Third Pole Climate Forum

Climate review for JJAS 2025

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NCC / CMA

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Outline

1 The CMA Reanalysis Version 1.5

2 State of the climate in TPRCC

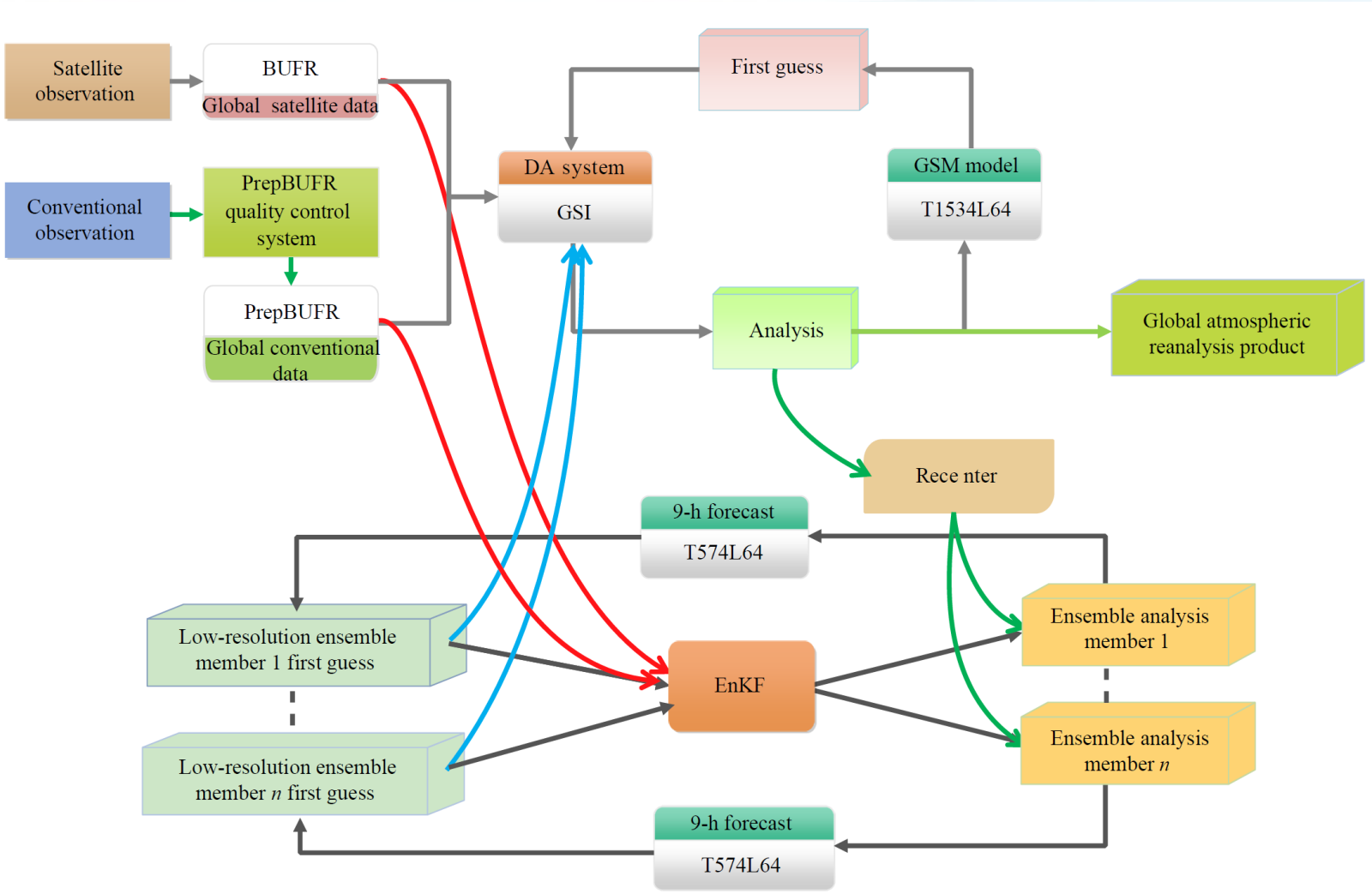
Dataset introduction

Entry	Description
Dataset name	CMA Global Atmospheric Reanalysis Version 1.5
Dataset short name	CRA1.5
Geographic coverage	Global coverage (90°S–90°N, 180°W–180°E)
Data period	January 1979 to present
Spatial resolution	0.1° × 0.1°
Temporal resolution	Hourly
Data format	GRIB2
Data volume	1.5 GB per hourly snapshot
Dataset composition	Includes three-dimensional isobaric variables (e.g., geopotential height, temperature, humidity, wind) and surface variables (e.g., air temperature, precipitation, pressure).
Publication platform	China Meteorological Data Service Network: http://data.cma.cn
Contact address	National Meteorological Information Center, No. 46 Zhongguancun South Street, Haidian District, Beijing 100081

Information on the CMA Global Atmospheric Reanalysis Version 1.5

Components and production workflow

◆CRA1.5 utilizes the Grid-point Statistical Interpolation (GSI) for deterministic analysis assimilation, the Ensemble Kalman Filter (EnKF) for ensemble assimilation, and the Global Spectral Model (GSM) for forecasting. Within this framework, a hybrid-4DEnVar assimilation scheme has been implemented.

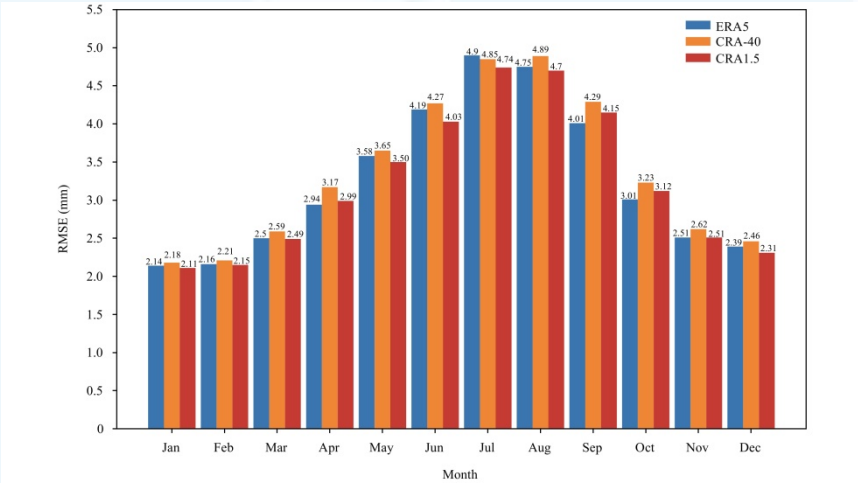


Schematic diagram of the CMA global atmospheric analysis system

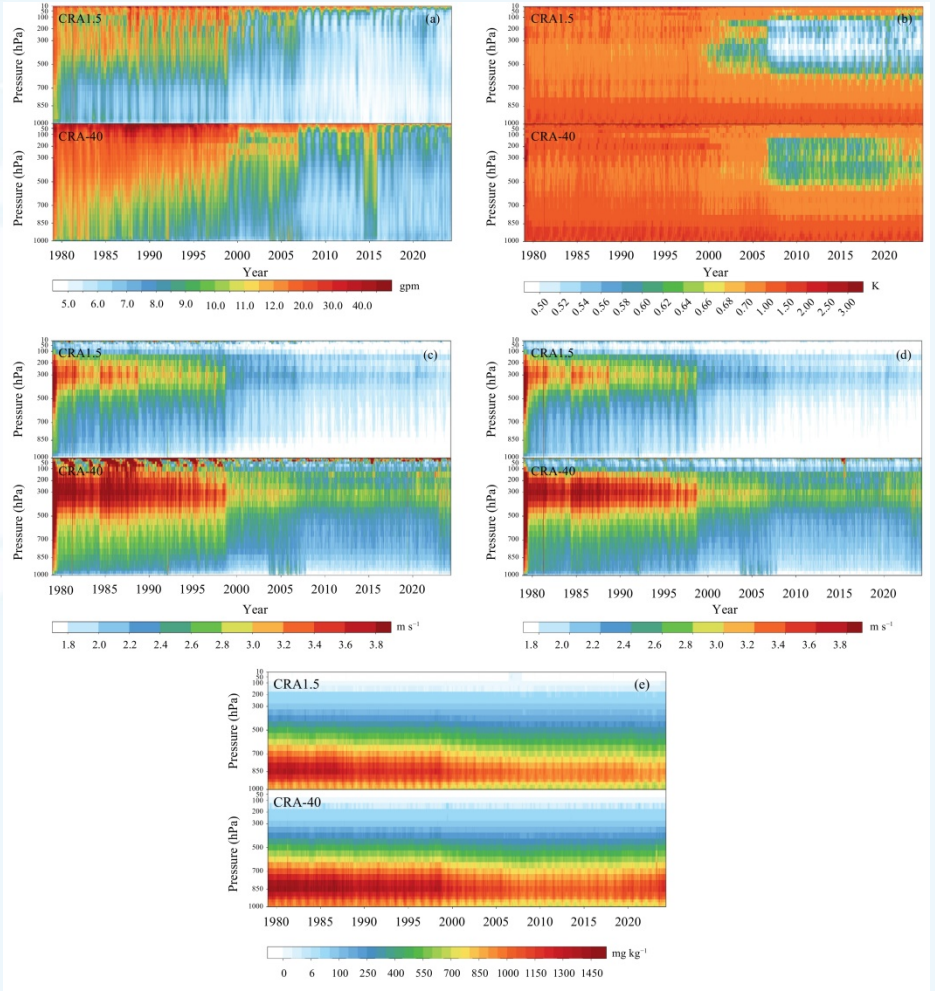
Performance

◆ CRA1.5 exhibits superior quality for geopotential height, temperature, wind fields, across the entire atmospheric layer compared to CRA-40

◆For precipitable water, the multi-yr averaged RMSE of CRA1.5 (3.1 mm) is 7.5% lower than that of CRA-40 (3.35 mm) and slightly lower than that of ERA5 (3.13 mm).



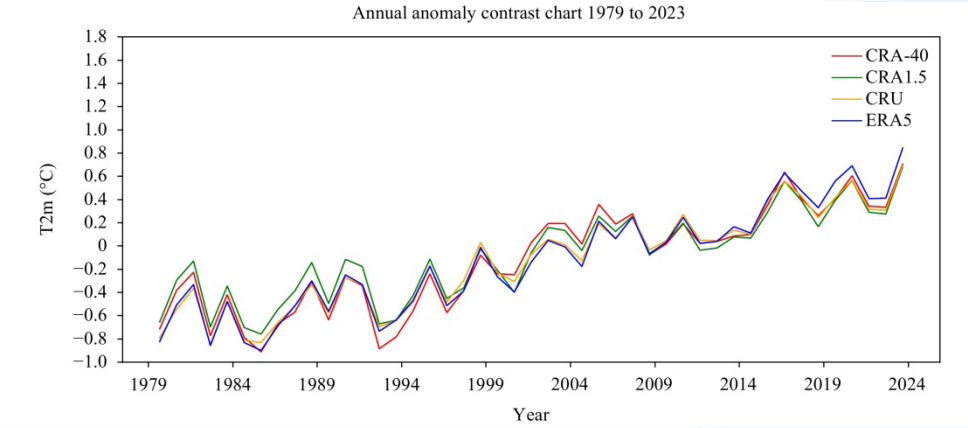
RMSE of CRA1.5, CRA-40, and ERA5 precipitable water with respect to CMA's ground-based GNSS/Met water vapor observations over China



RMSE of CRA1.5 and CRA-40 with respect to ERA5 for (a) geopotential height (gpm), (b) temperature(K), (c) zonal wind (m s−1), (d) meridional wind (m s−1), and (e) specific humidity (mg kg−1)

◆**Near-surface air temperature (T2m):**

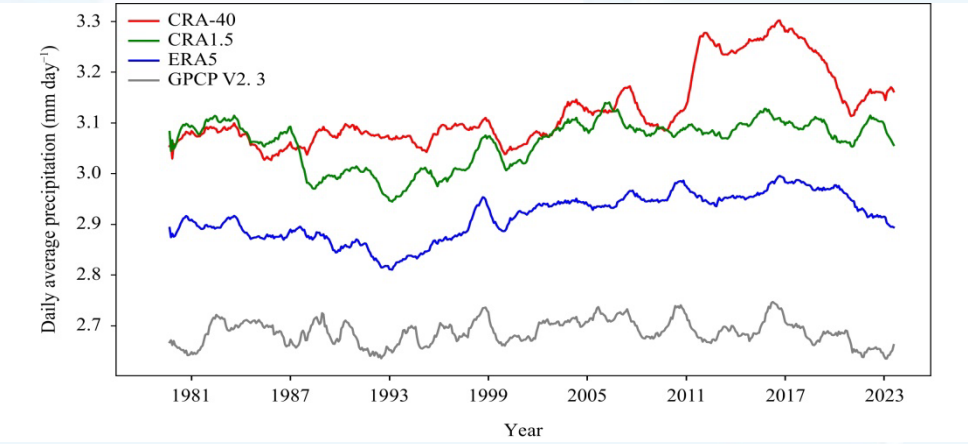
CRA1.5 exhibits slightly higher temperatures before 1990 but aligns more closely with HadCRUT5 after 1990, particularly after 2015, and is closer to HadCRUT5 than ERA5.



Annual averages of global-mean near-surface air temperature (T2m) anomalies (K) from 1979 to 2023

◆**Daily precipitation:**

CRA1.5's daily average precipitation is 3.12 mm day^{-1}, being roughly between CRA-40 and ERA5.



360-day running average of global daily average precipitation (mm day^{-1}) from 1979 to 2023

Publicly available: https://data.cma.cn/ai/#/home

Reference: Zhang, T., Z. J. Zhou, Z. Q. Liu, et al., 2025: The CMA Global Atmospheric Reanalysis Product version 1.5 (CRA1.5). J. Meteor. Res., 39(6), 1-20, doi: https://doi.org/10.1007/s13351-025-5112-3

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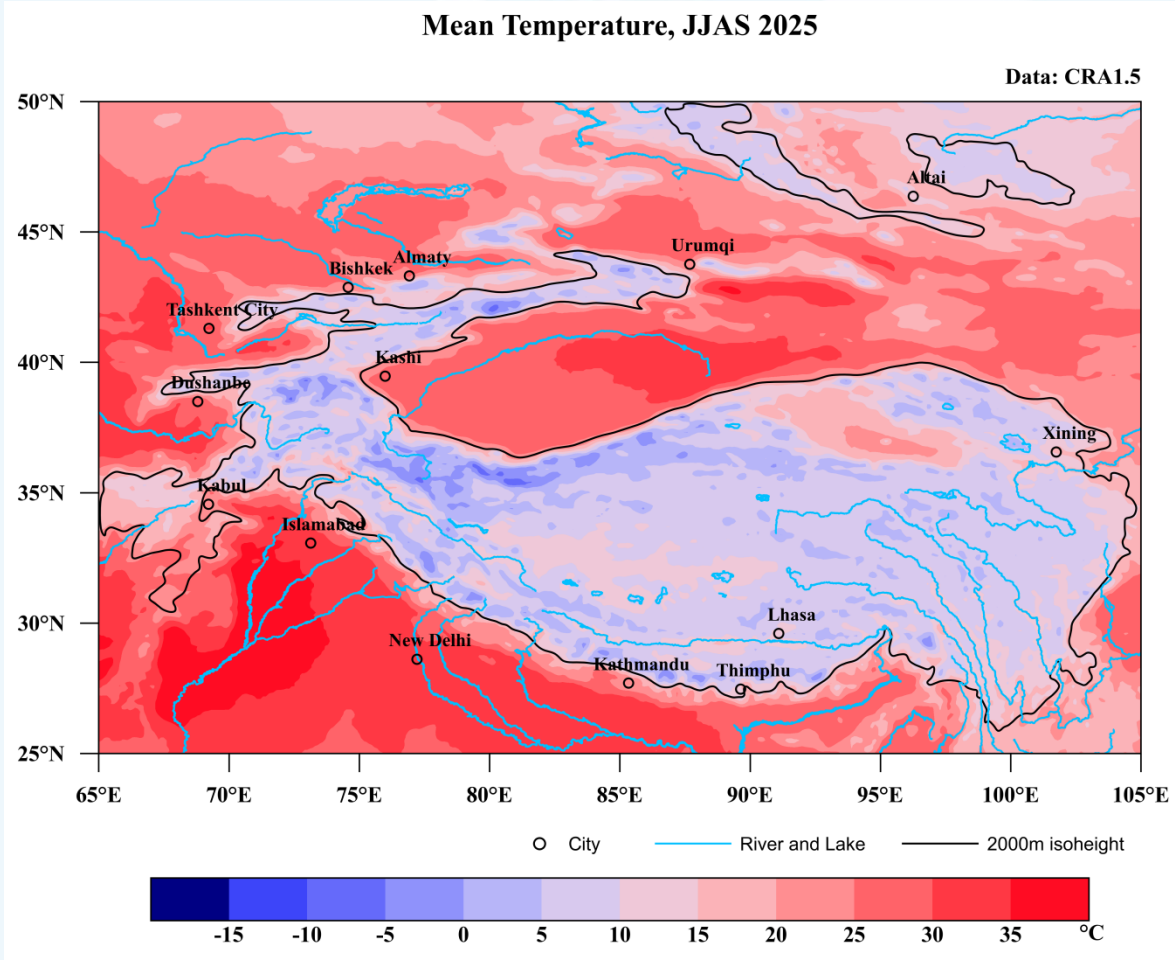
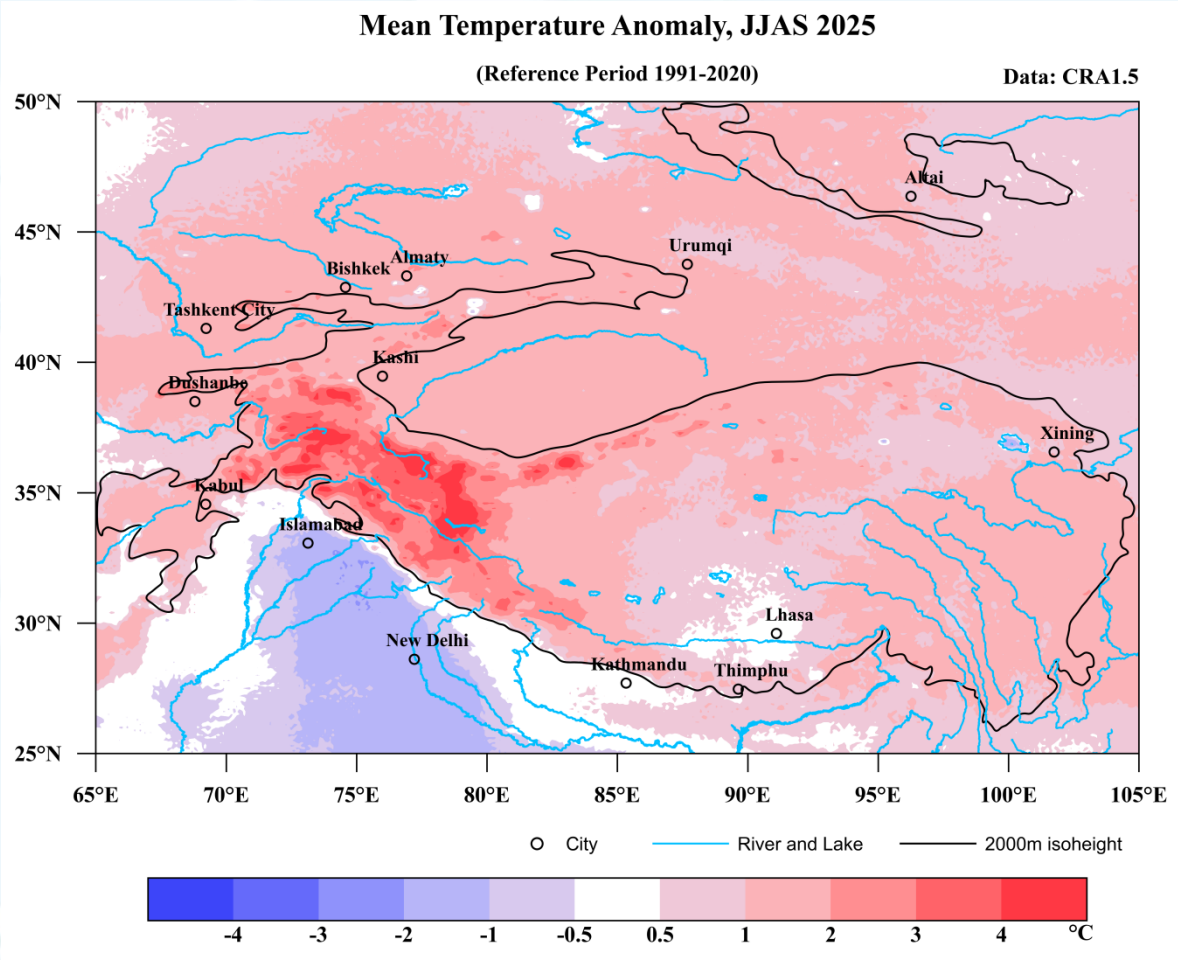
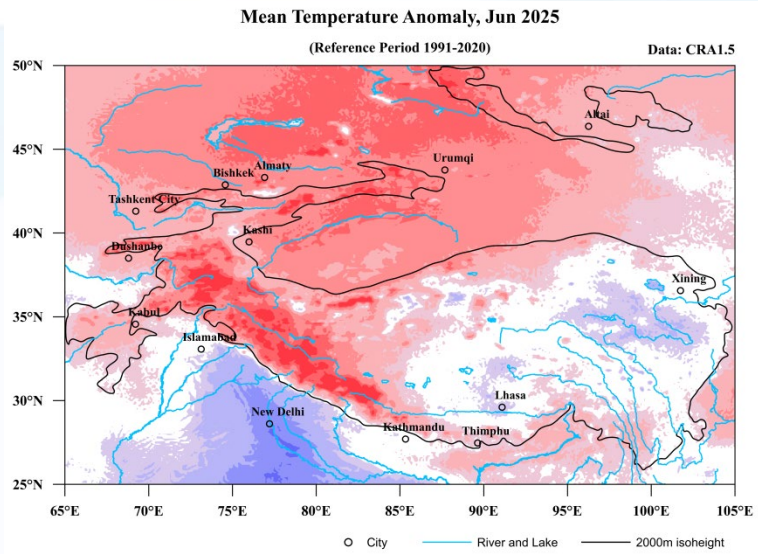
Temperature

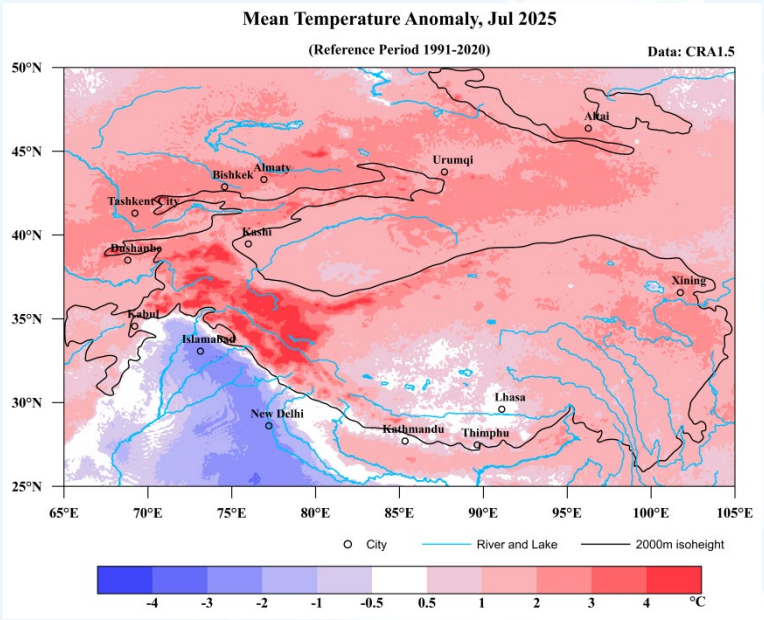
◆During the period from June to September (JJAS) 2025, most of the TP region witnessed above normal surface air temperature, with particularly significant positive anomalies of 2–4° C in the western TPCR. In contrast, the SAT in southwestern TP region was near or below normal with parts of the region 1–2° C lower than normal.

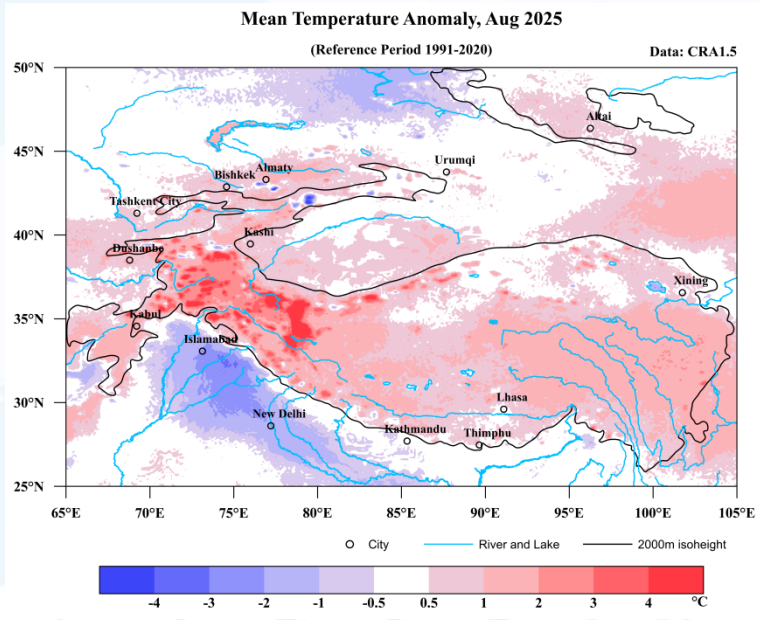


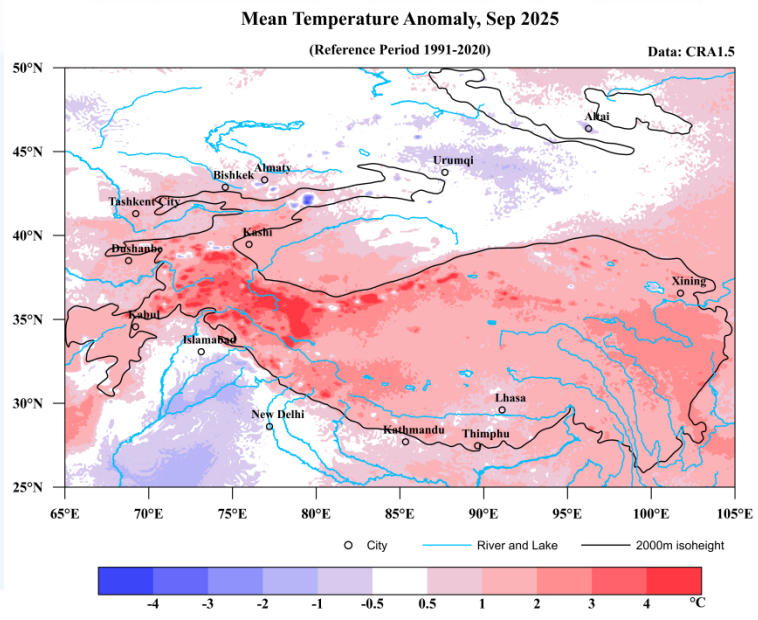


◆For individual months, the spatial pattern of SAT anomalies over the Third Pole region was in line with that for the entire se



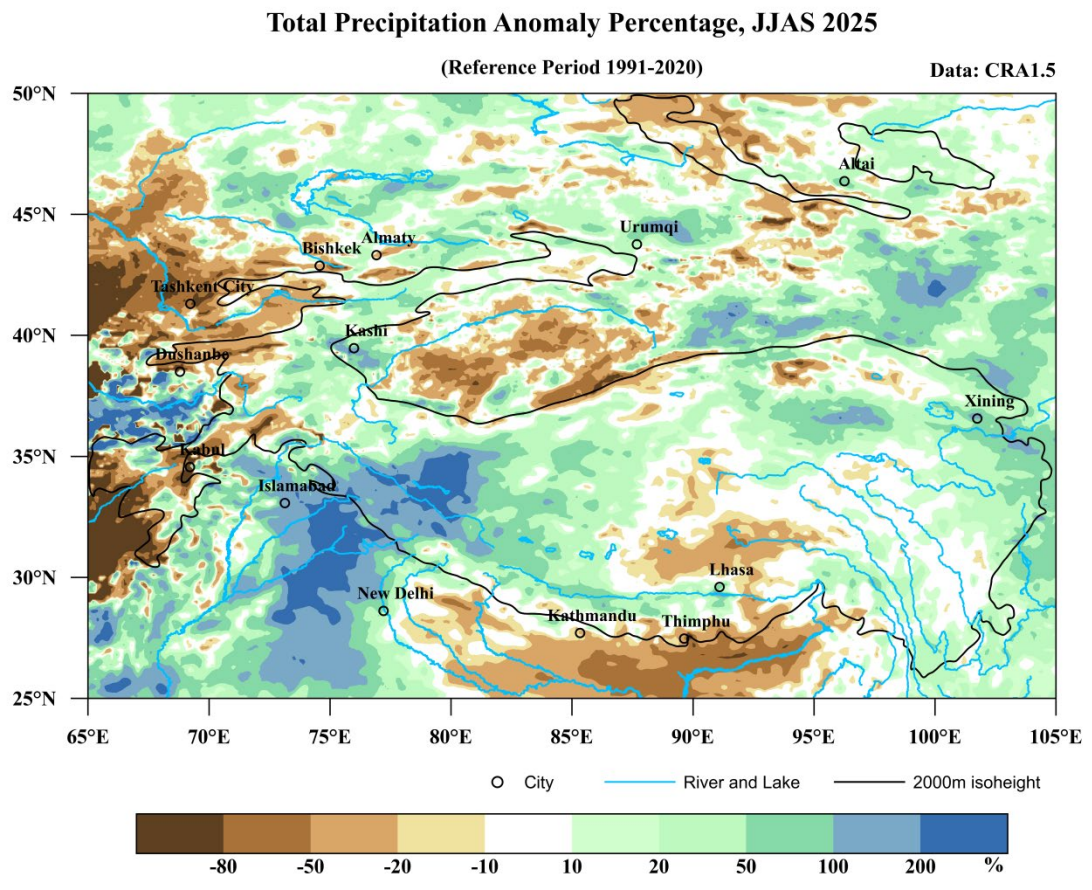


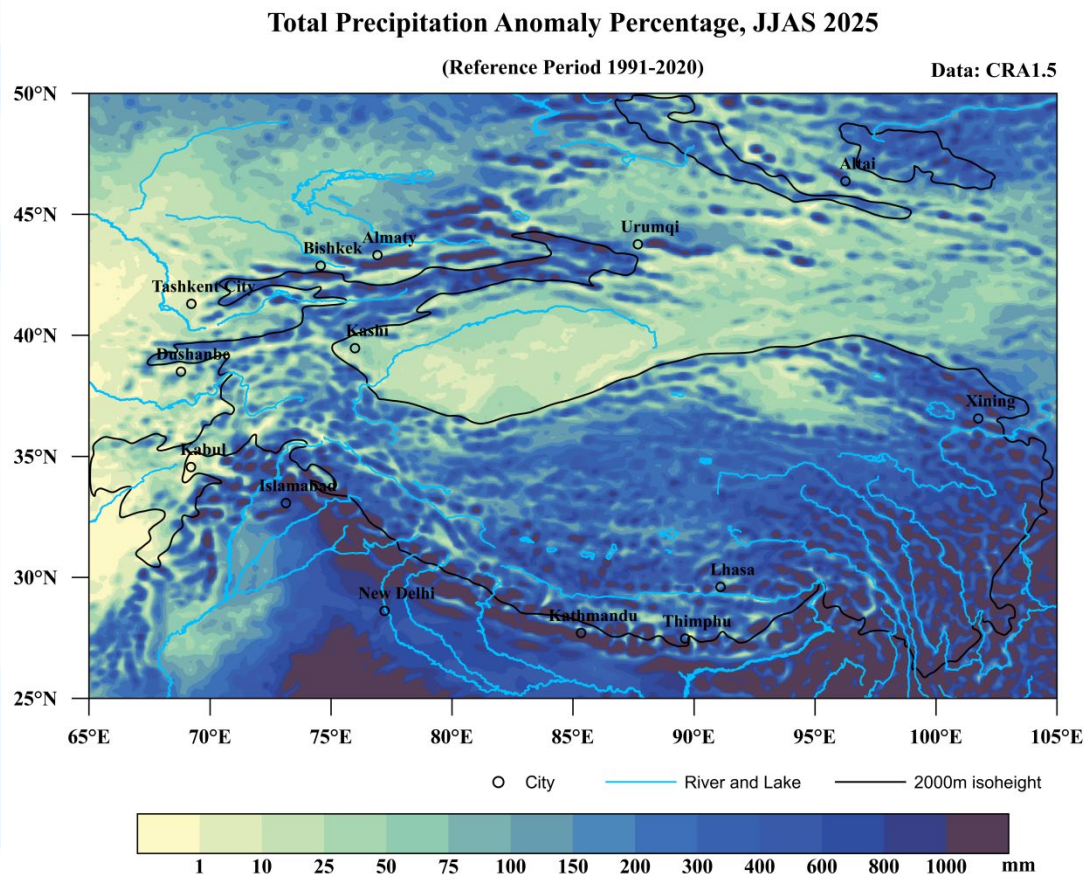




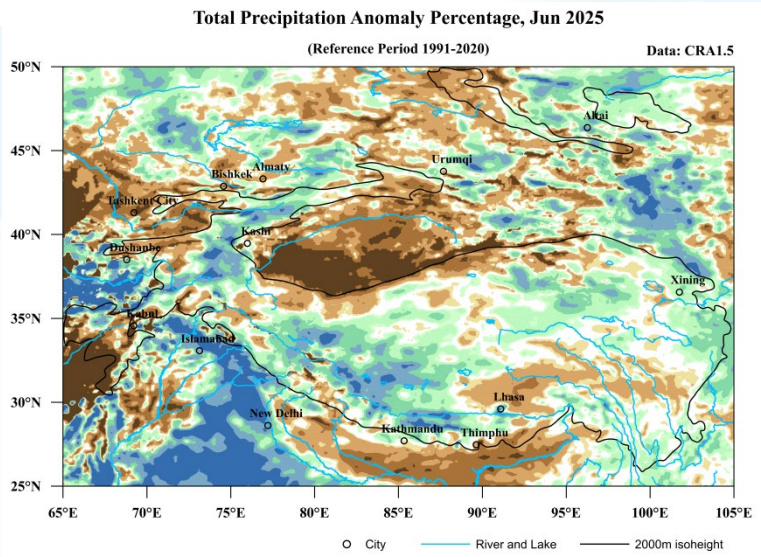
Precipitation

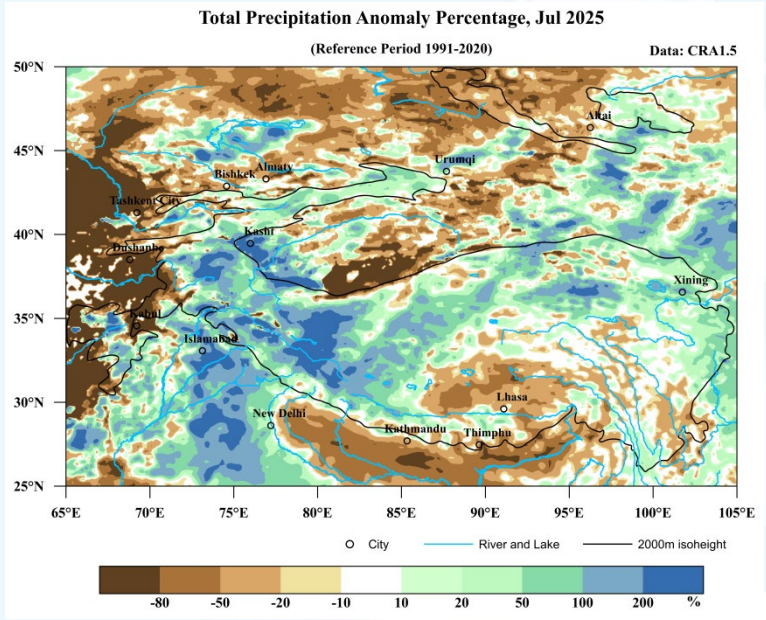
◆For JJAS 2025, the distribution of precipitation anomalies over the TP region exhibited a distinct west-east alternating pattern of “below-normal, above-normal, below-normal, above-normal”. The southwestern TP region and southwest TPCR experienced exceptionally wet conditions, in contrast, parts of western and northern TP region, as well as central areas along the southern margins, recorded precipitation deficits of 20%–50% relative to the normal level.

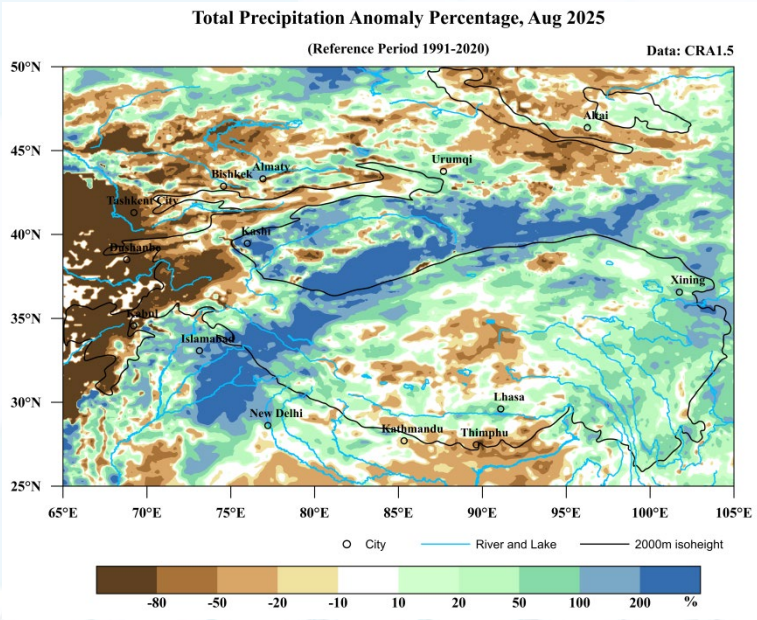


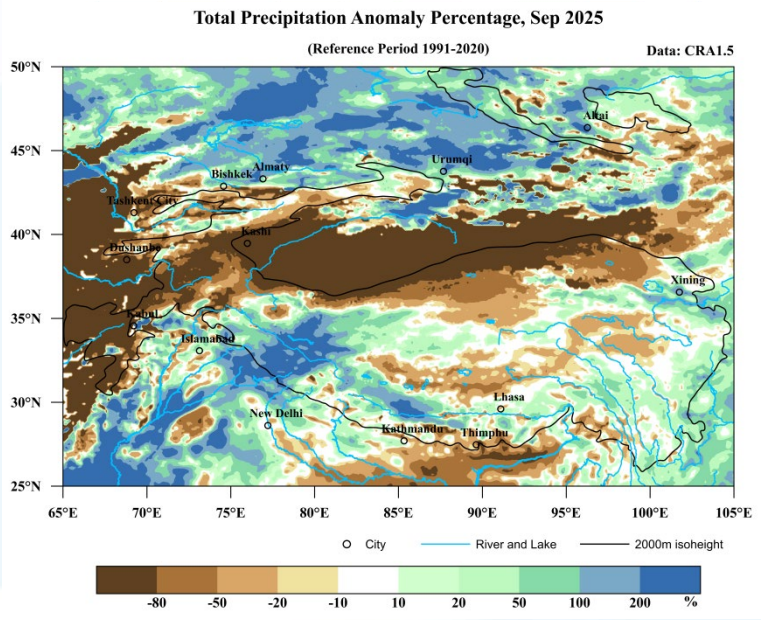


◆**The distribution of precipitation anomalies across most areas of the Third Pole region in individual months exhibits similar characteristics, with rainfall concentrated more heavily in the southwestern region and reduced in the western and northern regions.**



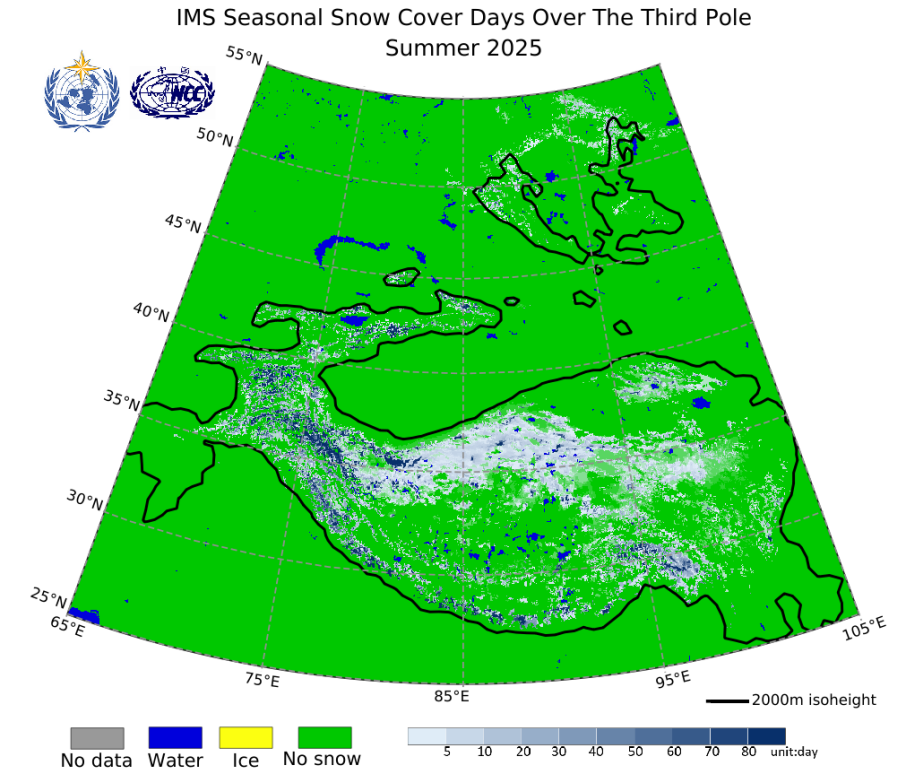


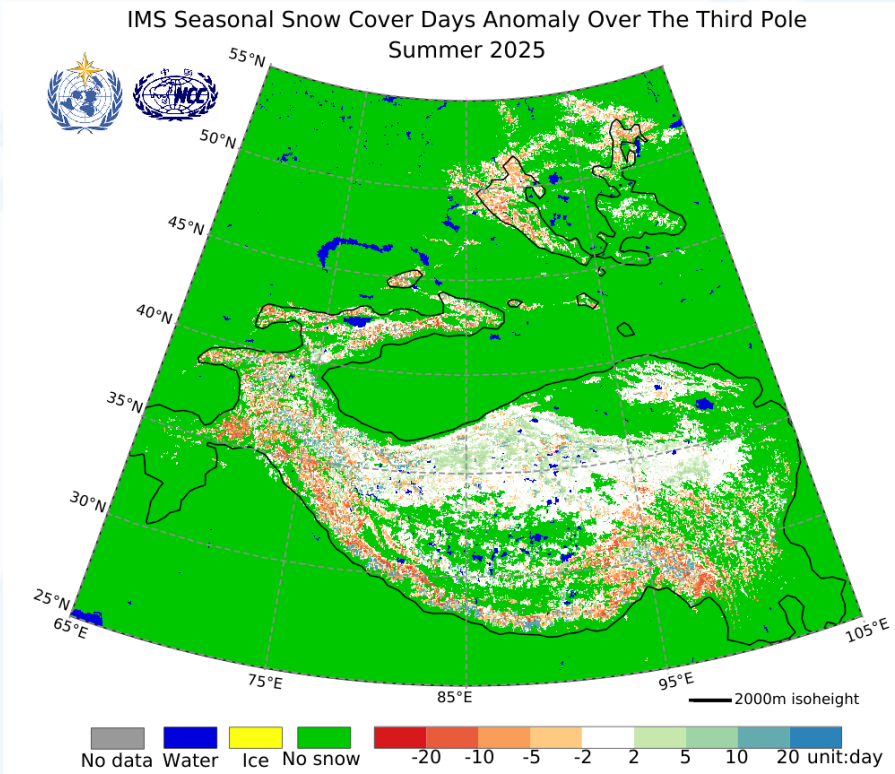




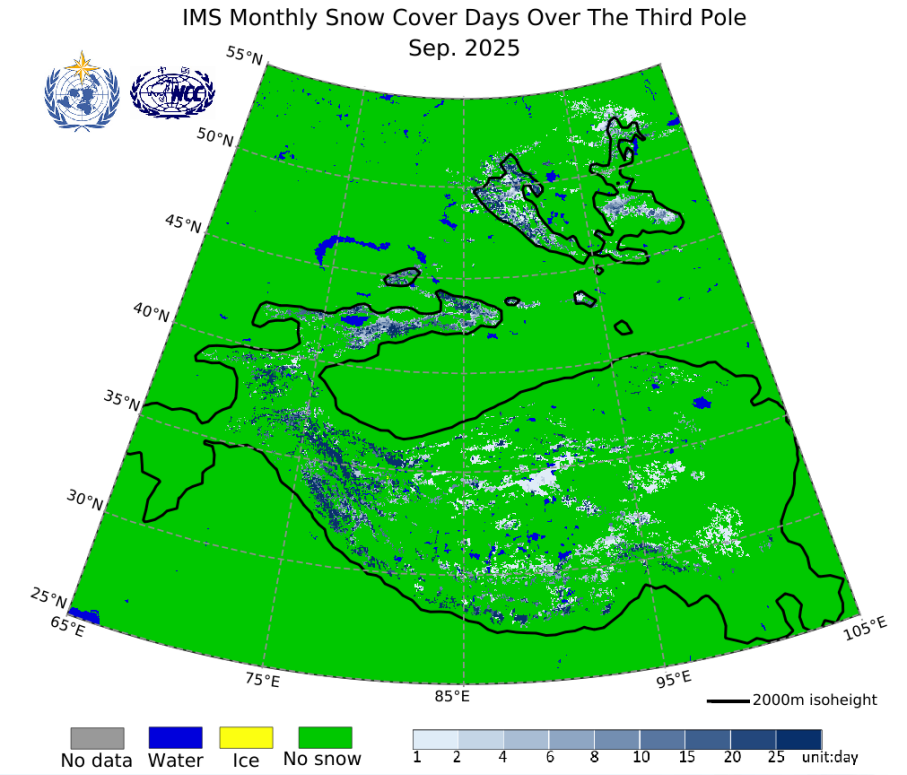
Snow Cover

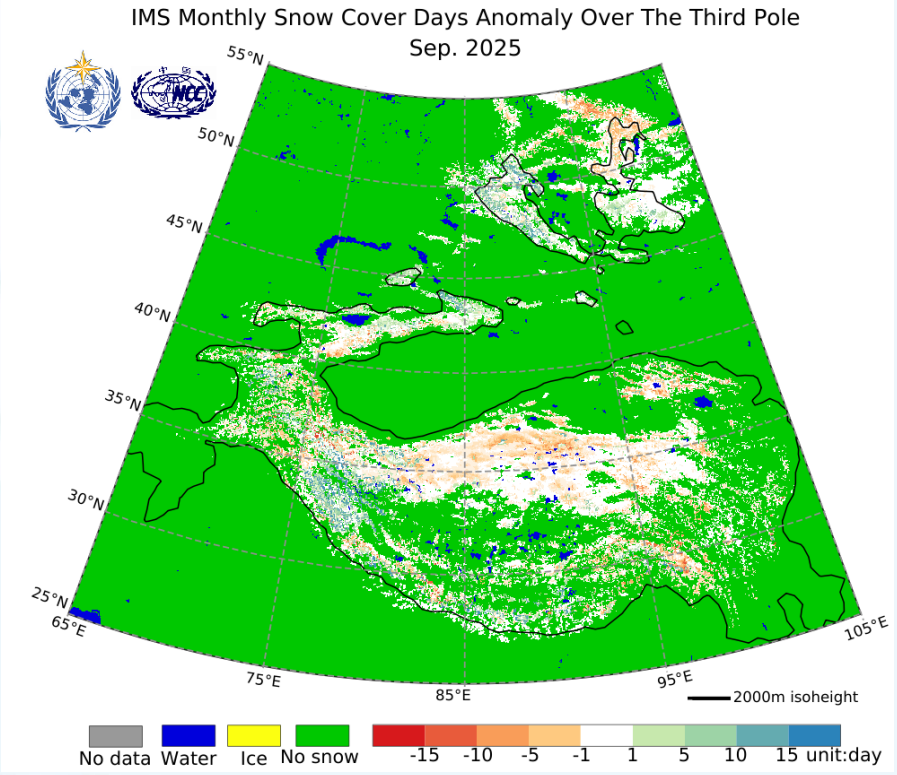
◆Over the past two decades, there has been no significant linear trend for summer snow cover extent (SCE) over the TP region as a whole, although notable inter-annual fluctuations have been observed. In summer (JJA) 2025, the regional SCE amounted 114.8×103 km^2, around 6.8% lower than the normal (2005-2020 average). The number of snow cover days (NSCD) exhibited below normal along most of the mountains over TP, except in the eastern Kunlun Mountains where NSCD was close to normal.





◆**For September 2025, the regional mean SCE was estimated as 109.7×103 km^2, around 3.5% less than normal. NSCD increased over the western TPCR and decreased in central TPCR, while in the mountain areas north of 40° N, the snow season has begun although the monthly NSCD remained below or near normal.**





Take-home Messages

CMA RA 1.5

- CRA1.5 has been implemented for real-time operation at the CMA, which is publicly available through the China Meteorological Data Network (https://data.cma.cn/ai/#/home).

State of the climate

- From JJAS 2025, most of the Third Pole (TP) region recorded above normal surface air temperature (SAT), while the SAT in the southwestern TP region was below normal.
- The southwestern TP region and parts of the southwest TPCR experienced significantly wetter conditions, with precipitation exceeding the normal amount by twice. Conversely, some areas in the western and northern TP region, as well as the central area along the southern edge, recorded a 20%–50% precipitation deficit relative to the normal level.
- In summer , snow cover extent (SCE) over the TP region was close to the normal.


Thanks