Tokyo Climate Center, Japan Meteorological Agency

TCC News

Winter 2022

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JMA's New Seasonal Ensemble Prediction System (JMA/MRI-CPS3)

The Japan Meteorological Agency (JMA) upgraded its Seasonal Ensemble Prediction System (Seasonal EPS) to the JMA/MRI-CPS3 version on 10 February 2022.

1. New Seasonal EPS

Details of the new system are available on the Tokyo Climate Center website (https://ds.data.jma.go.jp/tcc/tcc/products/model/outline/cps3_description.html).

A major feature of the new arrangement is daily five-ensemble member calculation. Users can access to the latest six-month forecast data from daily updated atmospheric and oceanic initial conditions and use them with their own optimal ensemble structure of lagged average forecasting (LAF), such as 50 members (5 members x 10 days), 100 members (5 members x 20 days) and so on. In addition, JMA targets seamless usage for future shorter-range forecasting.

2. EPS performance

ENSO predictive skill is illustrated in Figure 1-1 with anomaly correlation coefficients (ACCs) for NINO3 (150 – 90°W, 5°S – 5°N) SSTs between MGDSST analysis. The hindcast scores computed with 10-member ensembles based on 15-

day LAF starting every month for the period from 1991 to 2020. Improved overall ENSO predictive skill is observed for all lead times.

Figure 1-2 shows ACCs averaged over the Northern Hemisphere (20 – 90°N) for three-month average 2-m temperature between JRA-3Q reanalysis and 10-member ensemble hindcasts with 15-day LAF. The new system exhibits enhanced performance over the previous one for all forecasts, and scores for other elements are also improved overall. More detailed hindcast verification is available on the TCC website.

Skill in real-time seasonal forecasts is expected to be better than for hindcasts, as more ensemble members can be used with the optimal LAF ensemble structure.

3. New Seasonal EPS products

In its roles as the Tokyo World Meteorological Centre and the Tokyo Climate Center, JMA provides the real-time seasonal forecast products listed below around the 20th of each month on the Tokyo Climate Center website. In line with the seasonal EPS upgrade, all grid sizes have been enhanced from 2.5 to 1.25 degrees.

Table 1-1 Products from the new seasonal EPS available on the TCC website.

Gridded data (ID/password required)	https://ds.data.jma.go.jp/tcc/tcc/gpv/model/CPS3/CPS3_mem.html https://ds.data.jma.go.jp/tcc/tcc/gpv/model/CPS3/CPS3_ens.html https://ds.data.jma.go.jp/tcc/tcc/gpv/model/CPS3_Hind/CPS3_Hind.html https://ds.data.jma.go.jp/tcc/tcc/gpv/model/CPS3/CPS3_syserr.html
Forecast maps	https://ds.data.jma.go.jp/tcc/tcc/products/model/map/4mE/map1/pztmap.php https://ds.data.jma.go.jp/tcc/tcc/products/model/map/4mE/map1/zpcmap.php https://ds.data.jma.go.jp/tcc/tcc/products/model/map/7mE/map1/pztmap.php https://ds.data.jma.go.jp/tcc/tcc/products/model/map/7mE/map1/zpcmap.php
Probabilistic forecasts	https://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/3-mon/index.html https://ds.data.jma.go.jp/tcc/tcc/products/model/probfcst/warm_cold_season/index.html
Forecast indices (ID/password required)	https://ds.data.jma.go.jp/tcc/tcc/gpv/indices/index.html
Forecast SSTs Indices	https://ds.data.jma.go.jp/tcc/tcc/products/model/indices/3-mon/indices1/shisu_forecast.php
Forecast Verification	https://ds.data.jma.go.jp/tcc/tcc/products/model/verif/4mE/index.html https://ds.data.jma.go.jp/tcc/tcc/products/model/verif/7mE/index.html
Hindcast Verification	https://ds.data.jma.go.jp/tcc/tcc/products/model/hindcast/CPS3/index.html

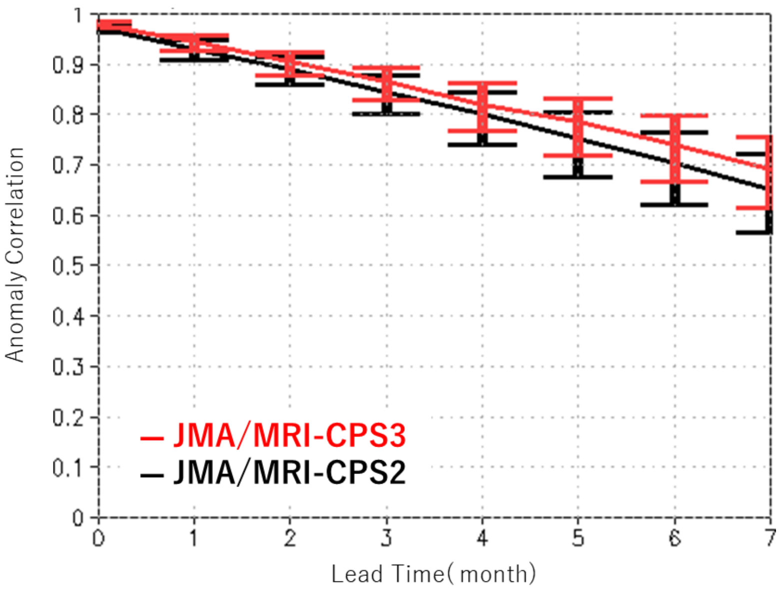

Figure 1-1. ENSO prediction skill
Anomaly correlation coefficients (ACCs) for NINO3 (150 – 90°W, 5°S – 5°N) SSTs between MGDSST analysis and hindcasts

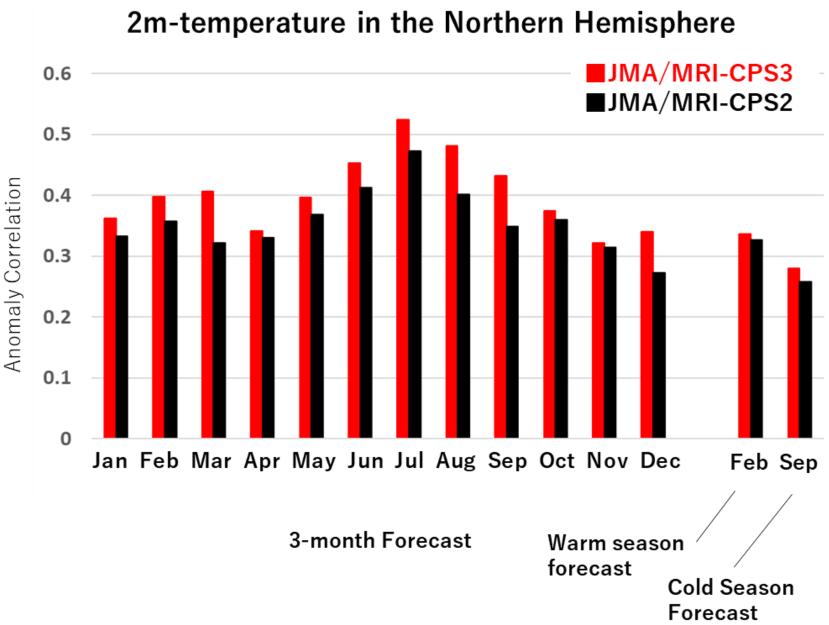

Figure 1-2. Seasonal prediction skill
Anomaly correlations averaged over the Northern Hemisphere (20 – 90°N) for three-month average 2-m temperatures between the JRA-3Q reanalysis and 10-member ensemble hindcasts

(YAMADA Takashi, World Meteorological Centre of Tokyo)

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2021 global surface temperature 6th highest since 1891

JMA analysis indicates that the annual anomaly* of the global average surface temperature for 2021 (i.e., the combined average of near-surface air temperatures over land and sea-surface temperatures) was +0.22°C above the 1991 – 2020 average, making it the sixth-warmest year since 1891 (Figure 2-1).

On a longer time scale, the annual global average surface temperature has risen at a rate of about +0.73°C per century. Global temperatures from 2014 to 2021 were the highest on record, with nine of the ten warmest occurring during the last decade (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. The global mean surface temperature tends to decrease after La Niña events. The La Niña event that started in boreal summer 2020 ended in boreal spring 2021, and another La Niña event emerged in boreal autumn 2021.

High temperature deviations were particularly evident over wide areas of southern Europe and Northern Africa to the Middle East and East Asia, and over central parts of North America, the North Pacific and the Atlantic Ocean (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://ds.data.jma.go.jp/tcc/tcc/products/gwp/gwp.html.

* In May 2021, JMA replaced the 1981 – 2010 baseline period for global monitoring with that of 1991 – 2020 (see TCC News No. 65).

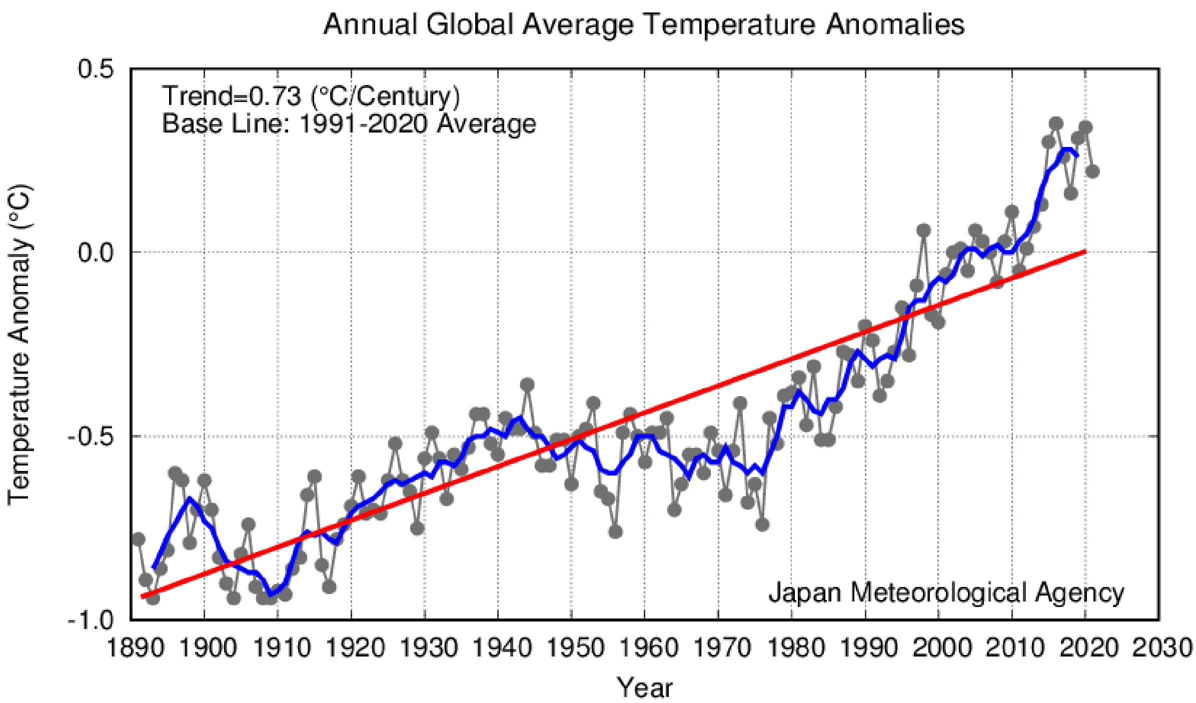

Figure 2-1 Long-term change in annual mean surface temperature anomalies over the globe
Anomalies are derived from the 1991 – 2020 average baseline. The thin black line indicates surface temperature anomalies for each year, while the blue and red lines indicate the related five-year running mean and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

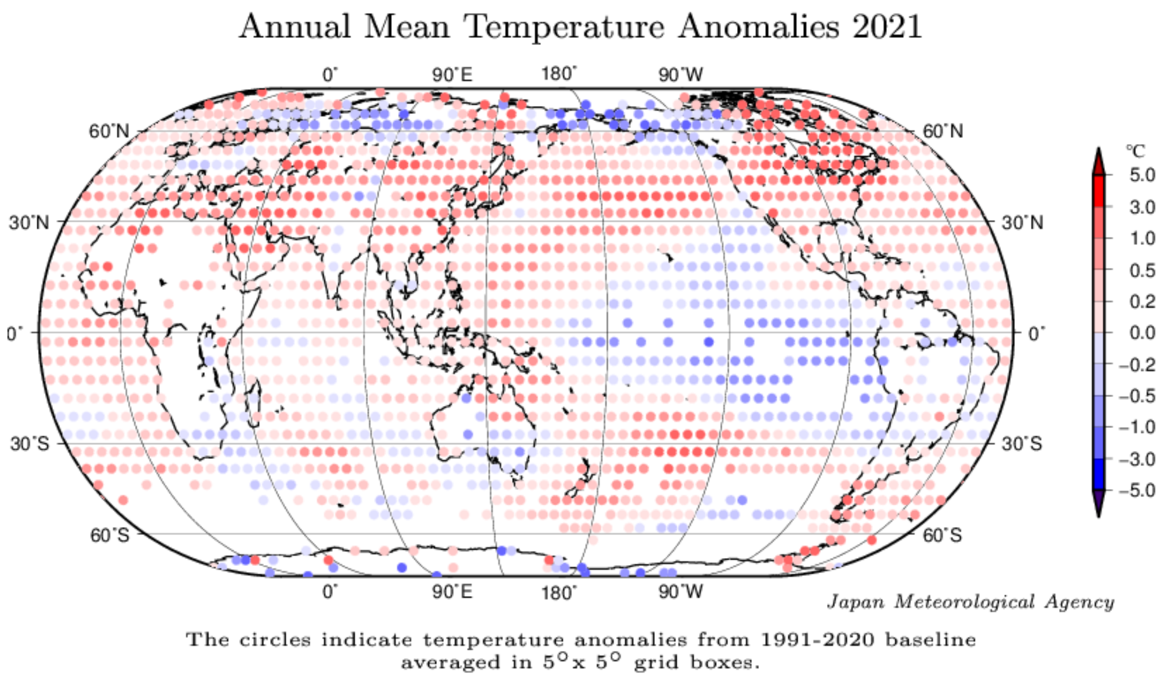

Figure 2-2 Annual mean temperature anomalies in 2021
The circles indicate anomalies of surface temperature averaged in 5° x 5° grid boxes. The annual mean global temperature anomaly is determined by averaging the anomalies, derived from the 1991 – 2020 average baseline, of all grid boxes weighted by the grid box area.

Table 2-1 Ranking of annual global average temperatures

Rank	Year	Temperature Anomaly w.r.t. 1991 – 2020 average
1	2016	+0. 35
2	2020	+0. 34
3	2019	+0. 31
4	2015	+0. 30
5	2017	+0. 26
6	2021	+0. 22
7	2018	+0. 16
8	2014	+0. 13
9	2010	+0. 11
10	2013	+0. 07

(TAMAKI Yuko, Tokyo Climate Center)

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Highlights of the Global Climate in 2021

Annual mean temperatures were above normal in the Northern Hemisphere and elsewhere, especially in the eastern part of East Asia, from the southern part of Central Asia to the northern part of Northern Africa, and from eastern Canada to the northern USA (Figure 3-1).

Extremely high temperatures were observed in at least five months from the northern Korean Peninsula to southeastern China, in and around the southern part of Central Asia, from the northern part of northern Africa to the western Middle East, from southeastern Canada to the northern USA, and in the central part of North America (Figure 3-3).

Central and western North America experienced heat waves in June and July, and Canada recorded a new record-high temperature.

Annual precipitation amounts were above normal from the southern part of Central Siberia to eastern China, in and around Indonesia, and in western India (Figure 3-2).

Annual precipitation amounts were below normal from the southern part of Central Asia to the eastern Arabian Peninsula and in the northwestern part of northern Africa (Figure 3-2).

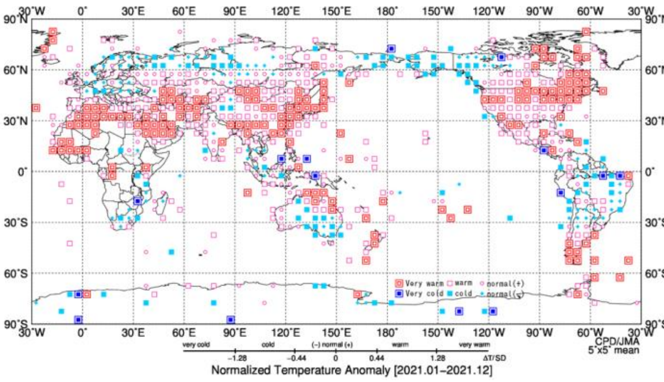
Extremely high precipitation amounts were observed in at least five months from the southern part of Central Siberia to northern Mongolia, from Sumatra Island to Sulawesi Island in Indonesia, and in eastern and central Europe (Figure 3-3).

Extremely light precipitation amounts were observed in at least eight months from southeastern Canada to the northern USA (Figure 3-3).

Major extreme climatic events and weather-related disasters occurring in 2021 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 2021 on the TCC website.

Table 3-1 Major extreme climatic events and weather-related disasters worldwide in 2021

	Type	Period	Area
(1)	Wet	January-February, April-September	From the southern part of Central Siberia to northern Mongolia
(2)	Wet	February, August-October	Central China
(3)	Heavy Rain	July	Central China
(4)	Warm	February-March, May, July, September	From the northern Korean Peninsula to southeastern China
(5)	Heavy Snow	January	In and around the Sea of Japan side of eastern Japan
(6)	Typhoon	December	From the central to southern Philippines
(7)	Wet	January, March, August-September, November	From Sumatra Island to Sulawesi Island
(8)	Cyclone	April	From southeastern Indonesia to Timor-Leste
(9)	Warm	January, May, October	In and around the eastern part of South Asia
(10)	Heavy Rain	May-November	In and around South Asia
(11)	Flood	February	Northern India
(12)	Warm	February, April-September, December	In and around the southern part of Central Asia
(13)	Wet	January, May, August, November-December	Eastern Europe
(14)	Wet	January, May-August	Central Europe
(15)	Warm	January-February, May-September, November	From the northern part of Northern Africa to the western Middle East
(16)	Warm	January, March, June, October	Western Saudi Arabia
(17)	Warm	January, September, November-December	The southwestern part of Western Africa
(18)	Wet	March, June-August, October	From the northeastern to southern USA
(19)	Warm	January, April, June, August, October-November	From southeastern Canada to the northeastern USA
(20)	Dry	January-July, November	From southeastern Canada to the northern USA
(21)	Warm	January, June-July, September-October	The central part of North America
(22)	Heat Wave	June-July	From the central to western part of North America
(23)	Cold Wave	February	From the central to southern USA
(24)	Tornado	December	The central USA
(25)	Wet	May-June, August	Central Mexico
(26)	Warm	August-October, December	From eastern Peru to northern Bolivia
(27)	Warm	July-August, October-November	Northeastern Australia



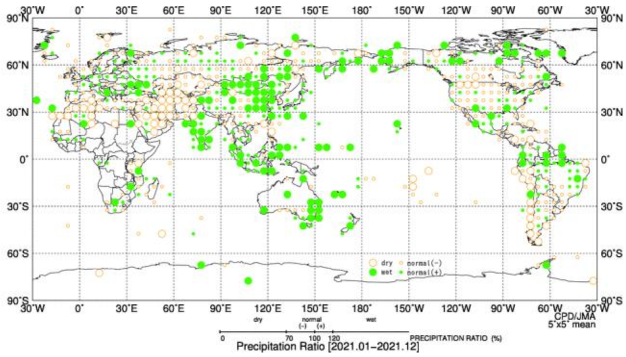


Figure 3-1 Normalized annual mean temperature anomalies for 2021

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 2021

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.

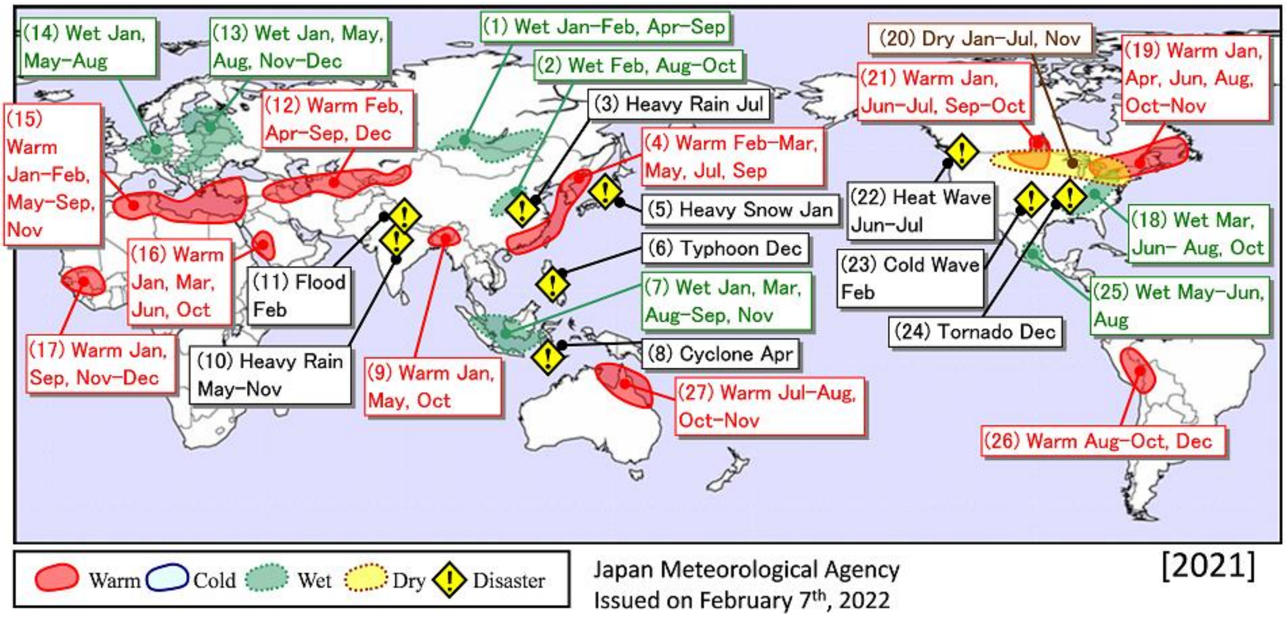


Figure 3-3 Major extreme climate events and weather-related disasters worldwide in 2021

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

(OKUNAKA Yuka, Tokyo Climate Center)

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Summary of Japan's Climatic Characteristics for 2021

Annual characteristics

Japan's climatic characteristics for 2021 can be summarized as follows:

- Annual mean temperatures were above normal nationwide, especially in northern and western Japan.
- Annual precipitation amounts were significantly above normal on the Pacific side of eastern Japan and above normal on the Pacific side of northern Japan, on the Sea of Japan side of eastern Japan, and in western Japan.
- From December 2020 to mid-January 2021, extremely cold air from the north caused heavy snowfall on the Sea of Japan side of the country. Heavy snowfall was observed from January 7th to 11th (including a 72-hour total of 187 cm in the Takada area of Niigata Prefecture and new snowfall records at 19 locations), causing extreme traffic disruption. Winter snowfall was considerably heavier than normal on the Sea of Japan side of western Japan and heavier than normal on the Sea of Japan side of eastern Japan.
- In August, a strong stationary front between the Okhotsk High and the North Pacific Subtropical High brought large amounts of water vapor, causing record monthly precipitation in western Japan.

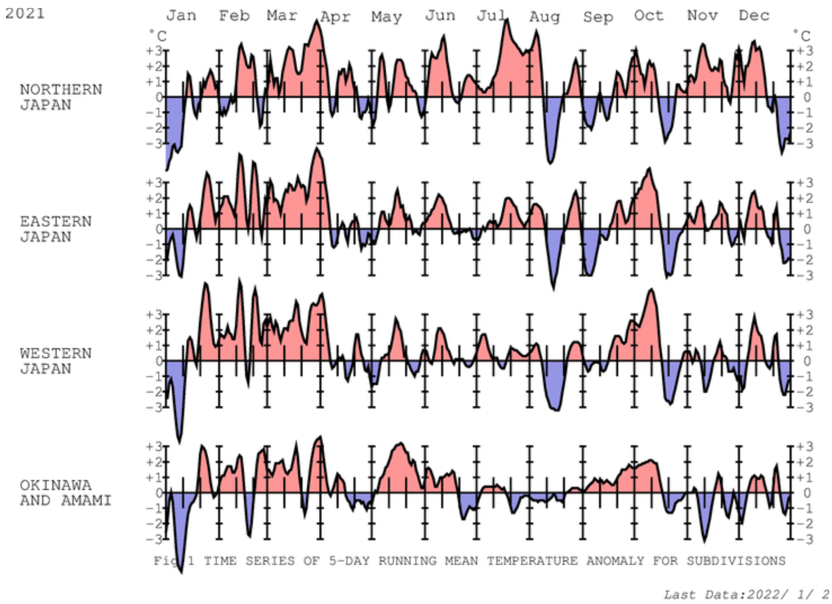

Figure 4-1 Time-series representation of five-day running mean temperature anomalies for subdivisions (January – December 2021)
The normal is the 1991 – 2020 average.

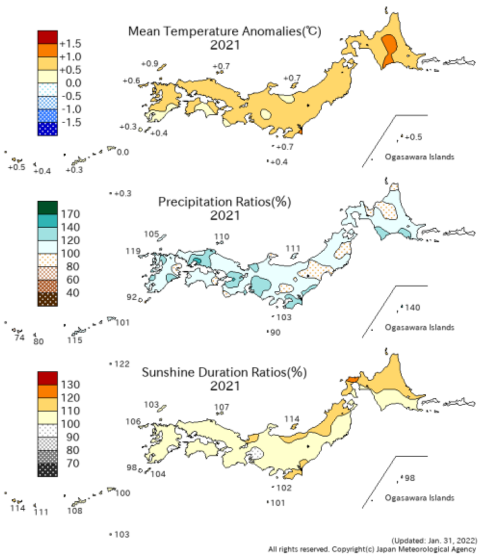

Figure 4-2 Annual climate anomalies/ratios for Japan in 2021

Seasonal characteristics

(a) Winter (December 2020 – February 2021)

The winter monsoon was stronger than normal in the first half of winter and weaker than normal in the second half. These conditions brought large variations in temperatures all over Japan.

Seasonal temperatures were significantly above normal in eastern Japan. Seasonal precipitation amounts were significantly above normal on the Sea of Japan side of eastern Japan due to cold air inflow and frequent passage of low-pressure systems. Seasonal sunshine durations were significantly above normal in western Japan due to frequent passage of high-pressure systems in the second half of winter.

(b) Spring (March – May)

Seasonal temperatures were significantly above normal nationwide due to significantly weak cold air-mass inflow in March and other factors. Stronger-than-normal activity in low-pressure systems throughout spring caused seasonal precipitation amounts to be significantly above normal in northern Japan. The Baiu rain front was active and displaced northward of its normal climatological latitude in May, causing seasonal precipitation amounts to be significantly above normal on the Pacific side of western Japan. Seasonal sunshine durations were significantly above normal in Okinawa/Amami.

(c) Summer (June – August)

Seasonal precipitation amounts were significantly above normal on the Pacific side of eastern Japan and in western Japan, mainly due to active stationary fronts and moist air inflow in August, while amounts on the Sea of Japan side of northern Japan were significantly below normal. Seasonal mean temperatures and seasonal sunshine durations were significantly above normal in northern Japan. Seasonal mean temperatures were above normal in eastern Japan, and seasonal sunshine durations were above normal on the Sea of Japan side of eastern Japan. These observations can be attributed to high-pressure systems in early June and late July. Sunshine durations were below normal in Okinawa/Amami in association with tropical low-pressure systems passing around the region.

(d) Autumn (September – November)

In the first half of autumn, the activity of the stationary autumn rain front and influences of typhoons were weaker than normal. In the second half of the season, cold-air inflow to northern Japan was weaker than normal and cut-off lows frequently affected the region. As a result, seasonal mean temperatures were above normal in northern and western Japan. Seasonal precipitation amounts were above normal on the Sea of Japan side of northern Japan, and below normal on the Pacific side of eastern Japan, in western Japan and in Okinawa/Amami. Seasonal sunshine durations were significantly above normal on the Sea of Japan side of northern Japan, in eastern Japan and in Okinawa/Amami, and above normal on the Pacific side of northern and western Japan.

(OKUBO Tadayuki, Tokyo Climate Center)

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TCC Training Seminar on One-month Forecast

JMA's Tokyo Climate Center (TCC) has engaged in efforts to help National Meteorological and Hydrological Services (NMHSs) improve their climate services since 2008. The Center's two major activities in this regard involve providing basic climate data, products and tools to NMHSs through its website and assisting with capacity development at NMHSs in the Asia-Pacific region. TCC holds annual training seminars as part of capacity development activities in its role as an RCC in the WMO RA II area. In addition to running annual training seminars, TCC arranges expert visits to NMHSs to promote the effective transfer of technology and discuss the support for climate services.

After the cancelation of the 2020 session due to COVID-19, the Training Seminar on One-month Forecasts was held online on 1, 2 and 7 December 2021. The event was attended by 14 trainees and 4 observers from NMHSs in Bangladesh, Bhutan, Hong Kong (China), Indonesia, Lao People's Democratic Republic, Malaysia, Mongolia, Nepal, Pakistan, Papua New Guinea, the Philippines, Sri Lanka, Thailand and Viet Nam. The seminar focused on improving knowledge about one-month forecasts and on enhancing skills in generating one-month forecast products using statistical downscaling methods. The course included presentations and practical exercises using data, products and a web-based application tool available on the TCC website as well as in-situ observation data provided by attendees. At the end of the seminar, all participants gave presentations on one-month forecasts in their own countries and engaged in fruitful discussions with presenters and others present.

The content of the presentations is available on the TCC website at https://ds.data.jma.go.jp/tcc/tcc/library/library2021.html.

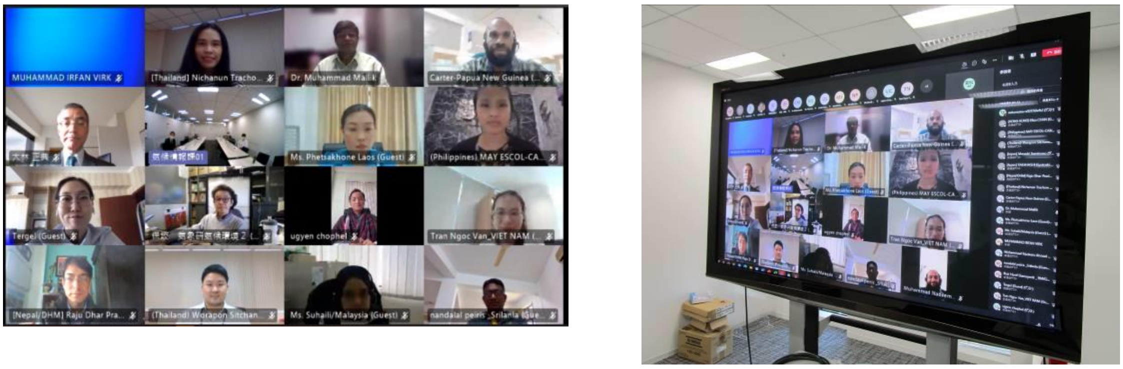

Figure 5-1 Attendees and Tokyo Climate Center staff after the opening presentation by Mr. OBAYASHI Masanori, Director-General of the Atmosphere and Ocean Department at the Japan Meteorological Agency (1 December, 2021)

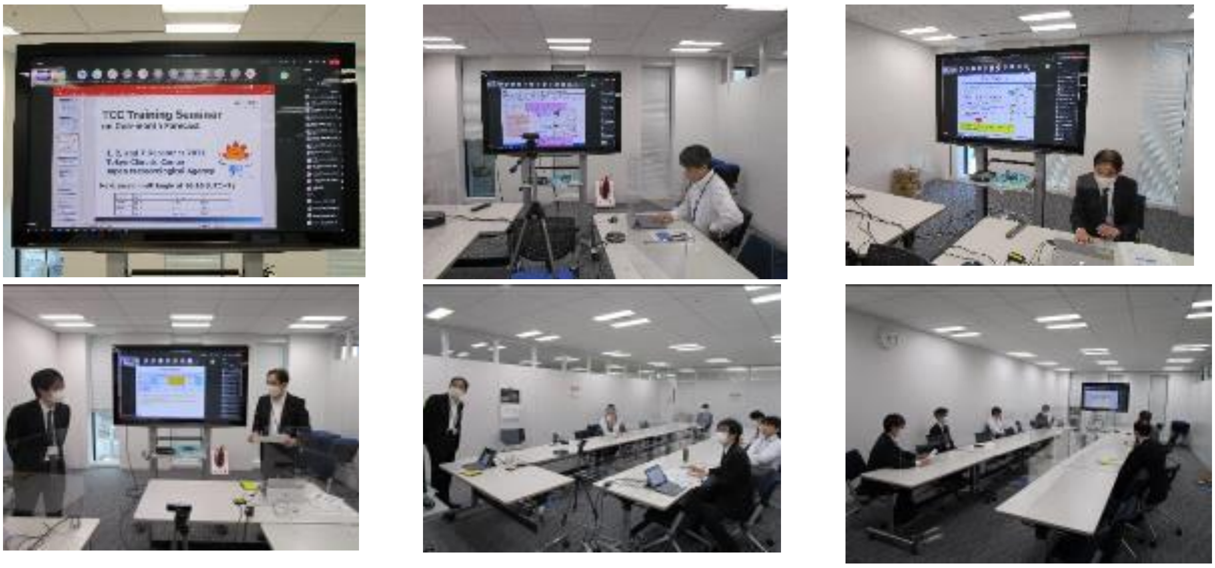

Figure 5-2 Presentations and practical exercises at the seminar

(WAKAMATSU Shunya, Tokyo Climate Center)

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Update of website on RA II Information Sharing for Climate Services

Climate services today play increasingly important roles in helping various socio-economic sectors to reduce related negative impacts and adapt to climate change and global warming. Against such a background, National Meteorological and Hydrological Services (NMHSs) need to provide high-quality, high-precision climate information in consideration of accessibility and user needs, and engage in various activities related to the Global Frameworks for Climate Services (GFCS) initiative to promote utilization of climate information in user sectors.

For the improvement of climate services and the successful implementation of GFCS, it is important to share information on the services, good practices and lessons learned in climate-related activities, especially among NMHSs in climatologically similar region. However, such important information has not so far been fully shared among NMHSs in WMO Regional Association II (RA II). In response to Decision 35 taken at the 16th sessions of RA II, TCC operates a dedicated website at https://ds.data.jma.go.jp/tcc/RaiiInfoshare/ (see TCC News No. 36, No. 50 and No. 59 for more information).

A November 2021 questionnaire survey conducted by TCC to support updating of the website generated responses from as much as 11 countries. Based on the information provided, the site was refined in December 2021 and January 2022. TCC is committed to supporting the improvement of RA II climate services via the operation of the website.

(WAKAMATSU Shunya, Tokyo Climate Center)

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TCC Activity Report for 2021

In 2021, the Tokyo Climate Center (TCC) continued to support the climate services of National Meteorological and Hydrological Services (NMHSs) in Asia-Pacific countries by providing and enhancing data and products, holding training seminars, publishing quarterly newsletters and participating in online international meetings.

1. Enhancement of data/products/tools on the TCC website

1.1 Issuance of special reports on extreme events

In a mandate role as a WMO Regional Climate Centre (RCC) in Regional Association II (RAII), 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://ds.data.jma.go.jp/tcc/tcc/products/clisys/reports/index.html).

A series of heavy snowfall events hit Japan from mid-December 2020 onward, especially on the Sea of Japan side, with new records observed in some places. TCC issued a press release on factors behind this snowfall and low temperatures around the country, and uploaded an English-language report to its website (https://ds.data.jma.go.jp/tcc/tcc/news/press_20210115.pdf).

Japan experienced record-warm weather conditions in March, and TCC issued a report summarizing the related characteristics of atmospheric circulation anomalies and the underlying mechanisms. The information was published in English on the Center's website (https://ds.data.jma.go.jp/tcc/tcc/news/press_20210421.pdf).

In mid-August 2021, areas from western to eastern Japan experienced record-heavy rain. In this context, the Japan Meteorological Agency (JMA), with the help of the Tokyo Climate Center Advisory Panel on Extreme Climatic Events (see TCC News No. 28), investigated atmospheric and oceanic conditions considered to have contributed to such climate extremes and summarized related primary factors. The comprehensive report is available on the website (https://ds.data.jma.go.jp/tcc/tcc/news/press_20210924.pdf).

1.2 Upgrade of the Global Ensemble Prediction System for One-month Prediction

JMA upgraded its Global EPS for one-month prediction on 1st April 2021, increasing the number of vertical model levels from 100 to 128 and improving surface/atmospheric initial conditions. Hindcast gridded data and verification charts for the new EPS are available to registered users via the TCC website.

Elsewhere, the provision of 2.5-degree forecast and hindcast gridded data for one-month prediction was terminated on 25 March 2021.

The ensemble size of forecast data for each initial day was changed from 24 to 25 for Tuesday and from 26 to 25 for Wednesday.

1.3 Release of Indian Ocean Dipole products

The Indian Ocean Dipole (IOD) is a major mode of interannual climate variability in the tropics, significantly affecting climate conditions on regional and global scales. From discussions with NMHSs (such as those held during the 2019 visit to Meteorological Service Singapore), TCC recognized a need to gather information on this mode. In response, the Center released new online IOD products on 28 January 2021, including data related to monitoring and associated effects on global climate/atmospheric circulation. A brief description of the products is provided in TCC News No. 63.

1.4 Update of website on RA II Information sharing for Climate Services

For the improvement of climate services and successful implementation of the Global Framework for Climate Services, it is important to share information on the services, good practices and lessons learned in climate-related activities, especially among NMHSs in climatologically similar region. However, such important information has not so far been fully shared among NMHSs in WMO RA II. In response to Decision 35 taken at the 16th session of Regional Association II (RA II) to improve information sharing on climate services in the region, TCC operates a dedicated website (https://ds.data.jma.go.jp/tcc/RaiiInfoshare/, see TCC News No.36 for more information).

A November 2021 questionnaire survey conducted by TCC for updating of the website generated responses from more than 10 Members thanks to the kind cooperation of their involvement. Based on the information provided, the site was updated and refined in December 2021.

1.5 Operational application of new climatological normals for 1991 – 2020

Under the Technical Regulations of the World Meteorological Organization (WMO-No. 49), climatological standard normals are averages of climatological data computed for 30-year periods (e.g., 1 January 1981 to 31 December 2010, 1 January 1991 to 31 December 2020 and so forth.) Countries should calculate climatological standard normals as soon as possible after the end of a standard normal period.

TCC switched from the previous climatological normal period of 1981 – 2010 to 1991 – 2020 on 19 May 2021. TCC products (other than those from WMC Tokyo for long-range forecasting and Model Prediction for NINO Regions) have been based on this new period since that date.

2. Capacity development

TCC holds annual training seminars as part of capacity-development activities related to its role as an RCC in RA II. In addition to running annual training seminars, it also arranges expert visits to and hosts visitors from NMHSs to support exchanges of views on climate services and the effective transfer of technology.

2.1 Training seminar

TCC holds training seminars every fiscal year (April – March), with the December 2021 event covering one-month forecasts. The seminar was held online for the first time due to COVID-19. Details of the events are reported in TCC News No. 66.

3. International meetings

3.1 Regional Climate Outlook Forums

RCCs are expected to actively contribute to and lead profound discussions in Regional Climate Outlook Forums (RCOFs). In 2021, TCC experts participated in the following RCOFs in Asia:

- Seventeenth session of the Forum on Regional Climate Monitoring, Assessment and Prediction for Regional Association II (FOCRA II-17) held online, on 7 May
- Nineteenth session of the South Asian Climate Outlook Forum (SASCOF-19) held online, from 26 to 28 April
- Twentieth session of the South Asian Climate Outlook Forum (SASCOF-20) held online, from 27 to 30 September
- Ninth session of the East Asia winter Climate Outlook Forum (EASCOF-9) held online, on 4 November
- Seventeenth session of the ASEAN Climate Outlook Forum (ASEANCOF-17) held online, from 22 to 26 November
- Twentieth session of the North Eurasian Climate Forum (NEACOF-20) held online, on 20 May

TCC attendees gave presentations on seasonal predictions based on JMA's numerical model and participated in discussions toward the formulation of a consensus statement on regional forecasts.

In collaboration with TCC, a representative from the World Meteorological Centre Tokyo (WMC Tokyo) attended FOCRA II-17, SASCOF-19, SASCOF-20, and NEACOF-20 online. WMC Tokyo also produced presentation materials for ASEANCOF-17.

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 2021, TCC News No. 63 – 66 were issued and made available on the TCC website.

5. Plans for 2022

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

RCCs are expected to play a major role in the implementation of the GFCS. TCC plans to further strengthen its activities and lead RA II's contribution to the Framework. Such activities include the provision of further assistance to NMHSs for better climate services, as well as maintenance of the portal site for Information Sharing on Climate Services in RA II.

- New/upgraded data, products and tool development

As per TCC News No. 65, on 14 February 2022 JMA upgraded its Seasonal Ensemble Prediction System (Seasonal EPS) from JMA/MRI-CPS2 to JMA/MRI-CPS3, which was adopted as the basis for three-month prediction products such as gridded date files, forecast maps and verification maps. Model forecasts of SST anomalies for NINO regions (provided via the El Niño and Indian Ocean Dipole online resources) were also influenced by the upgrade.

Specifications for operational forecasting were changed from 13 ensemble members every 5 days to 5 ensemble members every day. The baseline period for seasonal forecast products was also changed to 1991 – 2020.

In line with this upgrade, TCC plans to switch from CPS2 to CPS3 data provision as per the description page. CSP2 2.5-degree gridded data (GPV) for three-month and warm/cold-season prediction were discontinued in January 2022, and those for six-month prediction will still be provided for a few months in parallel with the new CPS3 gridded data.

Further enhancements of the new dataset planned for autumn 2022 include the utilization of JRA-3Q (Japanese Reanalysis for Three-Quarters of a Century), COBE-SST2 (Centennial in situ Observation-Based Estimates of the Variability of SST and Marine Meteorological Variables, version 2), and MOVE/MRI.COM-G3 (the Multivariate Ocean Variational Estimation/Meteorological Research Institute Community Ocean Model - Global version 3). These improvements will influence several products on the TCC website, including the interactive iTacs tool, with details to be provided in due course.

- Capacity development

In the last quarter of the year, TCC will hold its annual training seminar with a dozen invited experts as attendees. The Center will also continue to dispatch experts to NMHSs as necessary and host visitors from NMHSs upon request. The format of these activities (i.e., online or in person) will depend on COVID-19 developments.

(WAKAMATSU Shunya, Tokyo Climate Center)

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