

**Table of Contents: TCC News No. 83**

JMA's New Seasonal Ensemble Prediction System (JMA/MRI-CPS4) .....	1
2025 Global Surface Temperature .....	4
Highlights of the Global Climate in 2025 .....	6
Summary of Japan's Climatic Characteristics for 2025 .....	8
TCC Training Seminar on One-Month Forecasts .....	9
TCC Activity Report for 2025 .....	11
TCC contributions to Regional Climate Outlook Forums in Asia .....	13

**JMA's New Seasonal Ensemble Prediction System (JMA/MRI-CPS4)**

The Japan Meteorological Agency (JMA) upgraded its seasonal Ensemble Prediction System (EPS) from JMA/MRI-CPS3 (CPS3; Hirahara et al. 2023) to JMA/MRI-CPS4 (CPS4; Kubo et al. 2025) on 22 January 2026. One-month predictions have since been produced using CPS4 rather than the Global Ensemble Prediction System (GEPS).

**1. New seasonal EPS**

Details of CPS4 are provided on the WMC Tokyo website ([https://www.data.jma.go.jp/wmc/products/model/outline/cps\\_description.html](https://www.data.jma.go.jp/wmc/products/model/outline/cps_description.html)). Ensemble size and running frequency remain at 5 members per day for six-month prediction and 50 members per week for one-month prediction. The ensemble size for statistical implementation in six-month prediction is increased from 51 to 85 based on the Lagged Average Forecast method with 17 initial dates.

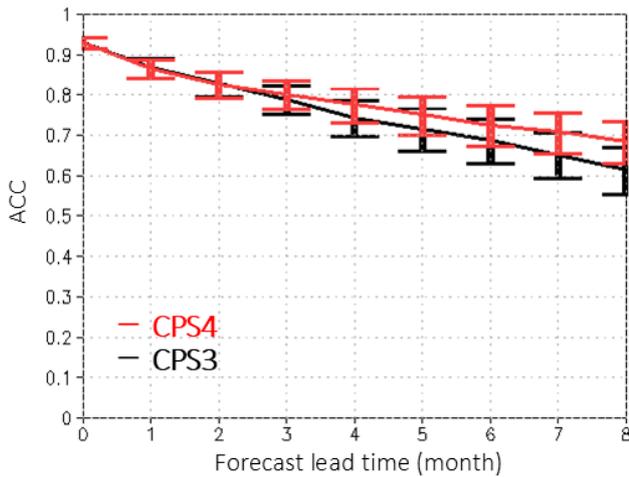
**2. Performance**

CPS4 predictive performance is evaluated via comparison with CPS3 for six-month prediction and with GEPS for one-month prediction based on hindcasts covering the period 1991 – 2020. The analysis datasets used for verification are MGDSST (Kurihara et al. 2006) for sea surface temperature (SST), JRA-3Q (Kosaka et al. 2024) for atmospheric elements, and outgoing longwave radiation (OLR) data provided by the National Oceanic and Atmospheric Administration (NOAA).

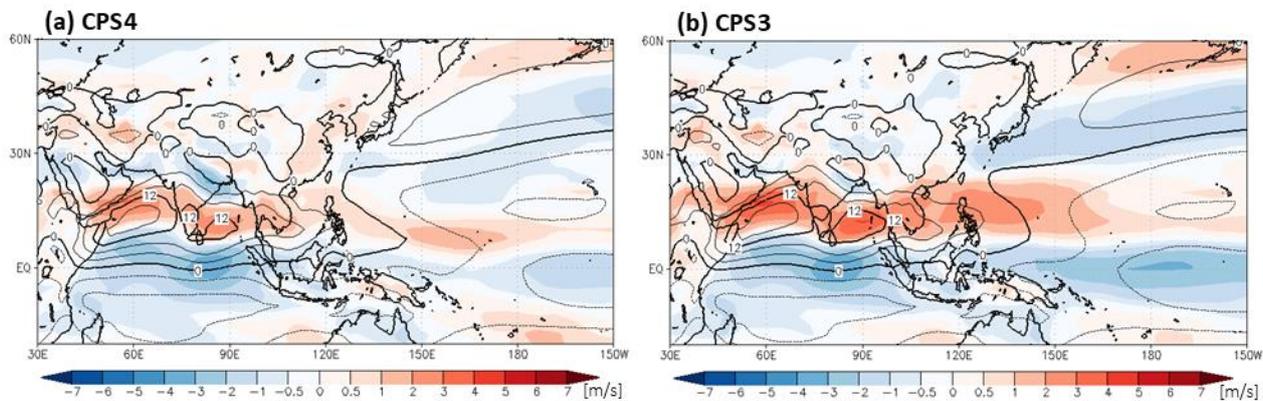
In six-month prediction, the anomaly correlation coefficients of the SST index for the western equatorial Pacific (NINO.WEST) show improvement (Figure 1-1). SST biases are reduced, including a low-temperature type known as cold-tongue bias in the equatorial Pacific and a positive Indian Ocean Dipole-like bias in the Indian Ocean. Atmospheric biases are also reduced. In the Asian monsoon region, biases relating to phenomena such as excessively

strong monsoon westerly winds and an excessively deep monsoon trough are reduced during boreal summer (Figure 1-2). Northward and weak biases of the subtropical jet stream from Eurasia to the North Pacific are also reduced.

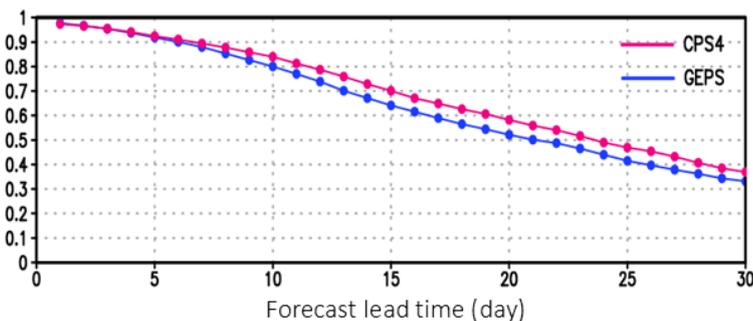
In one-month prediction, accuracy in CPS4 prediction of tropical intraseasonal variability phenomena, such as the Madden-Julian Oscillation (MJO) and the Boreal Summer Intraseasonal Oscillation (BSISO), is higher than that of GEPS (Figure 1-3). For the MJO, underestimation error in amplitude is reduced and eastward propagation of the active convective phase is more clearly represented in CPS4 than in GEPS (Figure 1-4). In addition, the bias of an overly weak subtropical jet stream over East Asia is reduced.



**Figure 1-1 NINO.WEST prediction skill**  
Anomaly correlation coefficients (ACCs) for NINO.WEST (0 – 15°N, 130 – 150°E) SSTs between MGDSST and hindcasts. Error bars show 95% confidence intervals.



**Figure 1-2 Mean error (shading) and model climatology (contours) of 850-hPa zonal wind for June – August**  
The initial month is May, and the contour interval is 4 m/s.



**Figure 1-3 MJO prediction skill**  
The vertical axis indicates bivariate correlation coefficients based on Wheeler and Hendon (2004). The horizontal axis is the forecast lead time (days).

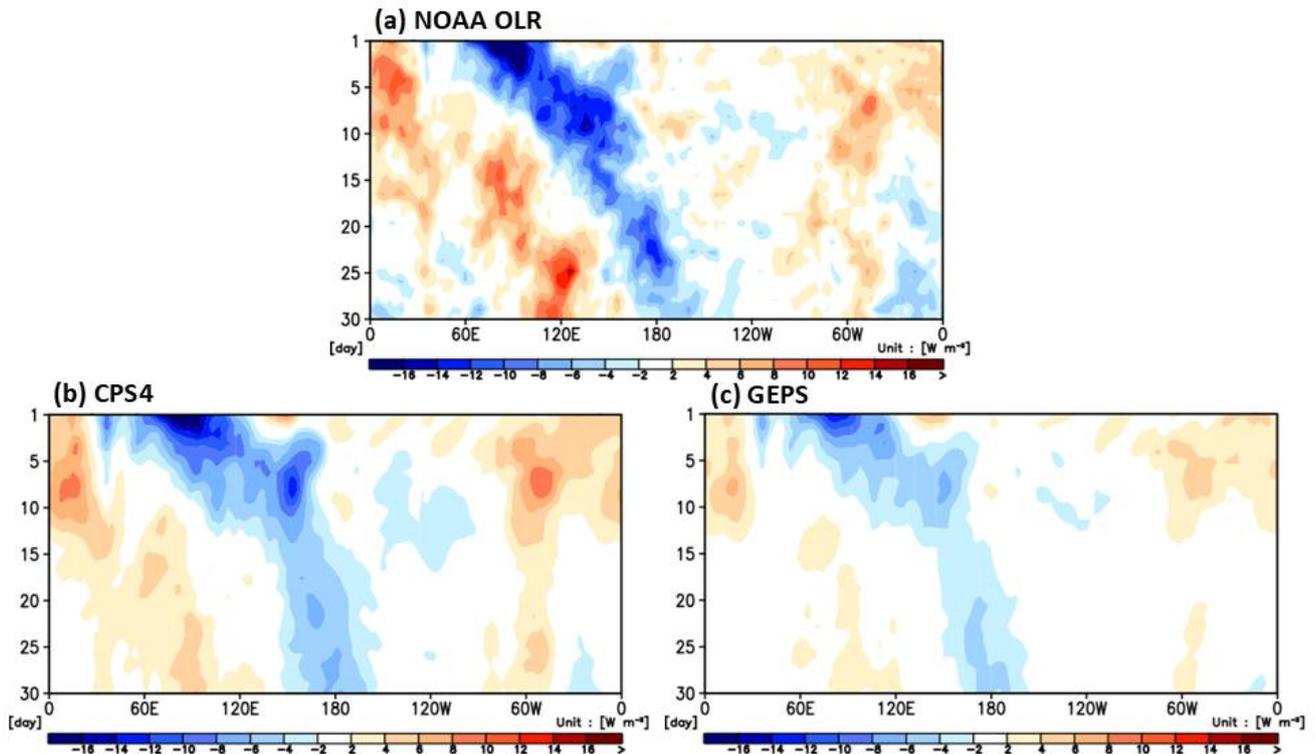


Figure 1-4 Longitude-time composite for OLR anomalies starting from a convectively active phase of MJO in the Indian Ocean

The horizontal axis is longitude, and the vertical axis is the forecast lead time (days). Initial months from November to April are included.

## References

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(SATO Hitoshi, World Meteorological Centre Tokyo)

[<<Table of contents](#) [<Top of this article](#)

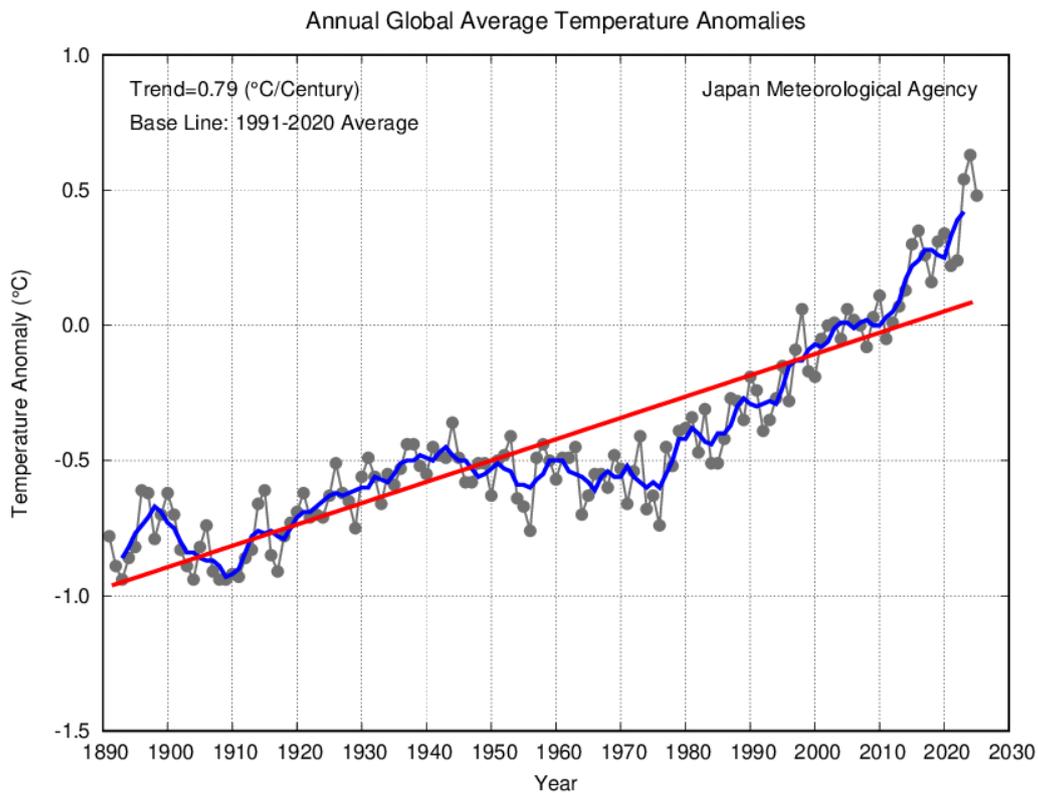
## 2025 Global Surface Temperature

JMA analysis indicates that the annual anomaly of the global average surface temperature for 2025 (i.e., the combined average of the near-surface air temperatures over land and the sea-surface temperatures) was  $+0.48^{\circ}\text{C}$  above the 1991–2020 average, and was the 3rd warmest on record since 1891 (Figure 2-1).

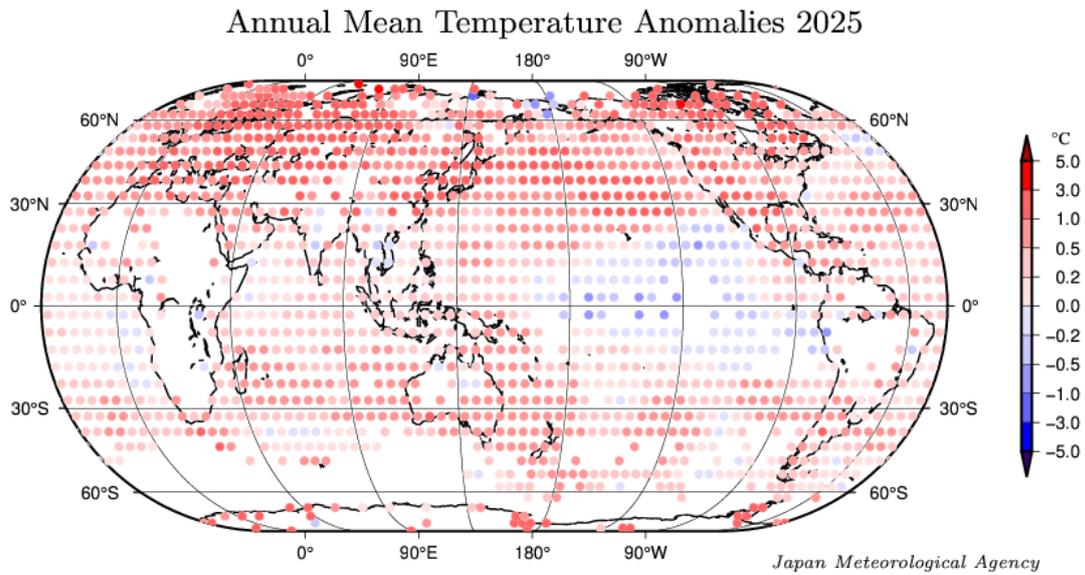
On a longer time scale, the annual global average surface temperature has risen at a rate of about  $+0.79^{\circ}\text{C}$  per century, and 2015 to 2025 were among the eleven warmest years since 1891 (Table 2-1). These recent high temperatures are thought to be affected by the global warming due to increase in anthropogenic greenhouse gas concentrations including carbon dioxide. In addition, the global averaged surface temperature is affected by inter-annual to decadal natural fluctuations intrinsic to the earth's climate.

High temperature deviations were observed in most parts of the world (Figure 2-2).

JMA monitors monthly, seasonal and annual average anomalies of global surface temperature, with results routinely updated on the TCC website at <https://www.data.jma.go.jp/tcc/tcc/products/gwp/gwp.html>.



**Figure 2-1 Long-term change in annual mean surface temperature anomalies over the globe**  
Anomalies are derived from the 1991–2020 average baseline. The thin black line indicates surface temperature anomalies for each year, while the blue and red lines indicate the related five-year running mean and the long-term linear trend, respectively.



**Figure 2-2 Annual mean temperature anomalies**

The circles indicate anomalies of surface temperature averaged in 5° × 5° grid boxes. The annual mean global temperature anomaly is determined by averaging the anomalies, derived from the 1991–2020 average baseline, of all grid boxes weighted with the grid box area.

**Table 2-1 Ranking of annual global average temperatures**

Rank	Year	Temperature Anomaly w.r.t. 1991–2020 average
1	2024	+0.63
2	2023	+0.54
<b>3</b>	<b>2025</b>	<b>+0.48</b>
4	2016	+0.35
5	2020	+0.34
6	2019	+0.31
7	2015	+0.30
8	2017	+0.26
9	2022	+0.24
10	2021	+0.22

*(BUNNO Ayaka, Tokyo Climate Center)*

[<<Table of contents](#)   [<Top of this article](#)

## Highlights of the Global Climate in 2025

Annual mean temperatures were above normal in most parts of the world, and very high in the eastern part of East Asia, in Central Asia, from Western Russia to Europe, in the northern part of Northern Africa, in northern Canada, from the southwestern USA to Central America, in the southern part of South America and in Oceania (Figure 3-1).

Extremely high temperatures were frequently observed in areas where the annual mean temperatures were very high (Figure 3-3 and [map](#) for details).

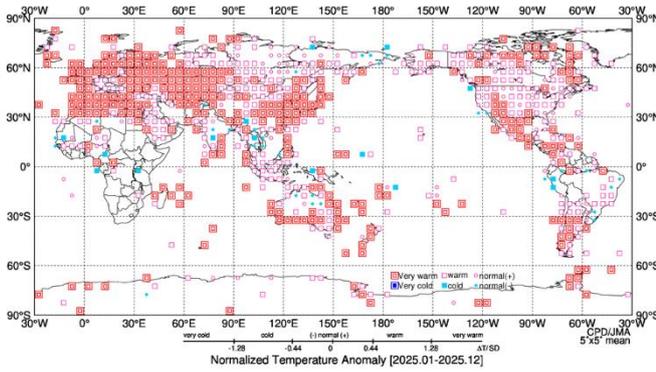
Annual precipitation amounts were above normal in central East Asia, in Southeast Asia, in India, from the interior of Siberia to northern Europe, in northern South America and from New Zealand to eastern Australia, and below normal in southern Central Asia, in the Middle East and from southeastern to central Europe (Figure 3-2).

Extremely high precipitation amounts were frequently observed from the interior of Siberia to northern Europe, in Southeast Asia and from Mexico to northern South America. Extremely low precipitation amounts were frequently observed from the northern Middle East to central Europe (Figure 3-3 and [map](#) for details).

Major extreme climatic events and weather-related disasters occurring in 2025 are listed below (Table 3-1, see also Figure 3-3). Further details are provided in the [Annual Report on Global Extreme Climate Events in 2025](#) on the TCC website.

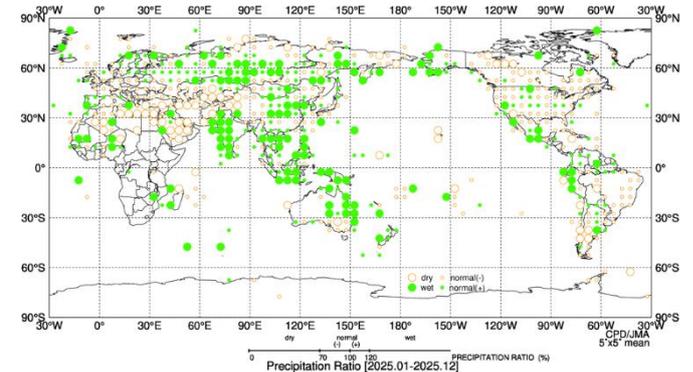
**Table 3-1 Major extreme climatic events and weather-related disasters worldwide in 2025**

	Type	Period	Area
(1)	Warm	June-October	The eastern part of East Asia
(2)	Heavy Rain	June-August	China
(3)	Heavy Rain	November	In and around Southeast Asia
(4)	Warm	April-July	In and around eastern Central Asia
(5)	Heavy Rain	June-October	From Nepal to Pakistan
(6)	Dry	January-March, June	In and around Turkey
(7)	Warm	January, March, June-July, September, November	From southeastern Europe to around the eastern Mediterranean Sea
(8)	Dry	February-April, June, August, December	In and around Germany
(9)	Warm	April, June-August	From northern Europe to around the western Mediterranean Sea
(10)	Heavy Rain	April-August	In and around Middle Africa
(11)	Warm	September-November	From Canada to central Mexico
(12)	Wet	July	In and around the State of Texas, USA
(13)	Warm	January-March	From southern Brazil to northern Argentina



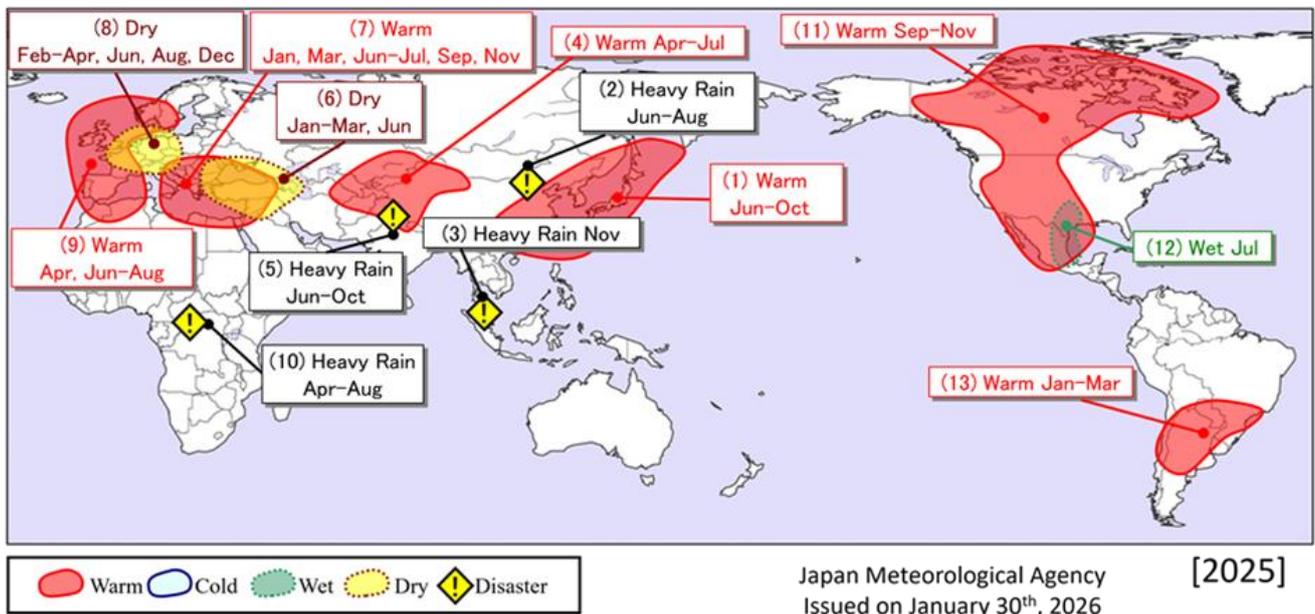
**Figure 3-1 Normalized annual mean temperature anomalies for 2025**

Categories are defined by the annual mean temperature anomaly against the normal divided by its standard deviation and averaged in 5° × 5° grid boxes. The thresholds of each category are -1.28, -0.44, 0, +0.44 and +1.28. The normal values and standard deviations are calculated from 1991–2020 statistics. Land areas without graphics represent regions for which the observation data sample is insufficient or normal data are unavailable.



**Figure 3-2 Annual total precipitation ratios for 2025**

Categories are defined by the annual precipitation ratio to the normal averaged in 5° × 5° grid boxes. The thresholds of each category are 70, 100 and 120%. Land areas without graphics represent regions for which the observation data sample is insufficient or normal data are unavailable.



Japan Meteorological Agency [2025]  
Issued on January 30<sup>th</sup>, 2026

**Figure 3-3 Major extreme climate events and weather-related disasters worldwide in 2025**

Schematic representation of major extreme climate events and weather-related disasters occurring during the year.

(UMEZU Hironori, Tokyo Climate Center)

[<<Table of contents](#) [<Top of this article](#)

## Summary of Japan's Climatic Characteristics for 2025

Japan's summer mean temperature was the highest since 1898. Among 153 meteorological stations nationwide, 132 saw the highest seasonal mean temperatures for summer on record (including 9 ties). A record high of 41.8°C in Japan was recorded at Isesaki station in Gunma Prefecture on 8 August.

### Temperature

Warm air covered Japan for most of the year, resulting in significantly above-normal annual mean temperatures in northern, eastern and western Japan. The annual mean temperature over the country was the third highest since 1898, following 2024 and 2023.

### Precipitation and Sunshine Duration

Annual precipitation amounts were below normal in western Japan and significantly below normal on the Pacific side of eastern Japan due to less influence from low-pressure systems and fronts and more coverage by high-pressure systems. Annual sunshine durations were significantly above normal in most parts of Japan and above normal on the Sea of Japan side of northern Japan.

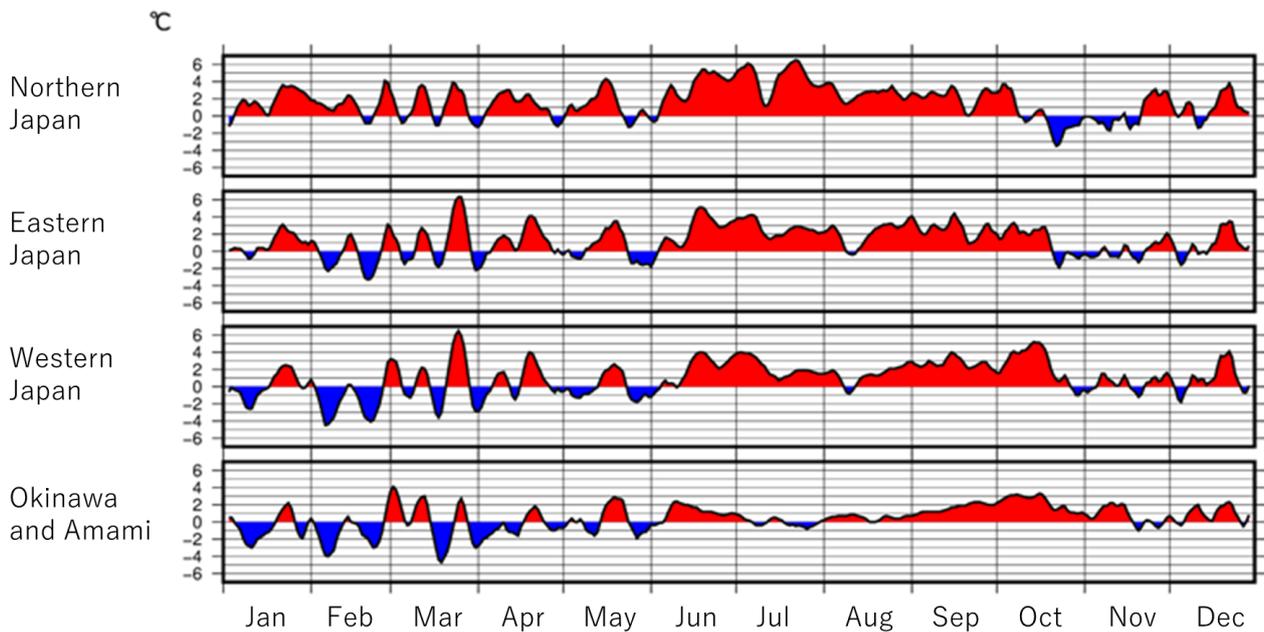


Figure 4-1 Time-series representations of five-day running mean temperatures (Jan. – Dec. 2025)

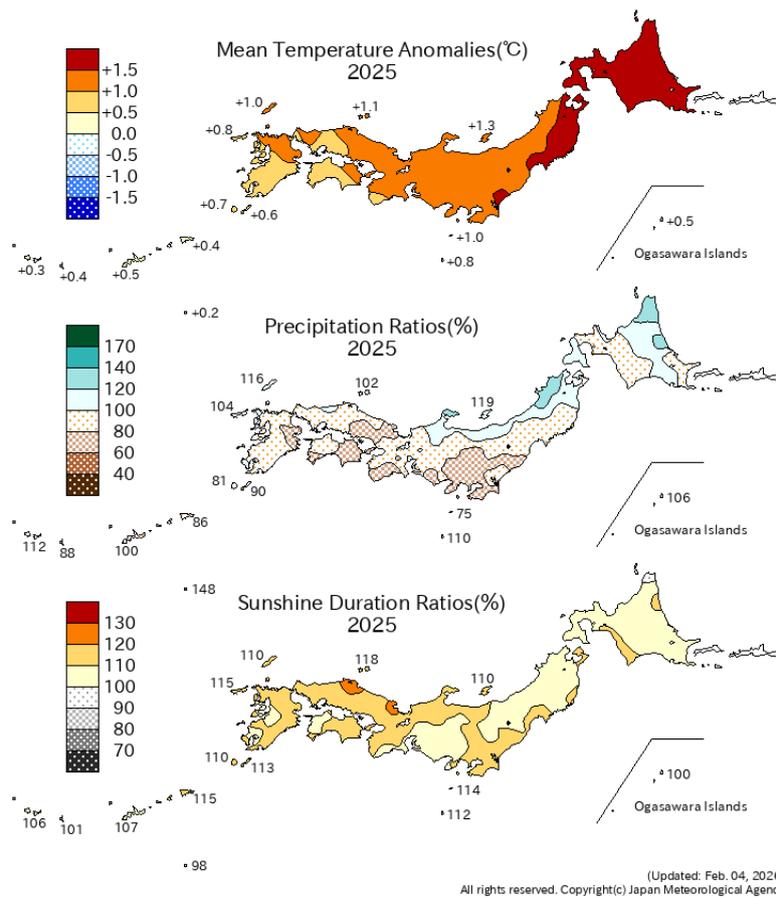


Figure 4-2 Annual climate anomalies/ratios for Japan in 2025

(NATORI Hiroaki, Tokyo Climate Center)

[<<Table of contents](#) [<Top of this article](#)

## TCC Training Seminar on One-Month Forecasts

JMA's Tokyo Climate Center (TCC) has assisted National Meteorological and Hydrological Services (NMHSs) in improving their climate services since 2008, providing basic climate data, products and tools to NMHSs online and assisting their capacity development in the Asia-Pacific region. TCC holds annual training seminars as part of these activities in its role as a Regional Climate Center in the WMO RA II area, and arranges expert visits to NMHSs to promote the effective transfer of technology and discuss possible support for climate services.

Against such a background, the Center held a training seminar on one-month forecasts in late January (online) and from 3 to 6 February (in-person at JMA headquarters) 2026. It was attended by 13 trainees from NMHSs in Bhutan, Cambodia, Hong Kong (China), Indonesia, Malaysia, Mongolia, Nepal, Pakistan, the Philippines, Singapore, Sri Lanka, Thailand and Vietnam. The training focused on climate system expertise and on skills in the analysis of atmospheric circulation fields and generation of one-month forecasts using the Interactive Tool for Analysis of the Climate System (iTacs) and the one-month guidance tool provided by TCC. All attendees gave final presentations on one-month

forecasting in their respective countries and engaged in fruitful discussions with TCC staff.

The training contents are available on the TCC website at <https://www.data.jma.go.jp/tcc/tcc/library/library2025.html>.



Photo 5-1 Attendees with JMA Atmospheric and Oceanic Department Director-General TAHARA Yoshihiko and other TCC staff



Photo 5-2 Attendees on a courtesy visit to JMA Director-General NOMURA Ryoichi



Photo 5-3 Presentations and practical exercises at the seminar

*(HARADA Masashi and KURAMOCHI Masaya, Tokyo Climate Center)*

[<<Table of contents](#)   [<Top of this article](#)

## TCC Activity Report for 2025

In 2025, the Tokyo Climate Center (TCC) continued to support Asia-Pacific National Meteorological and Hydrological Services (NMHSs) by providing and enhancing data and products, holding training seminars, publishing quarterly newsletters and participating in international meetings.

### 1. Enhancement of online data/products/tools

#### 1.1 Special reports on extreme events

In a mandate role as a WMO Regional Climate Centre (RCC) in Regional Association II (RA II), TCC monitors world climate conditions with focus on Asia and its surrounding area. The Center issues reports on extreme climate events and summaries of the Asian summer/winter monsoon on its website (<https://www.data.jma.go.jp/tcc/tcc/products/clisys/reports/index.html>).

In summer 2025, record-high temperatures were observed nationwide in Japan, with the national average exceeding the previous record set in 2024. An early seasonal march with the earliest-ever withdrawal of the Baiu rainy season caused record-dry conditions, especially on the Sea of Japan side of eastern Japan in July. In this context, the Japan Meteorological Agency (JMA), with the help of the Advisory Panel on Extreme Climatic Events (see [TCC News No. 9](#)), investigated atmospheric and oceanic conditions considered to have contributed to such climate extremes and summarized related

primary factors. A comprehensive report is available at [https://www.data.jma.go.jp/tcc/data/news/press\\_20250930.pdf](https://www.data.jma.go.jp/tcc/data/news/press_20250930.pdf) (TCC News No. 82).

In November 2025, broader Southeast Asia and the surrounding area experienced disastrously heavy rainfall, causing widespread disruption. TCC reported on the atmospheric and oceanic conditions associated with the rainfall in a release available at [https://www.data.jma.go.jp/tcc/data/news/press\\_20251225.pdf](https://www.data.jma.go.jp/tcc/data/news/press_20251225.pdf).

## 2. Capacity development

TCC conducts annual training seminar as part of capacity-development activities related to its role as an RCC in RA II. It also arranges expert visits to and hosts visitors from NMHSs to support discussions on climate services and effective transfer of technology.

### 2.1 Training seminar

TCC holds training each fiscal year (i.e., April to March). The Center held a seminar on ENSO/IOD and regional impact on 15 and 16 January (online) and 21 – 24 January (in-person at JMA headquarters). Details are reported in [TCC News No. 79](#).

## 3. International meetings

### 3.1 Regional climate outlook forums

RCCs are expected to actively contribute to and lead useful discussions in Regional Climate Outlook Forums (RCOFs). In 2025, TCC experts participated in the following RCOFs in Asia together with WMC-Tokyo experts:

- 21st session of the Forum on Regional Climate Monitoring, Assessment and Prediction for Regional Association II (FOCRA II) in Qingdao, Shandong, China, from 14 to 16 May
- 31st session of the South Asian Climate Outlook Forum (SASCOF-31) in Pune, India, from 28 to 30 April
- 32nd session of the South Asian Climate Outlook Forum (SASCOF-32) online, 25 September and 3 October
- 24th session of the ASEAN Climate Outlook Forum (ASEANCOF-24) online, from 24 to 25 April
- 25th session of the ASEAN Climate Outlook Forum (ASEANCOF-25) online, from 27 to 30 October
- 13th session of the East Asia winter Climate Outlook Forum (EASCOF-13) in Ulaanbaatar, Mongolia, from 6 to 8 November

## 4. Publications

TCC has published its newsletter (TCC News) on a quarterly basis since 2005. The publication is intended to enhance communication and provide information to NMHSs and related communities about recent TCC developments, events and activities as well as details of the Center's reports on the state of the climate, monitoring results and outlooks. In 2025, TCC News No. 79 - 82 were issued and made available on the TCC website.

## 5. Plans for 2026

### - Contribution to the Global Framework for Climate Services (GFCS)

RCCs are expected to play a major role in GFCS implementation. In this context, TCC plans to further strengthen its activities and lead RA II contributions to the framework. These efforts will include the provision of ongoing assistance to NMHSs for better climate services, as well as maintenance of a site for information sharing on climate services in RA II.

### - Product/tool provision

The Interactive Tool for Analysis of the Climate System (iTacs) provided by TCC will be upgraded in spring 2026.

#### – Capacity development

TCC will host experts at its annual training seminar in the second half of FY 2026, and will continue to dispatch experts to NMHSs as necessary and host visitors from NMHSs upon request.

#### – International meetings

TCC will host the 14th session of EASCOF (EASCOF-14), which is planned for autumn 2026. The Center will continue its active contribution to RCOFs in the Asian region.

*(KURAMOCHI Masaya, Tokyo Climate Center)*

[<<Table of contents](#)   [<Top of this article](#)

## TCC contributions to Regional Climate Outlook Forums in Asia

WMO Regional Climate Outlook Forums (RCOFs) bring together national, regional and international climate experts on an operational basis to produce regional climate outlooks based on inputs from participating National Meteorological and Hydrological Services (NMHSs), regional institutions, Regional Climate Centres (RCCs) and global producers of climate predictions. By providing a platform for countries with similar climatological characteristics to discuss related matters, these forums ensure consistency in terms of access to and interpretation of climate information.

Representative TCC experts attended the 13th session of the East Asia Winter Climate Outlook Forum (EASCOF-13) in Ulaanbaatar in Mongolia from 6 to 8 November 2025. The session was hosted by the Information and Research Institute of Meteorology, Hydrology and Environment (IRIMHE) and the National Agency for Meteorology and Environmental Monitoring (NAMEM). Around 50 experts from China, Japan, the Republic of Korea and Mongolia attended to Review of Recent Climate over East Asia and Weather Events (Session 1), Climate and Weather extremes and their Impacts (Session 2), Technology, Management and Climate Service (Session 3), and Seasonal Prediction of the East Asian Winter Monsoon (Session 4). Two TCC experts gave presentations on the characteristics of summer 2025 in Japan (Session 1), extreme events and related effects under global warming in Japan (Session 2) and a seasonal outlook for winter 2025/2026 over Japan (Session 4). These exchanges of expertise are expected to help develop understanding of phenomena related to the East Asian climate and support improvement of associated climate services.

Based on an agreement regarding the Recommendations on Objective Seasonal Forecasting (OSF) for EASCOF, the meeting marked the first actual implementation of OSF. These recommendations resulted from discussions seeking an optimal EASCOF approach based on consideration of existing climate service operations in East Asia and the inherent nature of the regional climate.



These activities are intended to support the output of country-scale outlooks by NMHSs, and to contribute to the summarization of consensus outlooks as well as the reduction of climate disaster risk in the water, agriculture and health sectors for each target area. TCC and WMC Tokyo are committed to ongoing collaboration with operational climate communities to enhance progress in forecast skills and application of climate information toward the resolution of common issues and the realization of a world resilient to adverse climate conditions.

*(TAMAKI Yuko and SEZAKI Fumi, Tokyo Climate Center)*

[<<Table of contents](#)   [<Top of this article](#)

You can find the latest newsletter from the Japan International Cooperation Agency (JICA).

**JICA Magazine**

<https://jicamagazine.jica.go.jp/en/>

"JICA magazine" is a public relations magazine published by JICA. It introduces the current situations of developing countries around the world, the people who are active in the field, and the content of their activities.

Any comments or inquiry on this newsletter and/or the TCC website would be much appreciated.

Please e-mail to [tcc@met.kishou.go.jp](mailto:tcc@met.kishou.go.jp).

(Editors: HARADA Masashi, KURAMOCHI Masaya)

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