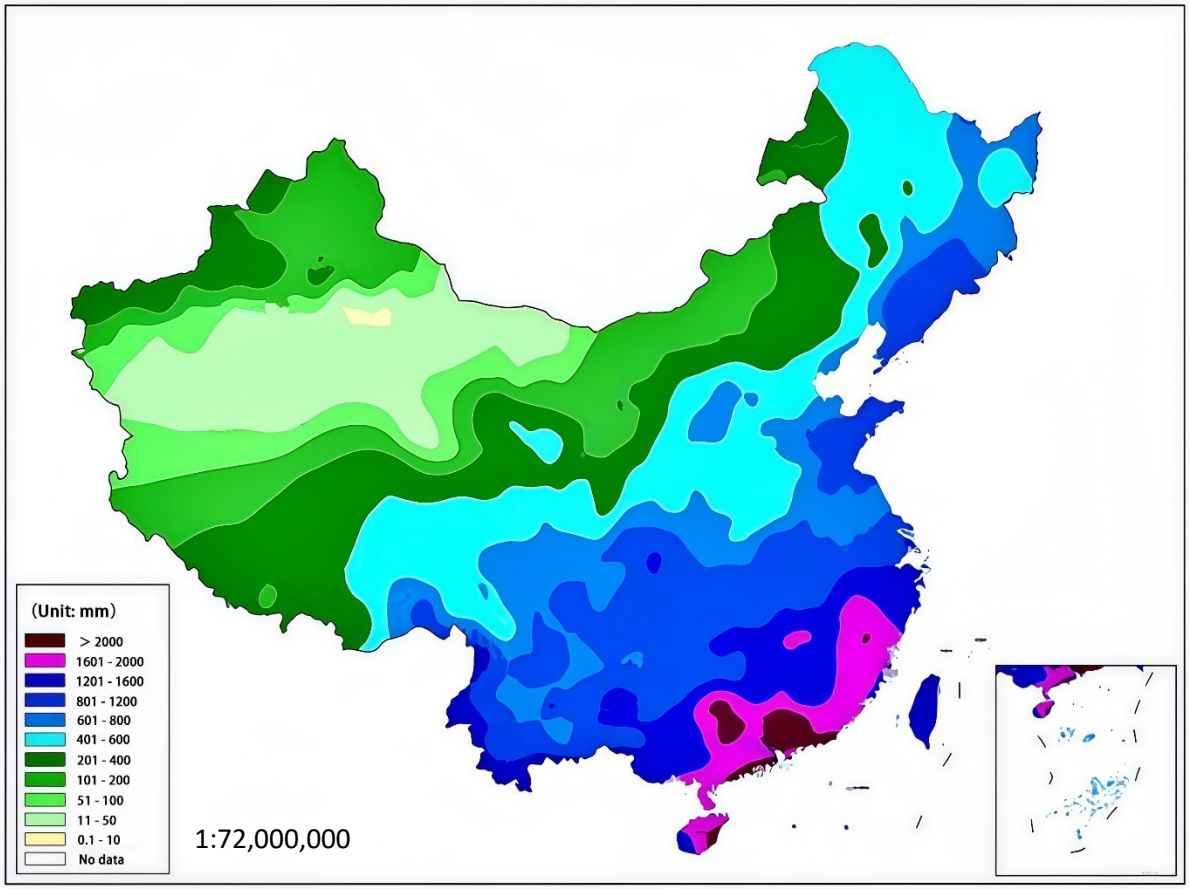
Distribution Patterns of Precipitation in Our Country

I. Overview

Precipitation in our country exhibits remarkable spatial and temporal variations, shaped by factors such as distance from the ocean, atmospheric circulation, and topography. The spatial distribution is characterised by a gradual decrease in annual rainfall from the southeastern coastal areas to the northwestern inland regions, with isohyets generally following a northeast–southwest orientation (Figure 1). This pattern divides the country into two major zones: the humid region, which receives abundant rainfall and supports agriculture, and the arid region, where precipitation is scarce and primarily supports pastoral activities. Additionally, temporal changes in precipitation are influenced by seasonal and interannual variability, with significant differences between wet and dry seasons.

Figure 1: Distribution of annual precipitation in our country



Reference: 2020 年中國氣候公報

Map reference:中華人民共和國自然資源部審圖號 GS(2023)2767 號 (Date of reference: 16 February 2025)

II. Spatial distribution of precipitation in our country

The annual precipitation in our country is influenced by the distance from the ocean, gradually decreasing from the southeastern coastal areas to the northwestern inland regions (Figure 1). Isohyets (lines of equal rainfall) generally follow a northeast–southwest orientation. The 400 mm isohyet begins on the western side of the Daxing'an Mountains in the northeast, passing through eastern Nei Mongol, western Jilin, northern Hebei, northern Shanxi, northern Shaanxi, southern Ningxia, southeastern Gansu, southern Qinghai, and southeastern Xizang, before reaching the southern slopes of the Himalayas. This line divides our country into two major zones: the humid region and the arid region (Figure 1) (中華人民共和國年鑒, 2023).

Figure 2:
Humid Region
(Yangjiang, Guangdong)

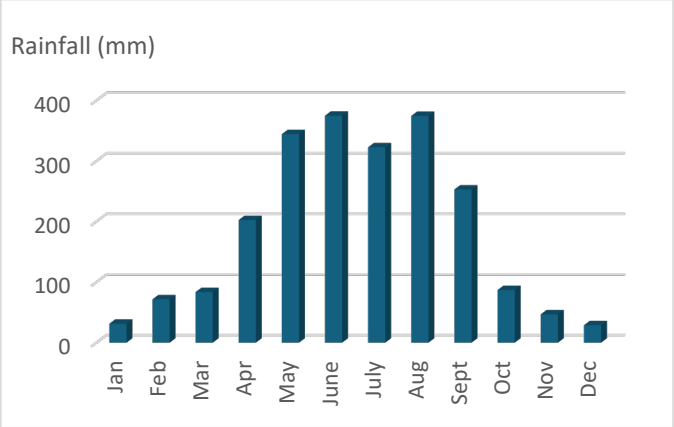
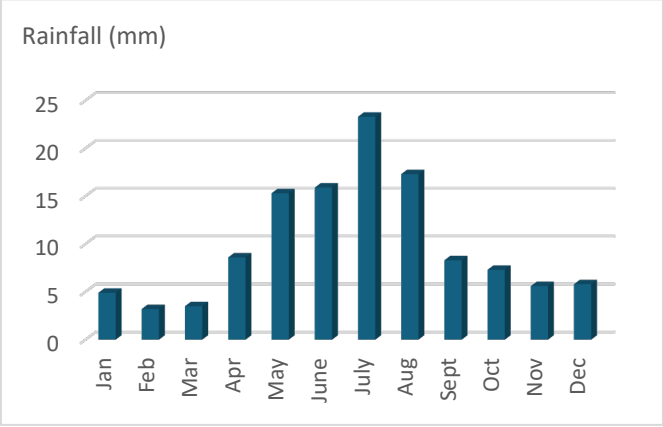


Figure 3:
Arid Region
(Karamay, Xinjiang Uygur Autonomous Region



Source: China Meteorological Data Service Centre, https://data.cma.cn/data/weatherBk.html

- Humid region
  - The humid region lies to the east and south of the 400 mm isohyet, where rainfall is relatively abundant, making it our country's primary agricultural area. In the northeast, most areas receive 400-600 mm of annual precipitation, with over 600 mm in the Xiaoxing'an Mountains and more than 800mm in the southeastern part of the Changbai Mountains. In the northern part of our country, including northern Hebei and the Fen and Wei River Valleys, annual precipitation is mostly 400-600 mm. South of the Huang He, rainfall generally exceeds 600-800 mm annually. The Qinling Mountains and Huai River Basin receive 800-1000 mm of precipitation each year. In the Sichuan Basin and the middle and lower reaches of the Chang Jiang, annual rainfall is around 1200 mm (中華人民共和國年鑒, 2023).
  - In the Yunnan-Guizhou Plateau, precipitation varies significantly due to topography. River valleys typically receive 800-1000 mm of annual precipitation, while mountainous areas generally receive 1200-1600 mm, and the southern plateau can exceed 1600 mm annually. Southeastern and southern coastal and hilly regions have annual precipitation ranging from 1600-2000 mm. Some areas in Guangdong, Guangxi, and Hainan receive more than 2000 mm, with specific locations such as Yangjiang in Guangdong (Figure 2), Dongxing in Guangxi, and

Qiongzhong in Hainan exceeding 2400 mm. These are the areas with the highest annual rainfall in the Mainland (中華人民共和國年鑒, 2023).

- Arid region
  - The arid region lies to the west of the 400mm isohyet, where rainfall is scarce, except for some mountainous areas with slightly higher precipitation. This region is primarily used for pastoral activities. Eastern Inner Mongolian Plateau, the Hetao region, central Gansu, central Qinghai, and the western sections of the Tanglha Mountains, Gangdise Mountains, and central Himalayas generally receive 200-400 mm annually. The Yarlung Zangbo Grand Canyon region is an exception, with rainfall exceeding 600 mm. In the Qilian Mountains and parts of the Tianshan Mountains, precipitation is around 400 mm (中華人民共和國年鑒, 2023).
  - In Xinjiang, areas north of the Tianshan Mountains receive 100-300 mm of annual rainfall (Figure 3), while areas to the south, including the Kunlun Mountains, generally receive less than 100 mm. The central regions of the Tarim Basin, Turpan Basin, and Qaidam Basin receive less than 50 mm annually, making them some of the driest places in the country (中華人民共和國年鑒, 2023).

- Windward slopes

  Topography significantly influences the distribution of precipitation. High-rainfall centres are often located on the windward slopes of mountains and hills at some distance from the ocean. Examples include the Wuyi Mountains (at the junction of Fujian, Zhejiang, and Jiangxi provinces), the southern slopes of the Yunkaidashan Mountains in Guangdong, the southeastern slopes of the Shiwandashan Mountains in Guangxi, the eastern slopes of the Wuzhishan Mountains in Hainan, and the eastern slopes of the Central Mountain Range. These areas are among the most significant high-rainfall zones in our country (中華人民共和國年鑒, 2023).

III. Temporal variations in precipitation

- The temporal variations in precipitation include seasonal changes and interannual variability. Seasonal changes refer to the distribution of precipitation within a year. The seasonal pattern of precipitation in our country is characterised by more rainfall in summer and autumn and less rainfall in winter and spring across most areas. In the south, the rainy season begins earlier, ends later, and lasts longer, typically spanning from May to October. In contrast, the rainy season in the north starts later, ends earlier, and is shorter, usually concentrating in July and August. Interannual variability reflects the stability of precipitation in a given location and is one of the key indicators of drought and flood risks in a region (中華人民共和國年鑒, 2023).

- In general, areas with higher precipitation tend to have smaller relative variability. For most regions, the relative variability of annual precipitation ranges between 10% and 30%. However, a notable high-variability centre is located in central and southern Hebei, where relative variability reaches 30% to 40%, making it the area with the greatest precipitation variability in the eastern monsoon region (中華人民共和國年鑒, 2023).

- In the arid northwest, where precipitation is low, the relative variability of annual precipitation is significantly higher, typically ranging from 30% to 70%. In some areas of the Tarim Basin, where rainfall is extremely scarce, the relative variability of annual precipitation exceeds 70%, making it the region with the highest precipitation variability in our country (中華人民共和國年鑒, 2023).

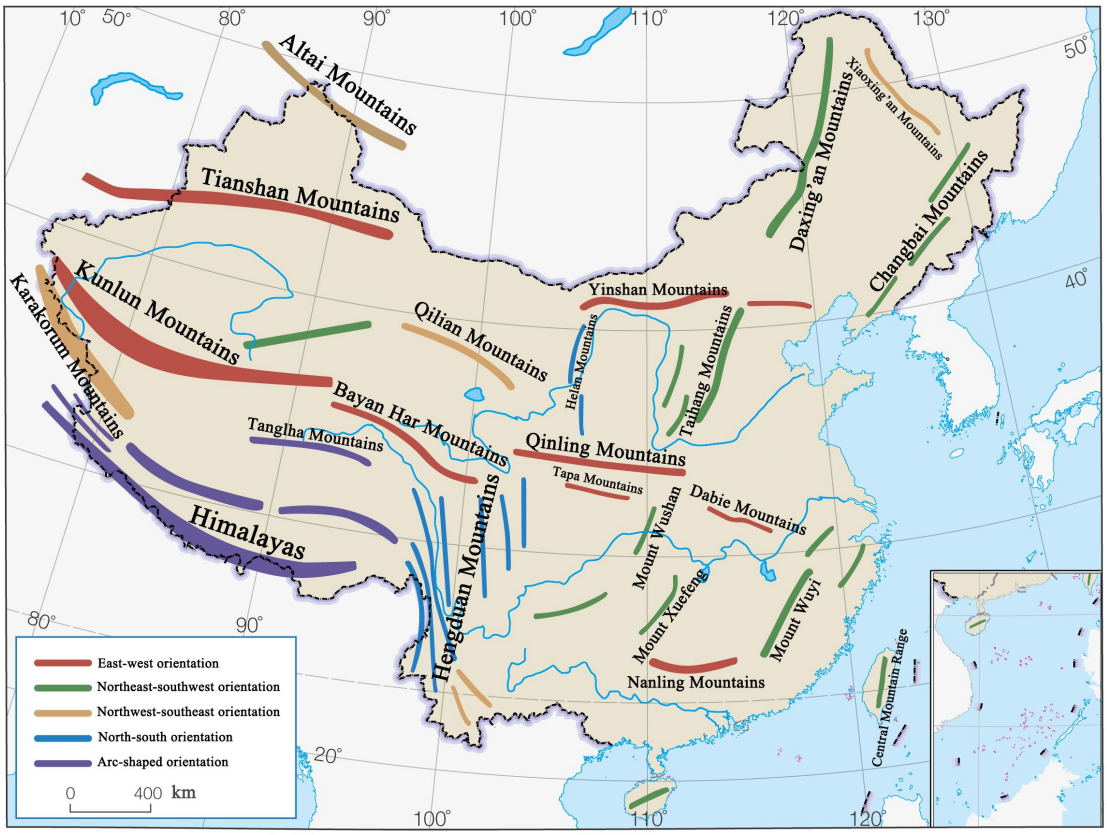
IV. Major factors controlling the distribution pattern of precipitation in our country

- Land-sea distribution – Influence of monsoon winds
  - The amount of water vapour in the air differs significantly between land and sea. Generally, areas near or over the ocean tend to receive more precipitation.
  - Our country is located in the eastern part of the Eurasian continent and on the western edge of the Pacific Ocean. The distinct differences in thermal properties between land and sea result in a pronounced monsoon climate, which greatly influences the precipitation in the monsoon regions of our country (中國科學院地理科學與資源研究所, 2007a).
  - There are three sources of summer monsoons affecting our country: The southwest monsoon originating from the southern Indian Ocean, the southeasterly trade winds originating from northern Australia, and the southeast monsoon and southern monsoon, which originate from the subtropical high-pressure system over the North Pacific and primarily affect the eastern part of our country (中國科學院地理科學與資源研究所, 2007a).
  - These monsoons extend into the northwest of northeast China and northern Nei Mongol, forming the northern boundary of the summer monsoon in our country. When the warm, moist monsoon air masses meet cold air from the northwest, they create a rain belt that brings abundant precipitation (中國科學院地理科學與資源研究所, 2007a).
  - Winter monsoon is originated from the Asian continent. It is mainly northern monsoon which is cold and dry. As a result, it brings little precipitation to the Mainland and the weather is cold and dry in winter. The condition is more distinctive in the northern part of China.

- Atmospheric circulation
  - Atmospheric circulation refers to the global and regional patterns of air movement that transport heat and moisture between regions. This phenomenon plays a key role in distributing precipitation across our country. For example, during summer, warm and moist airflows from the Pacific and Indian Oceans transport large amounts of water vapour to eastern and southwestern parts of our country, causing significant rainfall.
  - The main characteristics of precipitation in our country are as follows: Distinct wet and dry seasons with clear seasonal differences; regularity in the timing of the rainy season, with predictable start and end dates; more rainfall in coastal eastern regions compared to the arid western regions, and the south receives more rain than the north (中國科學院地理科學與資源研究所, 2007a).

- Topography and terrain
  - Many east-west mountain ranges in our country (Figure 4) act as barriers to the exchange of cold and warm air masses between the north and south, often forming boundaries between different climatic zones. Mountains also alter precipitation patterns by obstructing local airflow, influencing the distribution of rainfall (中國科學院地理科學與資源研究所, 2007b).

Figure 4: Major Mountain Ranges in Our Country



Map reference:中華人民共和國自然資源部審圖號 GS(2023)2766 號 (Date of reference: 15 February 2025)

  - Our country is a mountainous country, and its complex terrain has a significant impact on its climate and precipitation patterns (中國科學院地理科學與資源研究所, 2007b). Generally, within a certain range, precipitation increases with elevation. Additionally, the windward slopes of mountains tend to receive more rain and are more humid, while the leeward slopes, which is known as rain-shadow, are drier and receive less rainfall.

V. Conclusion

In conclusion, the distribution of precipitation in our country is influenced by a complex interplay of geographic, atmospheric, and topographic factors. The humid region, with its abundant rainfall, plays a vital role in supporting agricultural activities, while the arid region is more suitable for pastoral farming due to its limited precipitation. Seasonal and interannual variability further highlight the dynamic nature of precipitation, leading to climatic hazards such as flood and drought.

Understanding these patterns and their underlying causes is crucial for managing water resources and mitigating climate-related challenges across the country.

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