



WMO Third Pole
RCC Network



Third Pole Climate Forum

2nd Third Pole Climate Forum Consensus Statement (TPCF-2)

Online, 28-29 November, 2024

State of the Climate for June to October 2024 and
the Seasonal Outlook for December 2024 to February 2025

Background and Contributing Institutions

The Third Pole Regional Climate Centre Network (TPRCC-Network), focusing on the unique climate and cryosphere challenges of the Third Pole (TP) region, was established to deliver tailored regional climate services. The Network consists of three Nodes and their consortium members (list attached as Annex-I) distributed geographically and functionally: the Northern Node (led by China), the Southern Node (led by India), and the Western Node (led by Pakistan), with China taking the overall coordinating role. Broad collaborations have been established with GCW, GEWEX, ICIMOD, MRI, TPE, and UNESCAP to enhance the Network's effectiveness. The TPRCC-Network plays a pivotal role in promoting regional climate cooperation, supporting stakeholders in climate adaptation, and aiding decision-making across the region. Products and services are developed and disseminated through the TPRCC-Network web portal (<http://www.rccra2.org/tp-rcc/>), ensuring seamless access to climate information. Regular updates, seasonal climate bulletins, and consensus statements published during biannual climate forums, maintain a steady flow of information and engagement.

The latest Consensus Statement integrates the State of the Climate for June to October 2024 and the Seasonal Outlook for December 2024 to February 2025. Developed using regional expertise, it synthesizes observational data, historical trends, current climate conditions, and seasonal forecasts. The Statement provides a comprehensive overview of surface air temperature (SAT), precipitation, snow cover, and high-impact events observed during the preceding season while presenting an outlook for SAT and precipitation for the upcoming season. To facilitate the understanding of this Consensus Statement (CS), the developing details are provided in Annex-II.

This CS was produced and mutually agreed upon during the Second Third Pole Climate Forum (TPCF-2), which was held virtually on 28–29 November 2024 and hosted by the Pakistan Meteorological Department (PMD). The content and graphics were prepared collaboratively by the China Meteorological Administration (CMA), India Meteorological Department (IMD) and PMD with support from the Technical Team on Long-Range Forecast (TT-LRF) in developing objective methods for long-range forecast (LRF) products. Guidance from WMO and contributions from all consortium members and partners are gratefully acknowledged.

Highlights

- From June to September (JJAS) 2024, most of the Third Pole (TP) region experienced above-normal Surface Air Temperature (SAT), with temperatures exceeding the normal by 1-4 °C in the Third Pole core region (TPCR¹). During this period, precipitation was above normal across most of the TP region, with significantly wetter conditions observed in the southwestern areas.
- The snow cover extent was near normal during the summer (JJA) of 2024. However, it was slightly below normal (by -7.2%) in October for the TP region as a whole.
- Following the onset of South Asia summer monsoon, heavy rainfall and severe flooding impacted several countries within the TP region. Flash flood caused by a glacial lake outburst in Nepal resulted in widespread displacement and damage.
- SAT during DJF 2024-25 is expected to remain above normal across most parts of the TP region, with the highest anomalies anticipated over the southern part of TPCR.
- Below-normal precipitation is expected over the southwestern and southern parts of the TP region. Normal to above-normal precipitation is predicted in the northern and eastern parts of the TP region, particularly over areas extending towards Central Asia.

¹ TPCR refers to the region with altitude above 2000 m within the TPRCC-Network domain, i.e. the region within black contour in Figures 1-6 in the Consensus Statement.

Climate Summary for June – October 2024

Temperature

During the period from June to September (JJAS) 2024, most of the TP region witnessed above normal (with respect to 1991-2020) SAT, except for certain parts in the southwestern and northwestern regions. The TPCR was 1-4 °C warmer than the normal, with positive SAT anomalies ranging from 2 to 4 °C in parts of the western TPCR (Figure 1).

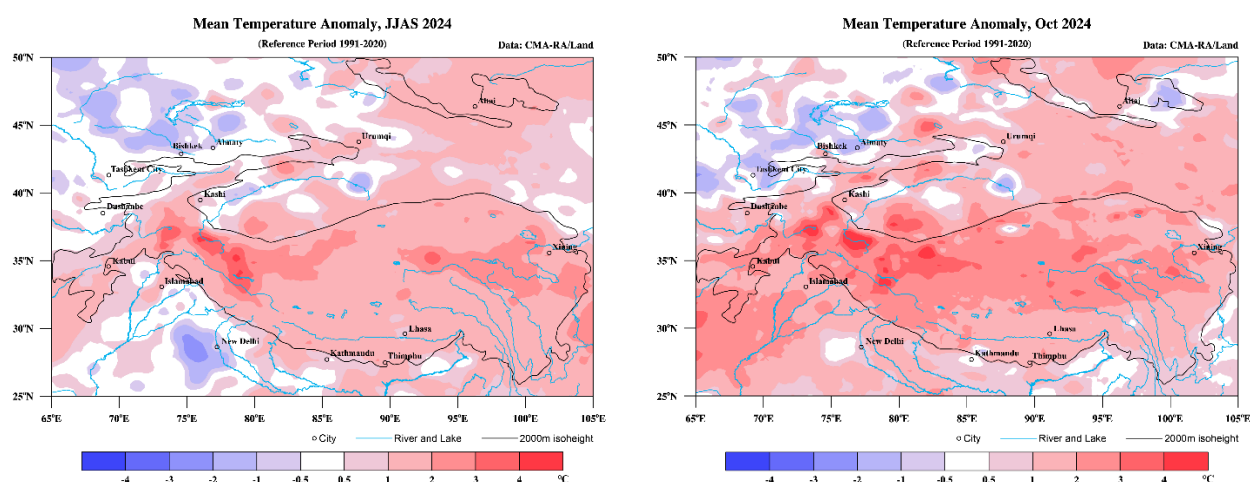


Figure 1 Mean surface air temperature anomalies (relative to 1991-2020) for JJAS 2024(left) and October 2024(right). Data source: CMA-RA/Land

In October, the spatial pattern of SAT anomalies across the TP region was basically consistent with that for JJAS. An overall above-normal pattern prevailed, with significantly higher than normal SAT in the western and central TPCR.

Precipitation

For JJAS 2024, precipitation was above normal across most of the TP region, except for the northwestern edge, parts of the central to the northern areas, and some regions in the southeast. The southwestern and northeastern areas experienced significantly wetter conditions, with precipitation surpassing the normal by 100 to 200%, and in certain localized areas, even more than 200% (Figure 2). In contrast, the northern and northwestern regions generally exhibited negative anomalies ranging from 20% to 50%, with some areas exceeding 50%.

In October, the pattern of precipitation anomalies was nearly the opposite of that observed during JJAS. The most significant negative precipitation anomalies were recorded in the central and southwestern parts of the TP region, with some areas experiencing reductions of exceeding 80%. Conversely, precipitation levels were above normal in other regions, with particularly notable positive anomalies occurring in parts of the southwestern and northeastern TP region, where the increases surpassed 200%.

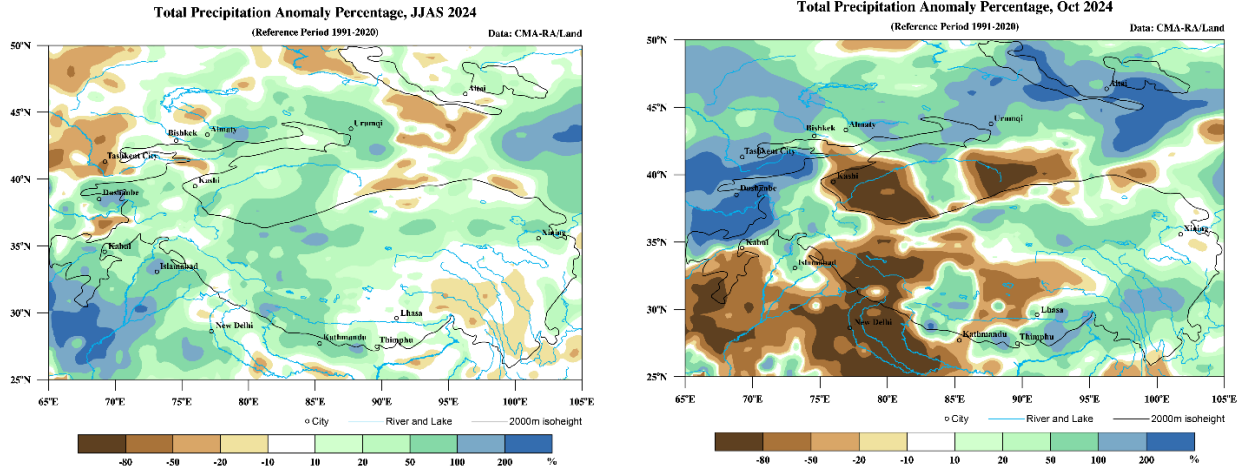


Figure 2 Total precipitation anomalies by percentage (relative to 1991-2020) for JJAS 2024 (left) and October 2024 (right). Data source: CMA-RA/Land

Snow Cover

Over the past two decades, there has been no significant linear trend for summer snow cover extent (SCE) over the TP region as a whole, although notable inter-annual fluctuations have been observed. For the summer (JJA) of 2024, the SCE amounted $122.6 \times 10^3 \text{ km}^2$, which is close to the normal ($123.1 \times 10^3 \text{ km}^2$). Spatially, snow cover was primarily concentrated in the western, northern, and southern edges of TPCR, with the larger values of the number of snow cover days (NSCD) in the western TPCR. Compared to the summer average from 2005 to 2020, the NSCD in the summer of 2024 was predominantly below normal across TPCR, with anomalies ranging from -5 to -20 days in the southern part. In vast areas spanning from the western to central regions, the NSCD was below to near normal (Figure 3).

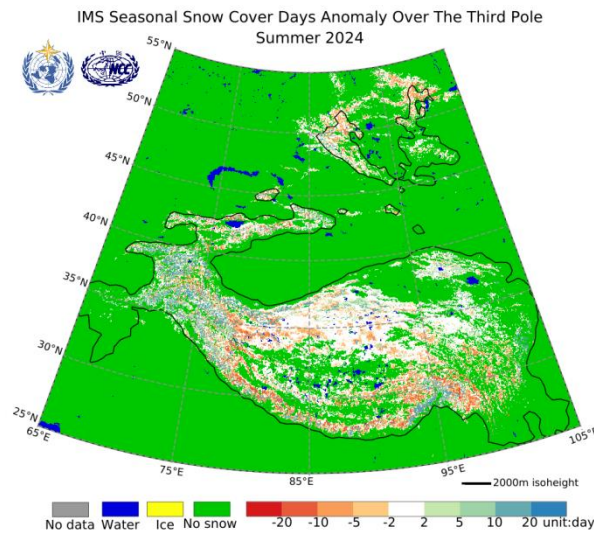


Figure 3 Summer (JJA 2024) anomalies of the number of snow cover days (relative to 2005-2020). Data source: IMS/NSIDC

For September and October 2024, the regional mean SCE were estimated as $110.5 \times 10^3 \text{ km}^2$ and $329.6 \times 10^3 \text{ km}^2$ respectively, and were marginally less than normal, with negative anomalies of $3.2 \times 10^3 \text{ km}^2$ and $23.6 \times 10^3 \text{ km}^2$. In September, the areas with fewer NSCD were primarily located in the central part of TPCR. While in October, the negative anomalies not only increased in amplitude,

but also extended into the northwestern part of the TP region. However, the NSCD in parts of the northeastern region and the western TPCR remained above normal (Figure 4).

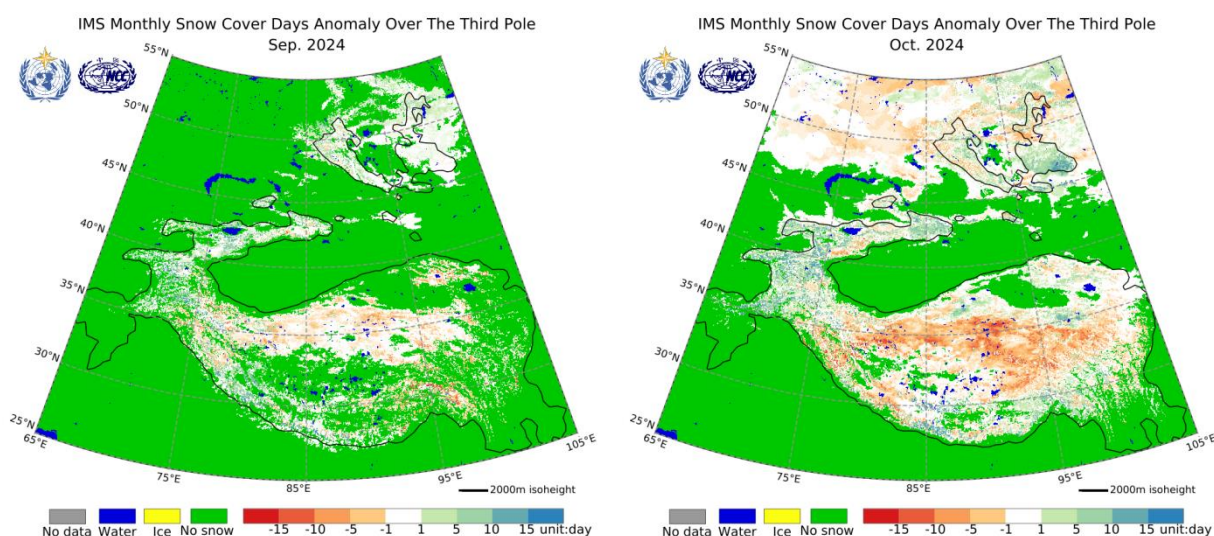


Figure 4 Monthly anomalies of the number of snow cover days in September 2024 (left) and October 2024 (right) (relative to 2005-2020). Data source: IMS/NSIDC

High-impact Climate Events

Heavy Rainfall

Following the onset of the South Asia summer monsoon, several countries within the TP region experienced severe weather and climate hazards associated with heavy rainfall.

From July 9 to 10, northwestern India, particularly Uttar Pradesh, suffered severe impacts from heavy rainfall, thunderstorms and lightning, resulting in considerable casualties and damage. By 15 July, the National Coalition of Humanitarian, Development and Resilience Actors in India reported 54 fatalities, with approximately 1.8 million affected individuals in 16 districts. From July 31 to August 1, heavy rainfall and strong winds impacted three districts in northern India leading to severe weather-related incidents and triggering flash floods that resulted in casualties and damage.

The monsoon season has also resulted in prolonged severe weather across several provinces in Pakistan, leading to casualties and damage from heavy rainfall, strong winds, and thunderstorms. As of early July, Pakistan's National Disaster Management Authority (NDMA) reported 337 fatalities and 604 injuries nationwide.

In Nepal, on July 8, 2024, an unprecedented rainfall event occurred in the southwestern part of Sudurpaschim Province, with 24-hour accumulated precipitation reaching 624.0 mm at Dodhara station, 573.6 mm at Hanuman Nagar station, and 555.8 mm at Sundarpur station. According to the Ministry of Home Affairs, by July 30, monsoon-related disasters, including floods and landslides, had resulted in 143 fatalities and 47 individuals reported missing. Further extreme rainfall from September 26 to 29 triggered additional flooding and landslides, which affected 71 municipalities across 20 districts. During this event, 25 stations set new records for 24-hour extreme precipitation. By October 16, more than 81,000 people had been affected, with 250 confirmed deaths, 18 individuals missing, and 178 injuries reported.

Meanwhile, in Mongolia, between June and October 2024, 70 heavy rain-induced flood events were reported. These floods caused significant losses, including the destruction of buildings and homes and the loss of livestock.

Glacial Lake Outburst Flood

On August 16, a glacial lake outburst in the Koshi region, the easternmost province of Nepal, triggered flash floods and mudslides that resulted in widespread displacement and damage. By August 19, reports indicated that 135 individuals had been displaced. The disaster led to destruction of houses, schools, and health facilities in the Thame village area.

Extreme Hydrological Event

During June to September 2024, increases in water levels were observed in the mountainous and foothill areas of East Kazakhstan and the Almaty region, with some instances exceeding dangerous levels. On August 18, the water level of the Kishi Almaty River in Almaty surpassed the critical threshold of 290 cm, reaching 295 cm, due to the heavy rainfall occurring in the watershed.

Seasonal outlook for DJF 2024-25

Temperature

The prediction for SAT across the TP region during DJF 2024-25 indicates a strong warming tendency. Above-normal temperatures are likely to dominate most parts of the region, particularly in the southern and eastern parts, including areas of the Himalayas and the southern Tibetan Plateau, which is consistent with the signal from the probabilistic temperature forecast (Figure 5).

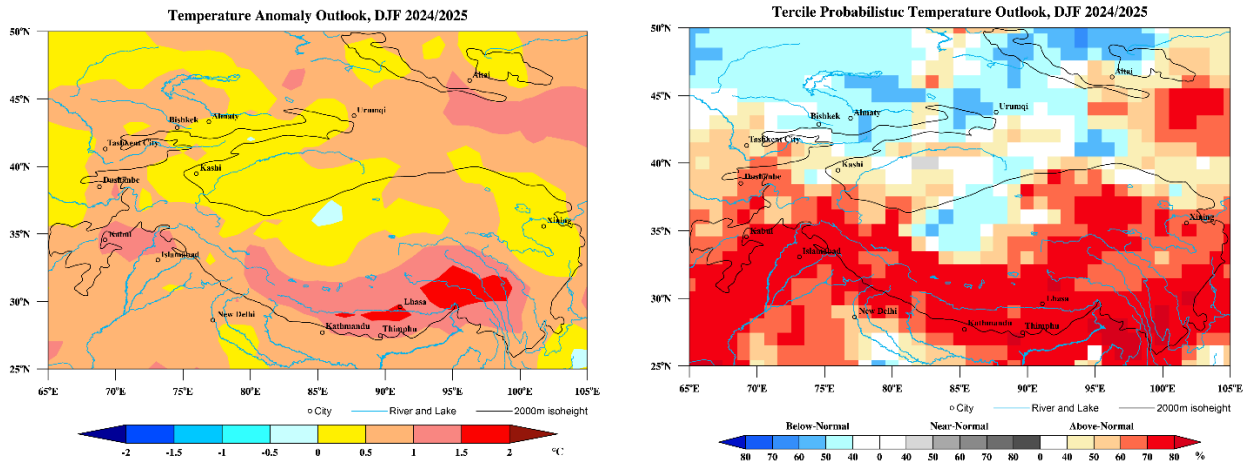


Figure 5 Surface Air Temperature anomaly and probabilistic outlook, MME, DJF 2024-25 for TP region

Although, the western and northern parts of the TP region, including the Karakoram and parts of Central Asia, are predicted to experience near to above-normal temperatures, certain areas within these parts show a likelihood of below to near-normal temperatures (Figure 5).

Precipitation

The precipitation outlook for DJF 2024-25 shows significant spatial variability over the TP region. Below-normal precipitation is expected over the southwestern and southern parts of the TP region, including the Karakoram and adjacent areas, as highlighted by both the tercile probabilistic and deterministic forecasts (Figure 6). Particularly, the southwestern TP region and parts of the Himalayas exhibit a clear signal of drier-than-normal conditions.

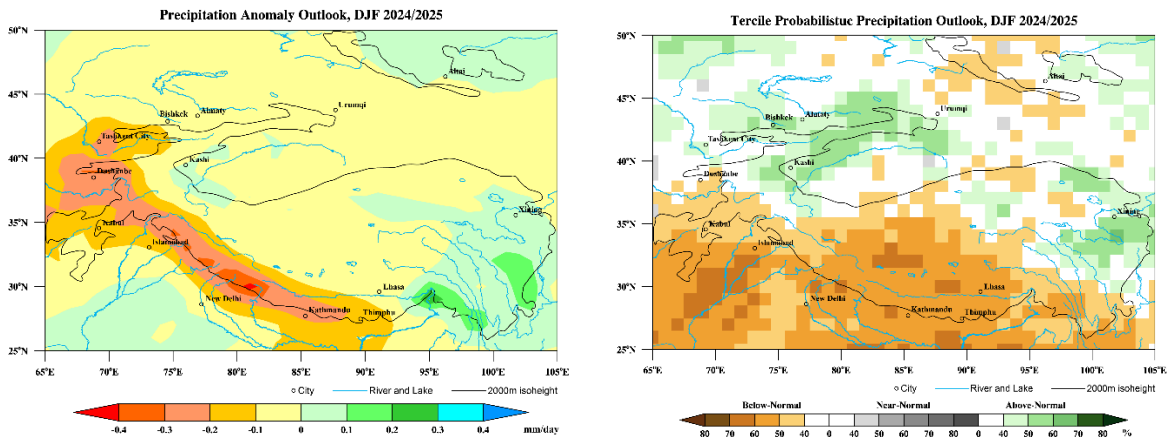


Figure 6 Precipitation anomaly and Probabilistic outlook, MME, DJF 2024-25 for TP region

Normal to above-normal precipitation is predicted in the northern and eastern parts of the TP region, particularly over areas extending towards Central Asia. This aligns with the probabilistic forecast, which suggests a tendency for slightly wetter conditions in these areas.

Meanwhile, the central parts of the TP region are likely to experience near-normal precipitation, reflecting a transitional zone between the wetter conditions to the north and drier conditions to the south of Karakoram Ranges.

Annex-I

Third Pole Regional Climate Centre Network Overview

A WMO Regional Climate Centre (RCC) Network comprises a group of specialized centers collectively fulfilling all mandatory functions required of an RCC. Each center in the network is referred to as a "Node," with specific responsibilities aligned to its expertise. The details for the Third Pole Regional Climate Centre Network are as follows:

The Northern Node

Function: Climate Monitoring

Lead: National Climate Centre, China Meteorological Administration (NCC/CMA), China

Consortium members: Bhutan, Mongolia, Nepal, Pakistan

The Southern Node

Function: Operational Data Services

Lead: India Meteorological Department (IMD), India

Consortium members: Bangladesh, Bhutan, Myanmar, Nepal

The Western Node

Function: Long-Range Forecasting

Lead: Pakistan Meteorological Department (PMD), Pakistan

Consortium members: Afghanistan, China, Tajikistan, Uzbekistan

Annex-II

Understanding the Consensus Statement

The probabilistic and deterministic outlooks of air temperature and precipitation for the TP region are based on the CMME prediction system, which consists of nine climate models (six domestic models and three international imported models) with a total of 207 ensemble members. The CMME system provides monthly and seasonal forecasts for air temperature, precipitation, and sea surface temperature for the next six months.

In terms of model skill (i.e., the ability of a climate model to predict seasonal climate), a multi-model ensemble (MME) approach, a well-recognized methodology for providing the most reliable objective forecasts, was used to merge information from all individual models using a simple composite method (SCM). This provides a forecast with higher confidence in regions where different model outputs are consistent and lower confidence where models show less agreement. For each individual model, the ensemble mean of anomaly forecasts was calculated by using their own climatology (reference period 1991 – 2020) obtained from the hindcast. MME was then calculated based on ensemble mean of anomaly forecasts from each individual model using SCM.

Snow cover products were produced using 4-km daily data of the IMS released by the NSIDC (<https://nsidc.org/home>). The number of snow cover days within a specific period was determined by counting the days with recorded snow cover. To calculate the SCE for each grid cell in a certain period, the following two-step methodology was employed: (1) calculate the snow cover fraction for each grid cell by dividing the number of days with snow cover by the total number of days in the period, and (2) multiply the snow cover fraction by grid cell area (16 km²) to obtain SCE for individual grid cells. The regional SCE for the period was determined by summing the SCEs of all grid cells within the domain of the TPRCC-Network.

Acronyms

1. BCC – Beijing Climate Centre
2. CMA – China Meteorological Administration
3. CMME - China Multi-Model Ensemble
4. DJF – December, January, February
5. GCW – Global Cryosphere Watch
6. GEWEX – Global Energy and Water EXchanges
7. ICIMOD – International Centre for Integrated Mountain Development
8. IMD – India Meteorological Department
9. IMS – Interactive Multisensor Snow and Ice Mapping System
10. JJAS – June, July, August, September
11. LRF – Long-Range Forecast
12. MME – Multi-Model Ensemble
13. MRI – Mountain Research Initiative
14. NSCD – Number of Snow Cover Days
15. NSIDC – National Snow and Ice Data Center
16. PMD – Pakistan Meteorological Department
17. SAT – Surface Air Temperature
18. SCE – Snow Cover Extent
19. SCM – Simple Composite Method
20. TP – Third Pole
21. TPCR – Third Pole Core Region
22. TPE – Third Pole Environment Programme
23. TPRCC-Network - Third Pole Regional Climate Centre Network
24. TT-LRF – Technical Team on Long-Range Forecast
25. UNESCAP – United Nations Economic and Social Commission for Asia and the Pacific
26. WMO – World Meteorological Organization