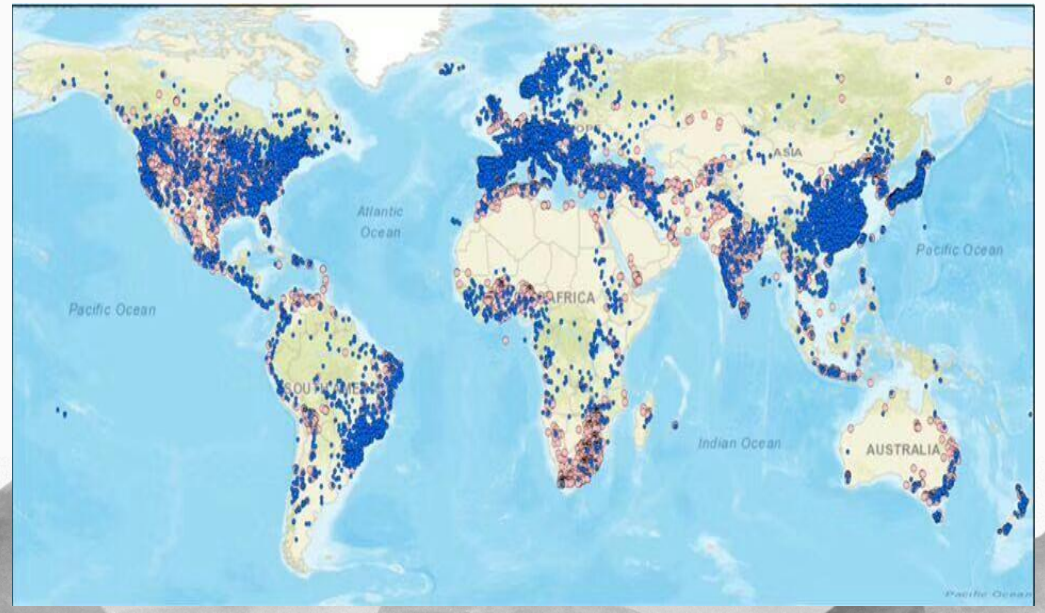
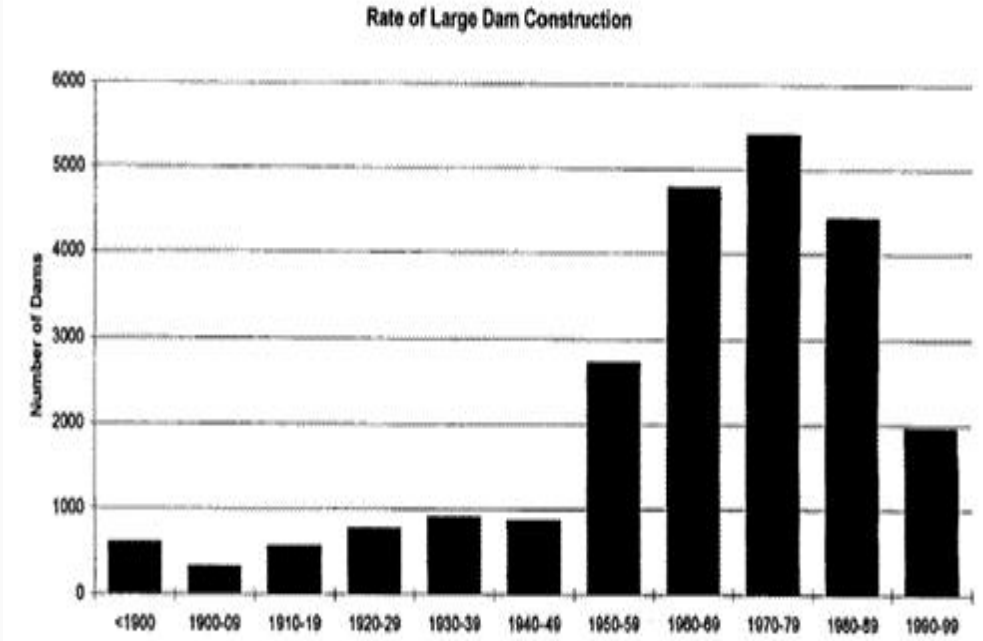
Dams are the cornerstone of river basin .

Dams are used to meet people's needs for water supply, irrigation, flood control, navigation, and energy.

Dams can also regulate the water cycle process and the water ecological environment.



The global distribution of dams



The emergence of dams in large numbers began during the industrial revolution.

In the middle of the last century, the number of dams began to increase significantly.

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What is Water Cycle ?

A process of continuous transformation of the water phase.

The water cycle means that water in different places on the earth changes its state to another place on the earth by solar radiation and gravity.

Links include evaporation, precipitation, condensation, infiltration, runoff, plant transpiration, and water vapor transportation.

The water cycle is divided into external cycle and internal cycle. The former refers to the water cycle that occurs between the ocean and the land. The latter refers to the water cycle that occurs inside the ocean or inside the land.

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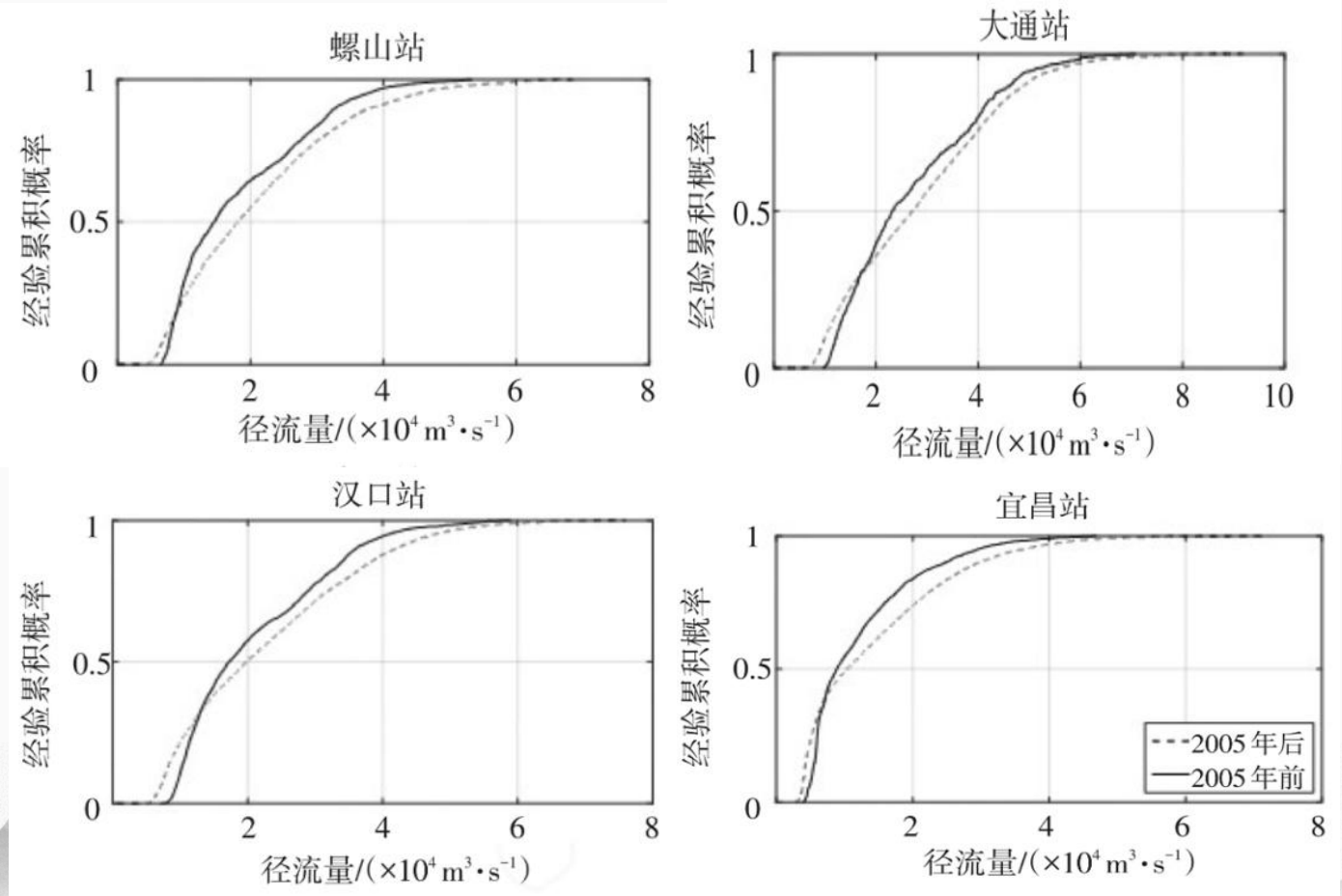
The impact of dam construction on the hydrological cycle—Runoff

The runoff in the basin has been tempered by accumulating abundance , replenishing dryness and reducing flood peaks.



The cumulative probability curve of flow experience shows that after the completion of the Three Gorges Dam, the frequency of low flow increases and the frequency of high flows decreases at each station.

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The impact of dam construction on the hydrological cycle—Evaporation

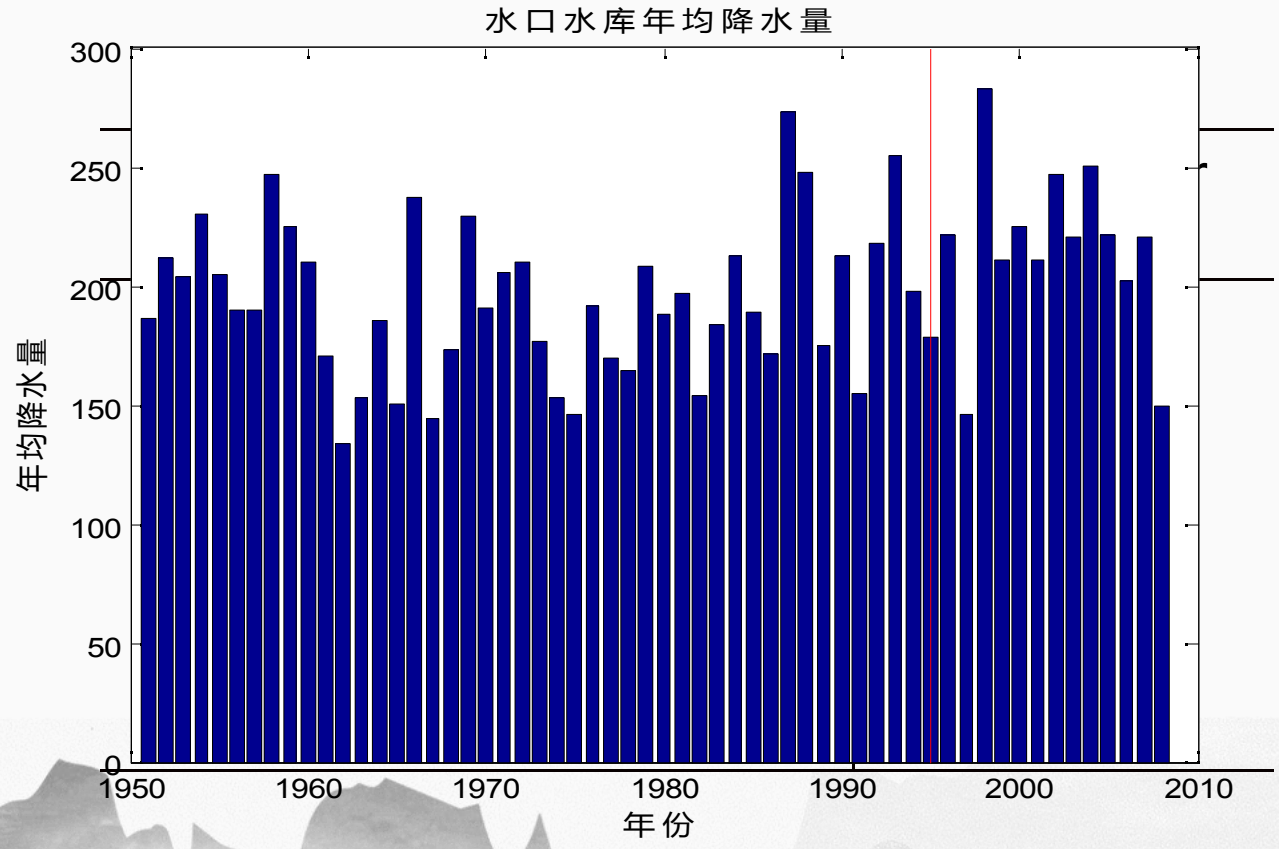
The construction and operation of the reservoir will inevitably increase the surface area of the water body, thereby increasing the total evaporation of the water body.

The average water area of the Three Gorges Dam before the construction of the dam was 502km^2, and the average water area after the construction of the dam was 639km^2. Water storage has increased the average water area of the upstream by about 1/5 in 13 years.

The impact of dam construction on the hydrological cycle—Precipitation

The dam has a certain promoting and regulating effect on the precipitation in the basin where it is located.

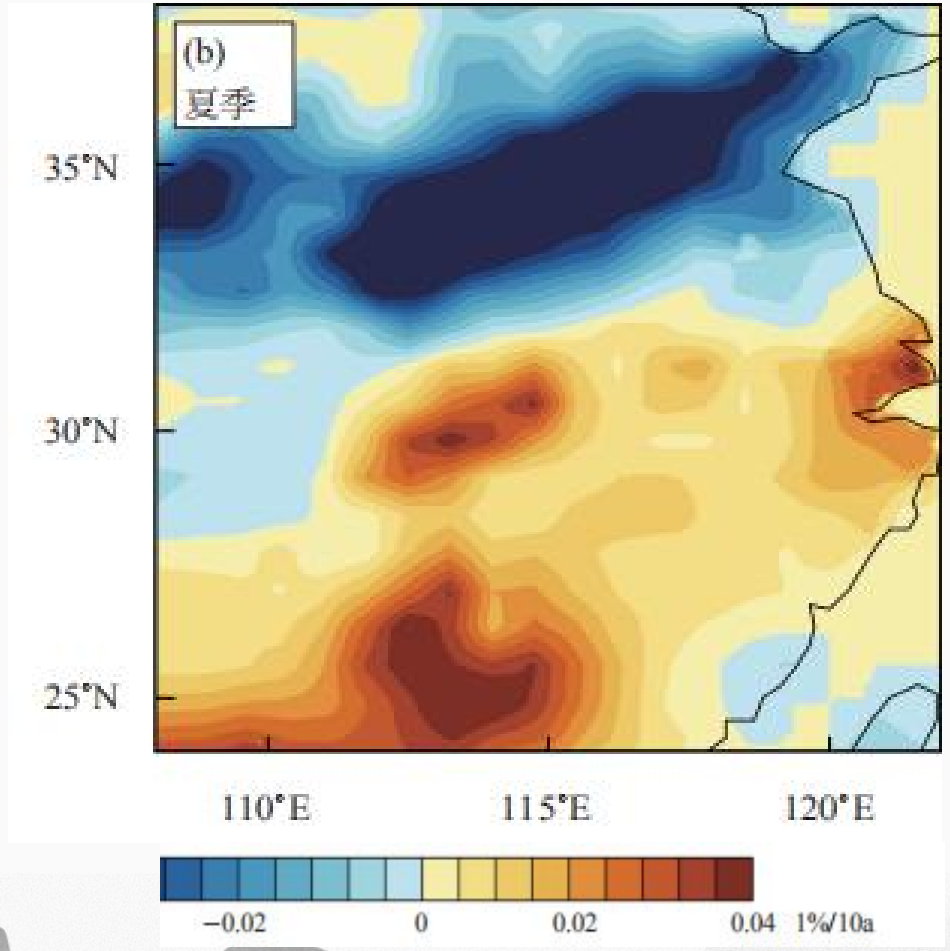
The Shuikou Reservoir in Fujian is a relatively dry area. After the construction of the dam, the local annual precipitation has increased by 11.67%. It can be seen from the figure that the annual precipitation before the construction fluctuates greatly, and the annual precipitation after the construction tends to be stable.



The impact of dam construction on the hydrological cycle—Infiltration

Infiltration: soil humidity

After the Three Gorges Dam was fully operational, the soil moisture in the middle and lower reaches of the Yangtze River showed a trend of wetness in the south and dryness in the north.



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The impact of dam construction on the hydrological cycle—

Plant Transpiration and Groundwater

Plant Transpiration: Vegetation Abundance

The construction of dams can directly or indirectly affect the growth of plants, thereby affecting plant transpiration.

Groundwater: water for irrigation

The construction of irrigation dams has increased the amount of irrigation water and increased the total amount of groundwater resources, which can greatly increase the utilization rate of water resources.

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Conclusion

Runoff : The most intuitive and main function of dam construction on runoff flow is regulation, which increases dry season runoff and reduces flood season runoff. The regulation and storage effect of dams weakens the volatility of flow during flood season and dry season, thus making the surface The amplitude and frequency of runoff flow changes tend to be flat. However, in addition to dam construction, there are many factors that affect the surface runoff flow. Therefore, in actual situations, multiple demonstrations are needed.

Evaporation : The number of dams in the world has been increasing continuously, and the water storage function of dams has increased the surface area of land water bodies, thereby increasing global land evaporation.

Precipitation : The completion of the dam has led to an increase in precipitation in the reservoir area and a decrease in precipitation in the non-reservoir area. The precipitation is affected by many factors, and it is impossible to quantify the overall change in precipitation affected by the dam.

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Conclusion

The construction of the dam increases the rainfall, soil moisture, and groundwater level in the reservoir area, which increases the amount of water resources in the reservoir area. The dam has affected the redistribution of water resources, breaking the balance of the global water cycle, and making the "reservoir area wetter. The non-reservoir area is drier."

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Thanks!