Monthly Highlights on the Climate System (April 2025)

Highlights in April 2025

- The tripole pattern of positive, negative, and positive sea surface temperature (SST) anomalies in the equatorial Pacific Ocean weakened but persisted. Positive SST anomalies prevailed over the Indian Ocean.
- Convective activity was enhanced around the maritime continent, while suppressed in the western Indian Ocean. From the western to central equatorial Pacific, active and suppressed convection was observed in the Southern Hemisphere side and the Northern Hemisphere side, respectively.
- In the upper troposphere, corresponding to the convective activity, anti-cyclonic circulation anomalies were seen over Southeast Asia and Australia.
- In the 500-hPa height field of the Northern Hemisphere, the main polar vortex located in the Barents Sea and significant positive anomalies were seen over northern Europe and the Sea of Okhotsk. Positive anomalies were dominant in the mid-latitudes while weak negative anomalies were seen over East Asia.
- The subtropical jet stream meandered over East Asia resulting the southward shift near Japan.
- In the sea level pressure field, negative anomalies were seen over East Asia and a pressure trough formed from the Yellow Sea to the Sea of Japan.
- Monthly mean temperatures were above normal in northern/eastern/western Japan while below normal in Okinawa/Amami. Monthly sunshine durations were the lowest for April since 1946 in the Sea of Japan side and the Pacific side of northern Japan.

Climate in Japan (Fig. 1):

- Monthly mean temperatures were above normal in northern/eastern/western Japan, because the regions were likely to be affected by warm-air inflow. On the other hand, they were below normal in Okinawa/Amami, because the regions were affected by cold-air inflow in early April.
- Monthly precipitation amounts were significantly above normal on the Sea of Japan side of northern Japan and on the Pacific side of northern Japan. Monthly sunshine durations were the lowest on record on the Sea of Japan side of northern Japan and the lowest on record, tying the record of 2006 on the Pacific side of northern Japan for April since 1946, because the regions were well affected by low pressure systems.
- On the other hand, monthly precipitation amounts were significantly below normal on the Sea of Japan side of western Japan and on the Pacific side of western Japan, because the regions were well covered by high-pressure systems.

World Climate

-The monthly anomaly of the global average surface temperature (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.55°C (2nd warmest for April since 1891) (preliminary value) (Fig. 2). On a longer time scale, global average surface temperatures have risen at a rate of about 0.81°C per century in April (preliminary value).

- Extreme climate events were as follows (Fig. 3).
  - Monthly mean temperatures were extremely high in eastern China, in Eastern Siberia, from India to the Arabian Peninsula via Central Asia, in Europe and in and around Mauritius.
  - Monthly precipitation amounts were extremely high in Siberia, in and around Turkey and in eastern Australia.
  - Monthly precipitation amounts were extremely low from central to western Europe.

Oceanographic Conditions (Fig. 4):

- In the equatorial Pacific, positive SST anomalies were observed to the west of South America and negative anomalies were observed from the west of the dateline to the central part. Both the monthly mean SST anomaly averaged over the NINO.3 region and the SST deviation from the latest sliding 30-year mean over the region were +0.1˚C (Fig. 5).

- In the North Pacific, remarkably positive SST anomalies were observed from the seas east of the Philippines to the central part of the subtropics and around the dateline in the mid-latitudes, and remarkably negative SST anomalies were observed to the southwest of California. In the South Pacific, remarkably positive SST anomalies were observed in the western and central parts of the mid-latitudes.
- In the tropical Indian Ocean, remarkably positive SST anomalies were observed from the western part to around India and in the southeastern part.
- In the North Atlantic, remarkably positive SST anomalies were observed in the western part of the subtropics and the west of Europe. In the South Atlantic, positive and negative SST anomalies were observed in the western and eastern parts of the tropics, respectively.

Tropics:

- Convective activity was enhanced from the Bay of Bengal to the Maritime Continent, to the Southern Hemisphere side of the western and central equatorial Pacific, and the eastern equatorial Pacific, and suppressed over the western to central Indian Ocean, from the western and central equatorial Pacific to the Northern Hemisphere side (Fig. 6).
- Eastward propagation of the active phase of equatorial intraseasonal oscillation was unclear (Fig. 7).
- In the upper troposphere, anti-cyclonic circulation anomalies straddling the equator were seen from the eastern Indian Ocean to the Maritime Continent. A wavy pattern of circulation anomalies was seen from south China to the northeast, with cyclonic circulation anomalies over western Japan and anti-cyclonic circulation anomalies from the Sea of Okhotsk to the east of Japan (Fig. 8).
- In the lower troposphere, anti-cyclonic circulation anomalies straddling the equator were seen over the western to central tropical Pacific.
- In the sea level pressure field, positive anomalies were seen over the eastern Indian Ocean and over the western to central tropical Pacific, and negative anomalies were seen over the western Indian Ocean, around the northern coast of Australia, and over the eastern equatorial Pacific. The Southern Oscillation Index value was +0.5 (Fig. 5).

Extratropics:

- In the 500-hPa height field (Fig. 9), at the high-latitudes, the split polar vortex was centered in the Barents Sea, and positive anomalies were seen in northern Europe and the Sea of Okhotsk. At the mid-latitudes, positive anomalies were seen in Central Asia, the central to eastern North Pacific, and the western North Atlantic, while weak negative anomalies in East Asia, the eastern North Atlantic, and the eastern Mediterranean Sea.
- The westerly jet stream was stronger than normal over western North America (Fig. 10). The subtropical jet stream was stronger than normal over Africa and shifted southward from its normal position over East Asia. Southward meandering of the polar-front jet stream was weak in and around Japan.
- In the sea level pressure field (Fig. 11), positive anomalies were seen from the Arctic Ocean to northern Europe, from the Sea of Okhotsk to the Bering Sea, and from the central North Pacific to western North Atlantic through North America. Negative anomalies were seen from western Siberia to around Japan.
- Temperatures at 850-hPa were above-normal over Eurasia except in northern Western Siberia and along the Arctic Ocean coast. Europe and the northwestern North Pacific were also above-normal, and the Barents Sea was below-normal (Fig. 12).
- In the 30-hPa height field, the stratospheric polar vortex in 2024/2025 winter came to an end.
- The zonal mean zonal wind in the troposphere in both hemispheres were westerly anomalies in the 60° latitude band and easterly anomalies in the 30° latitude band. The zonal mean temperatures in the troposphere were above normal in a wide area.

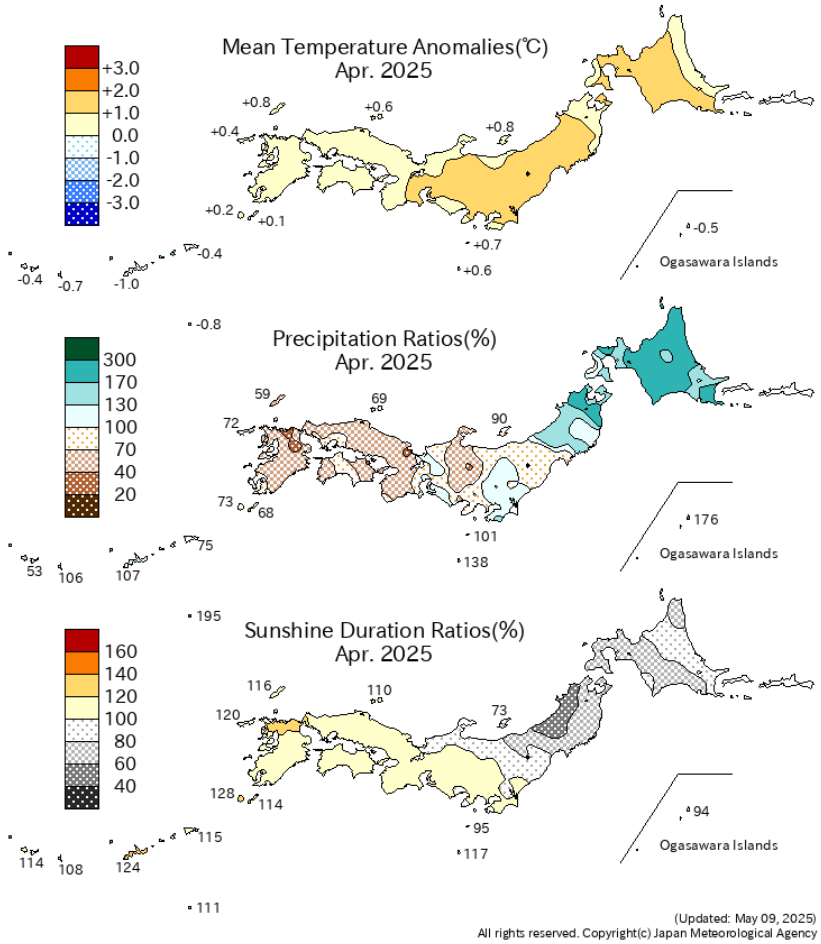

Fig.1 Monthly climate anomaly/ratio over Japan (April 2025)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
The base period for the normal is 1991-2020.

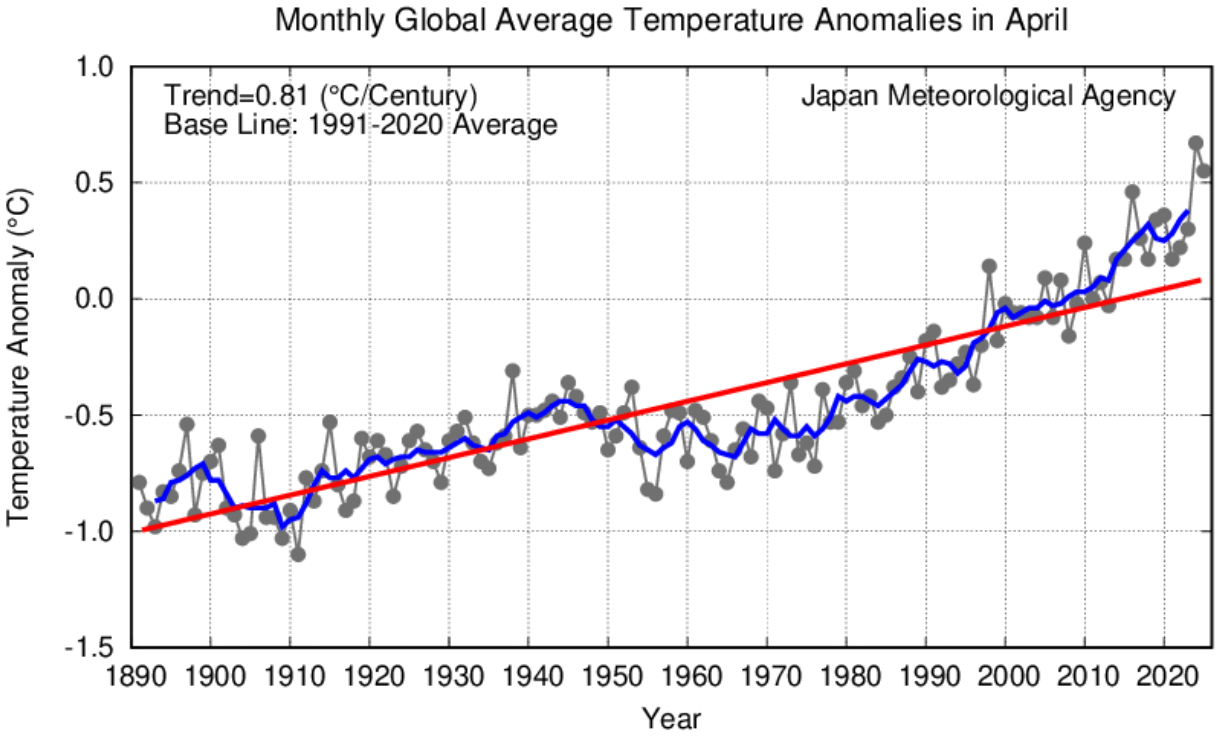

Fig.2 Long-term change in monthly anomalies of global average surface temperature in April
The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations from the 1991-2020 average.

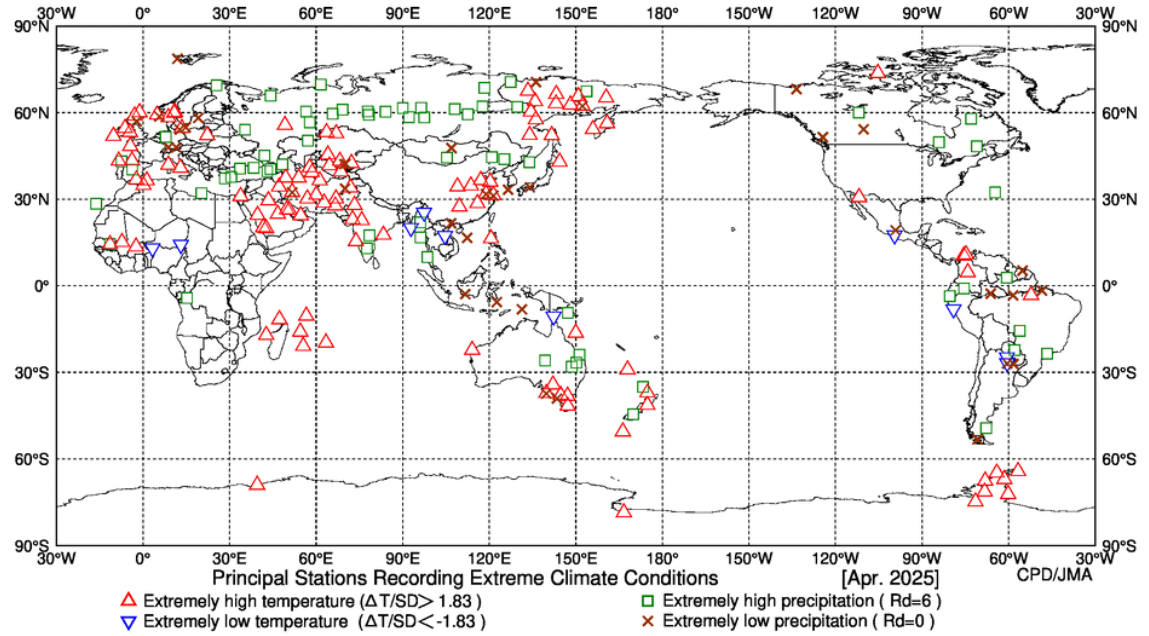

Fig.3 Distribution of extreme climate stations (April 2025)

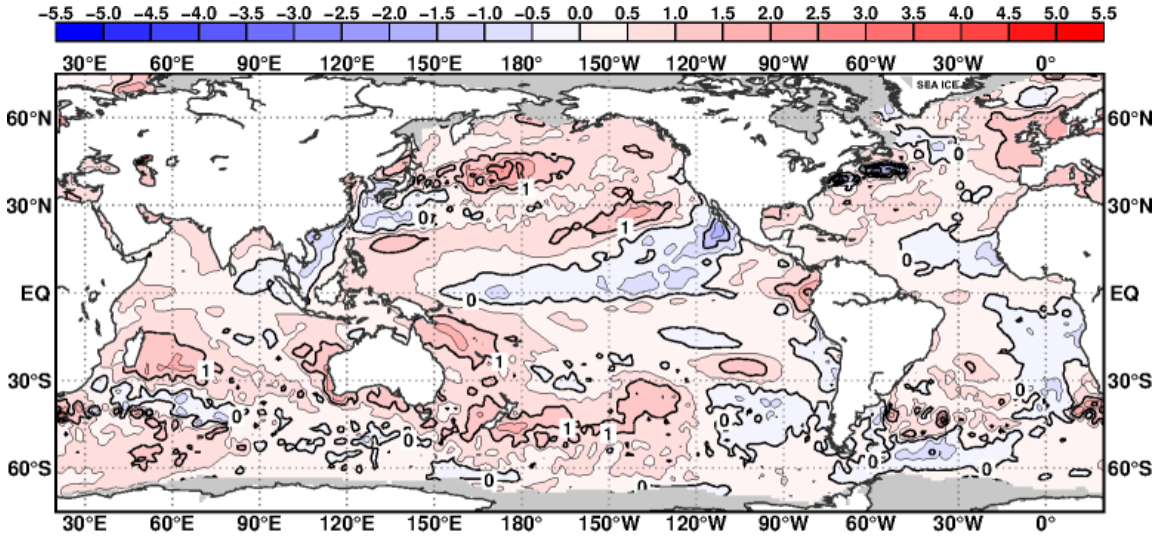

Fig.4 Monthly mean sea surface temperature anomaly (April 2025)
The contour interval is 0.5 degree C. The base period for the normal is 1991-2020. Maximum coverage with sea ice is shaded in gray.

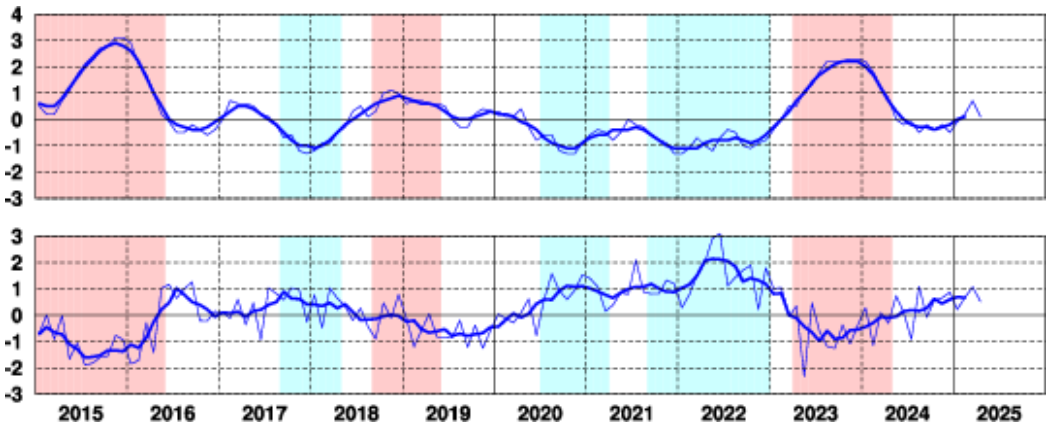

Fig.5 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1991-2020 base period (lower).
Thin blue lines represent monthly means and thick blue lines five-month running means. Periods of El Niño and La Niña events are shown as red-colored and blue-colored boxes, respectively.

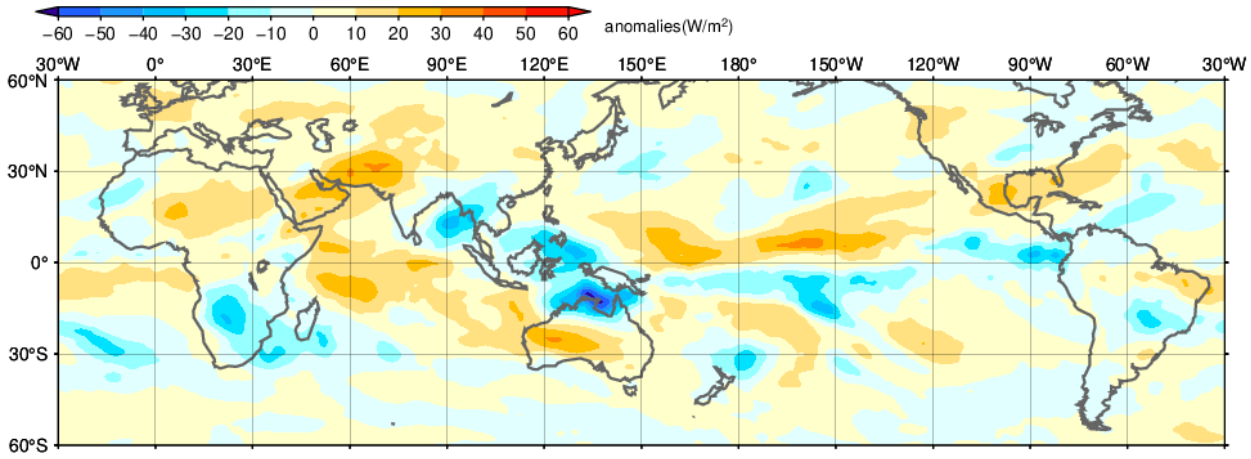

Fig.6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (April 2025)
The shading interval is 10 W/m^2. The base period for the normal is 1991-2020. Original data (CPC Blended OLR) are provided by NOAA.

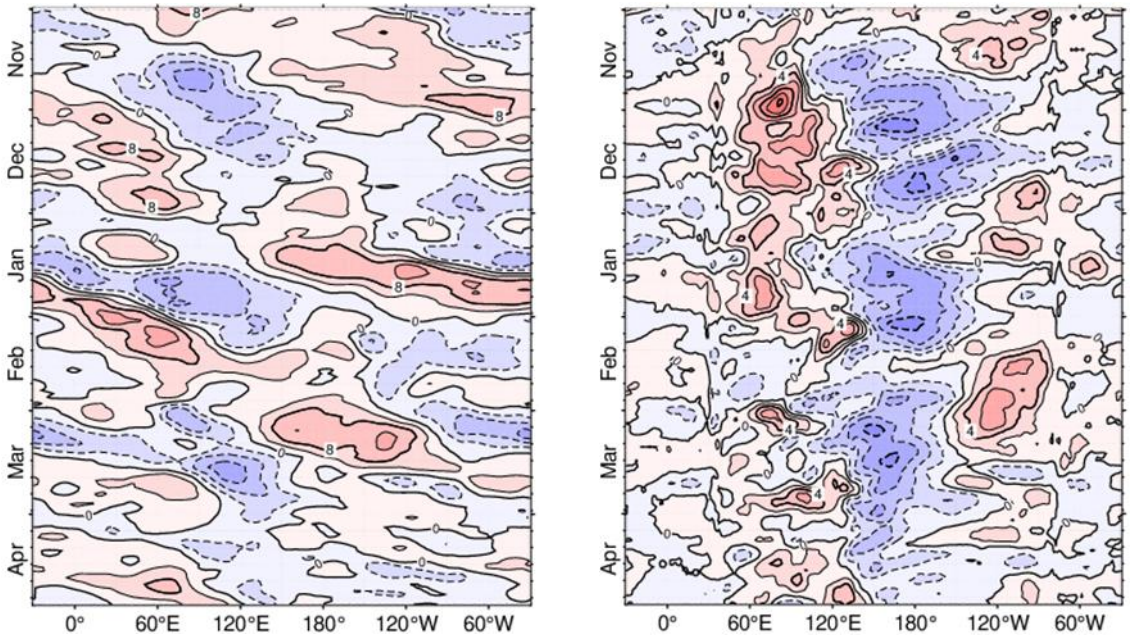

Fig.7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (November 2024 – April 2025)
The contour intervals are 4x10^6 m^2/s (left) and 2 m/s (right). The base period for the normal is 1991-2020.

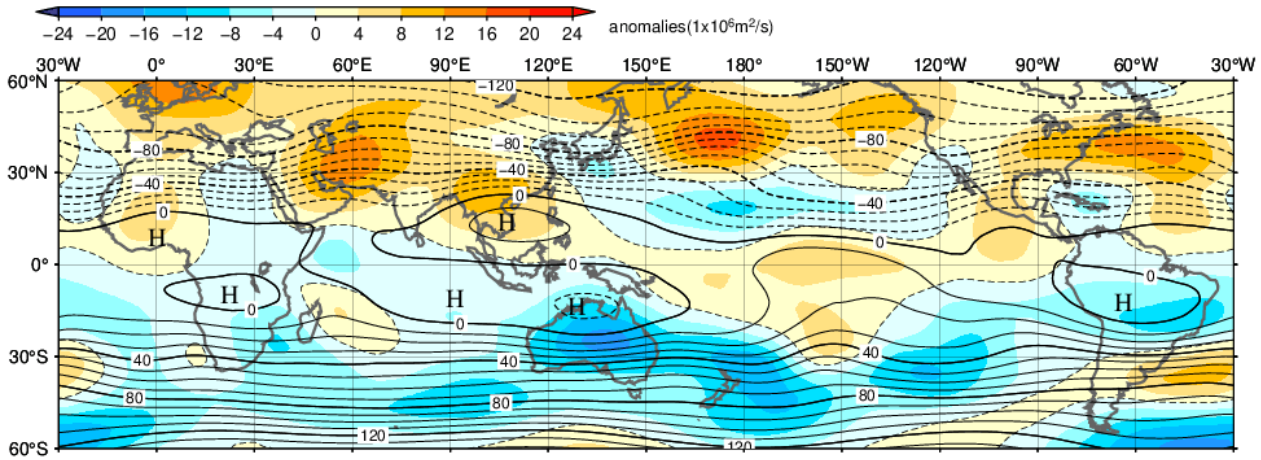

Fig.8 Monthly mean 200-hPa stream function and anomaly (April 2025)
The contour interval is 10x10^6 m^2/s. The base period for the normal is 1991-2020.

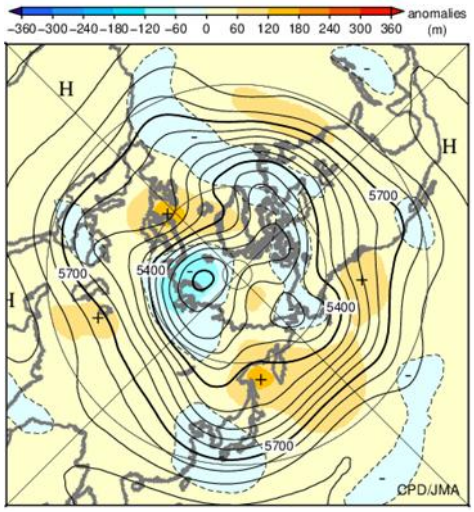

Fig.9 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (April 2025)

The contours show 500-hPa height at intervals of 60 m. The shading indicates its anomalies. The base period for the normal is 1991-2020.

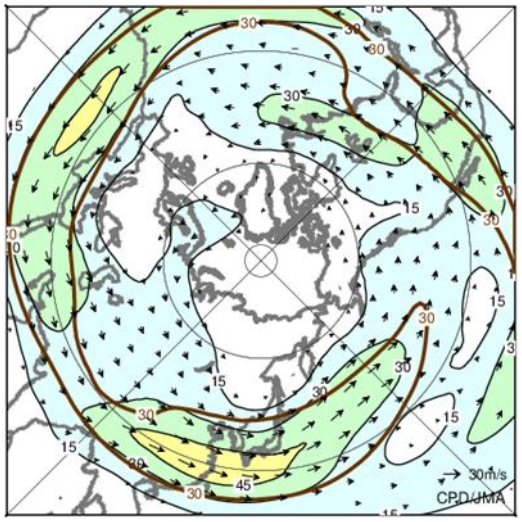

Fig.10 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (April 2025)

The black lines show wind speed at intervals of 15 m/s. The brown lines show its normal at intervals of 30 m/s. The base period for the normal is 1991-2020.

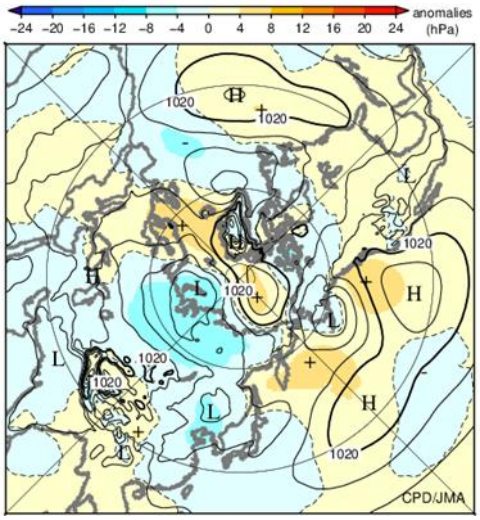

Fig.11 Monthly mean sea level pressure and anomaly in the Northern Hemisphere (April 2025)

The contours show sea level pressure at intervals of 4 hPa. The shading indicates its anomalies. The base period for the normal is 1991-2020.

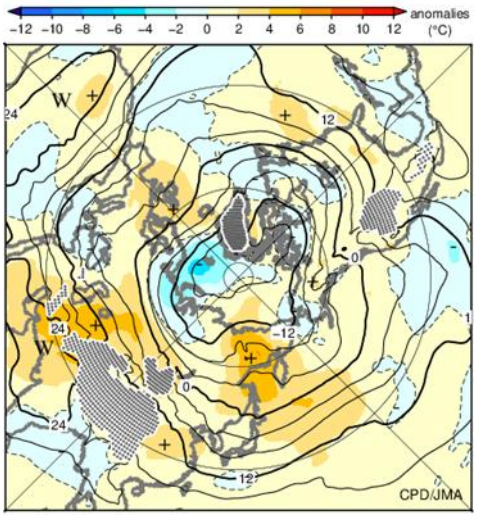

Fig.12 Monthly mean 850-hPa temperature and anomaly in the Northern Hemisphere (April 2025)

The contours show 850-hPa temperature at intervals of 4 degree C. The shading indicates its anomalies. The base period for the normal is 1991-2020.

Detailed information on the climate system is available on the Tokyo Climate Center's website.
https://www.data.jma.go.jp/tcc/tcc/index.html
This report is prepared by the Tokyo Climate Center, Climate Prediction Division, Atmosphere and Ocean Department, Japan Meteorological Agency.