Seasonal Highlights on the Climate System (December 2024 – February 2025)

Highlights (December 2024 – February 2025)

- In the equatorial Pacific, remarkably positive SST anomalies were observed in the western part and negative anomalies were observed in the central part, indicating La Niña-like conditions.
- Convective activity was enhanced from the eastern Indian Ocean to Southeast Asia and in and around southern Central America, and suppressed from Africa to the central Indian Ocean and from the western to central equatorial Pacific.
- In association with enhanced convection, anti-cyclonic circulation anomalies straddling the equator were seen over the eastern Indian Ocean. Cyclonic circulation anomalies were seen over Japan.
- The polar front jet stream meandered southward over Japan. The westerly jet stream over the North Pacific was stronger than normal.
- In the sea level pressure field, the Aleutian Low and the Siberian High were both stronger than normal, indicating enhanced East Asian winter monsoon.
- Seasonal mean temperatures were significantly below normal in Okinawa/Amami and below normal in western Japan, while those were above normal in Northern Japan.
- Seasonal precipitation amounts were the smallest on the Pacific side of eastern/western Japan on record for winter since 1946/47, and tied for the smallest on the Sea of Japan side of western Japan. While those were significantly above normal on the Sea of Japan side of eastern Japan, and above normal on the Sea of Japan side of northern Japan. Seasonal snowfall amounts were above normal on the Sea of Japan side of western Japan.

Climate in Japan (Fig. S1):

- Seasonal mean temperatures were significantly below normal in Okinawa/Amami and below normal in western Japan, due to cold air inflow, while those were above normal in northern Japan.
- Seasonal precipitation amounts were significantly below normal on the Pacific side of northern/eastern/western Japan, on the Sea of Japan side of western Japan, and in Okinawa/Amami, due to weak influence of low-pressure systems. Those were the smallest on the Pacific side of eastern/western Japan on record for winter since 1946/47, and tied for the smallest on the Sea of Japan side of western Japan. While those were significantly above normal on the Sea of Japan side of eastern Japan, and above normal on the Sea of Japan side of northern Japan, due to strong winter monsoon. Seasonal snowfall amounts were above normal on the Sea of Japan side of western Japan.
- Seasonal sunshine durations were significantly above normal on the Pacific side of northern/eastern/western Japan and on the Sea of Japan side of western Japan, due to the strong winter monsoon and high-pressure systems that frequently covered the regions. Those were the longest on the Pacific side of eastern Japan on record for winter since 1946/47, and tied for the longest on the Pacific side of northern/western Japan. While those were below normal on the Sea of Japan side in eastern Japan.

World Climate (Fig. S2):

- Seasonal mean temperatures were extremely high in western Eastern Siberia, in and around Western Siberia, in India and in and around northern Argentina.
- Seasonal precipitation amounts were extremely high in and around Western Siberia and from southern Central America to western Peru.
- Seasonal precipitation amounts were extremely low from Honshu region of Japan to the Korean Peninsula, from the northwestern Middle East to western Europe and in and around northern Argentina.

Oceanographic Conditions (Fig. S3)**:**

- In the equatorial Pacific, remarkably positive SST anomalies were observed in the western part and negative anomalies were observed in the central part.
- In the North Pacific, remarkably positive SST anomalies were observed in a wide area of the subtropics and 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 part of the mid-latitudes.
- In the Indian Ocean, remarkably positive SST anomalies were observed in the Bay of Bengal, and remarkably negative SST anomalies were observed in the western part of the Arabian sea.
- In the North Atlantic, remarkably positive SST anomalies were observed in the subtropics and the eastern part of the mid-latitudes.
- In the South Atlantic, positive SST anomalies were observed in a wide area of the tropics, and remarkably negative SST anomalies were observed in the mid-latitudes.

Tropics:

- Convective activity was enhanced from the eastern Indian Ocean to Southeast Asia and in and around southern Central America, and suppressed from Africa to the central Indian Ocean and from the western to central equatorial Pacific (Fig. S4).
- In the upper troposphere, anti-cyclonic circulation anomalies straddling the equator were seen over the eastern Indian Ocean, and cyclonic circulation anomalies were seen over Japan (Fig. S5).
- In the lower troposphere, cyclonic circulation anomalies straddling the equator were seen over the Indian Ocean, and anti-cyclonic circulation anomalies straddling the equator were seen from the western to central Pacific.
- In the sea level pressure field, negative anomalies from the Indian Ocean to Indonesia, and positive anomalies were seen over the tropical Pacific.

Extratropics:

- In the 500-hPa height field (Fig. S6), positive anomalies were seen from northern Eurasia to northwestern North America, and negative anomalies were seen from Japan to the south of the Aleutian Islands and from northeastern North America to the east.
- The polar front jet stream meandered southward over Japan. The westerly jet stream over the North Pacific was stronger than normal (Fig. S7).
- In the sea level pressure field (Fig. S8), the Aleutian Low and the Siberian High were both stronger than normal, indicating enhanced East Asian winter monsoon.
- Temperatures at 850-hPa were above normal over the Arctic region, and below normal in southeastern East Asia, from the central to eastern North America and in the Middle East (Fig. S9).

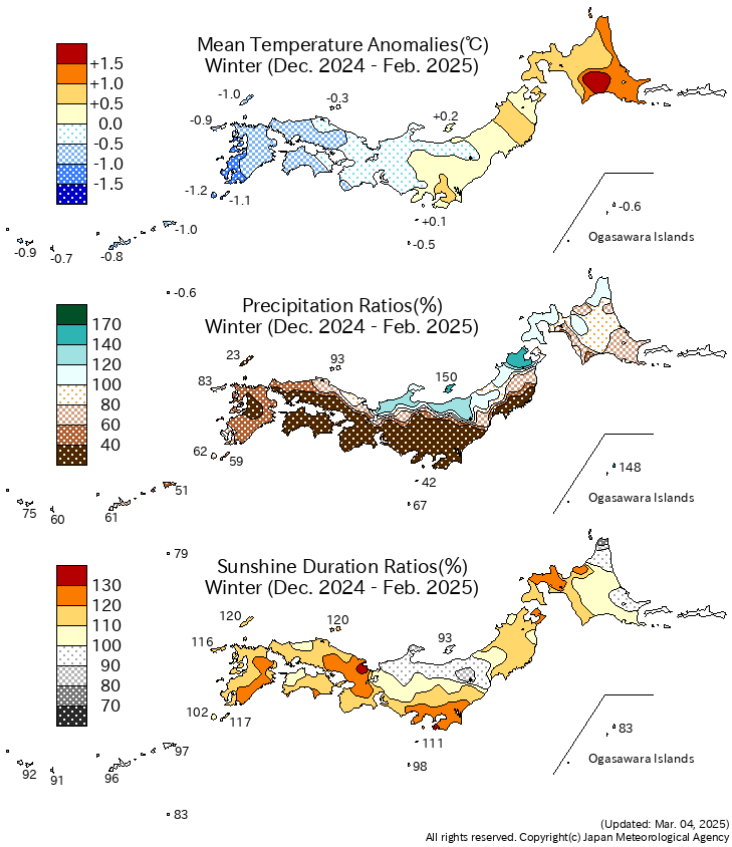

Fig. S1 Seasonal climate anomaly/ratio over Japan (December 2024 – February 2025)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
The base period for the normal is 1991-2020.

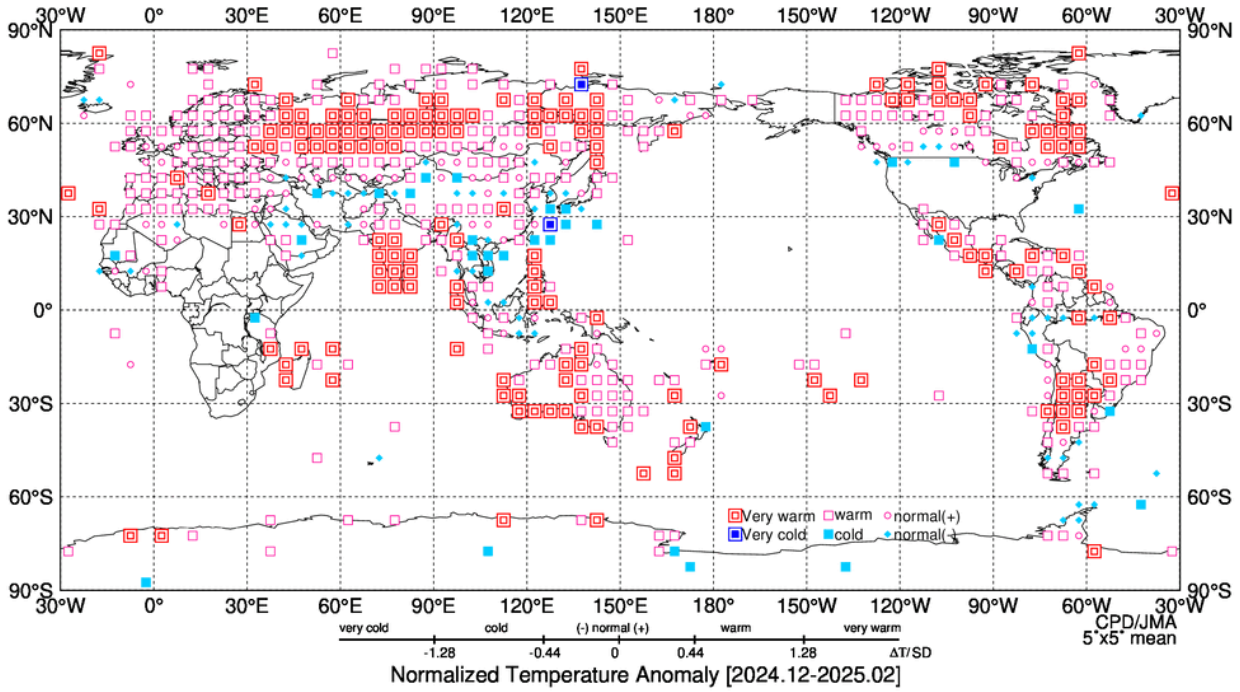

Fig. S2 Three-month mean temperature anomaly (normalized) category (December 2024 – February 2025)

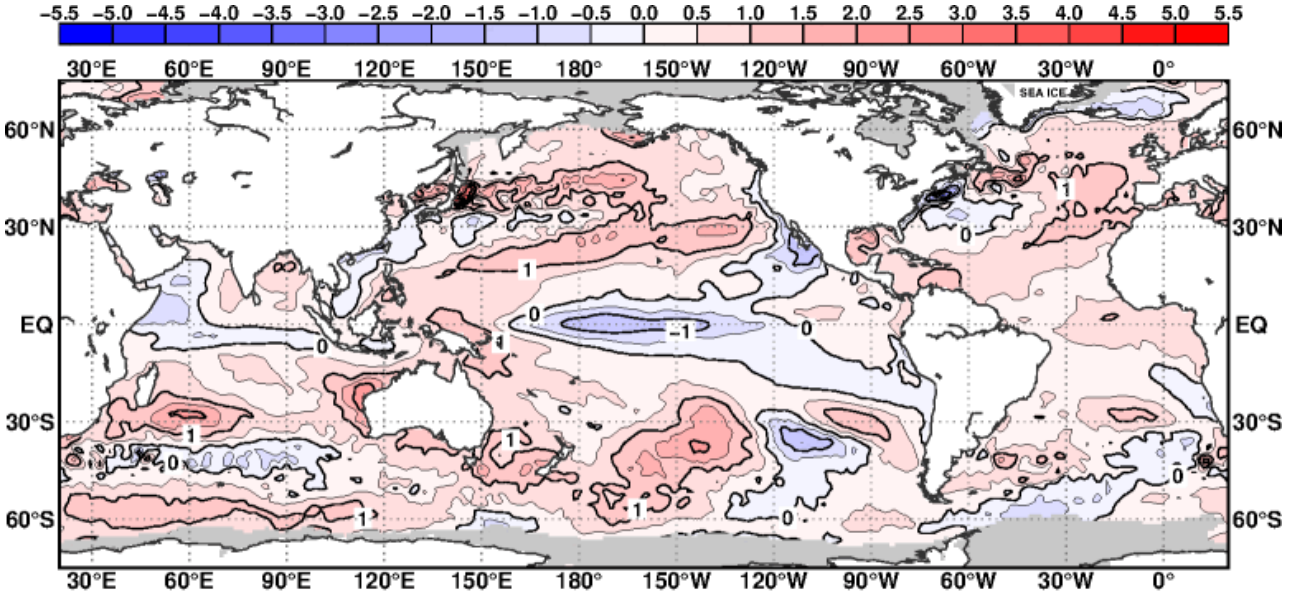

Fig. S3 Three-month mean sea surface temperature anomaly (December 2024 – February 2025)
The contour interval is 0.5 degree C. The base period for the normal is 1991-2020. Maximum coverage with sea ice is shaded in gray.

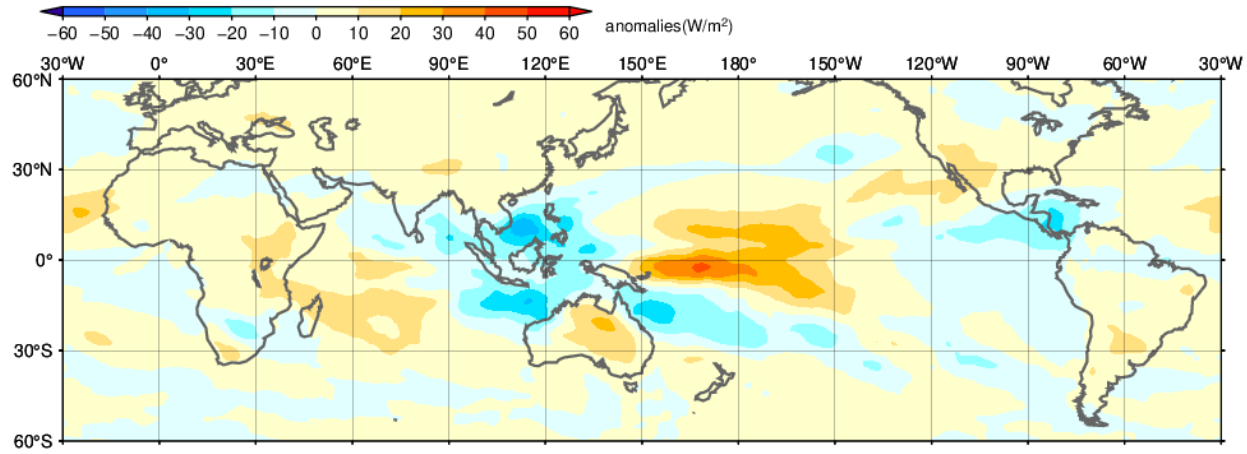

Fig. S4 Three-month mean Outgoing Longwave Radiation (OLR) anomaly (December 2024 – February 2025)
The shading interval is 10 W/m^2. The base period for the normal is 1991-2020. Original data (CPC Blended OLR) provided by NOAA.

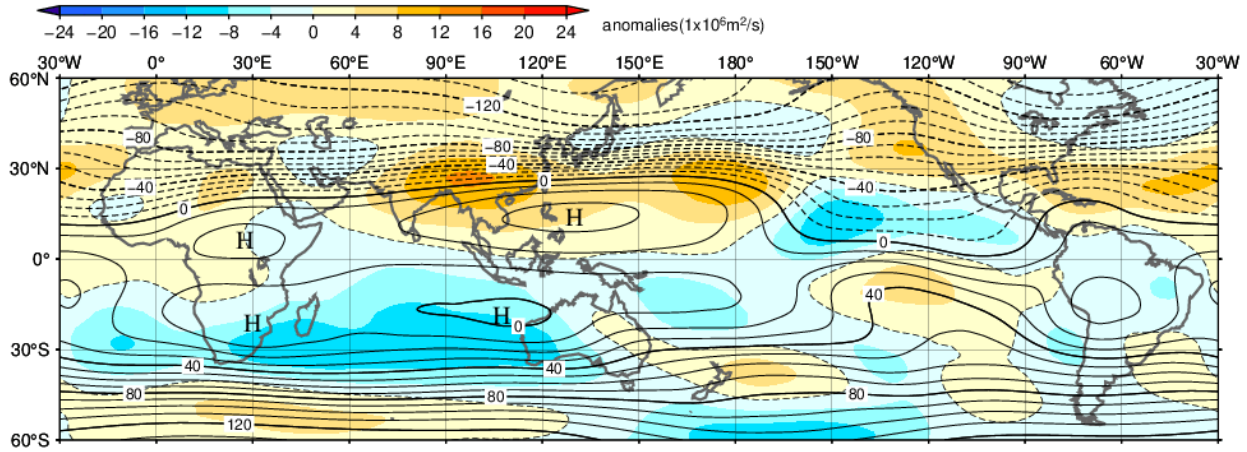

Fig. S5 Three-month mean 200-hPa stream function and anomaly (December 2024 – February 2025)
The contour interval is 10x10^6 m^2/s. The base period for the normal is 1991-2020.

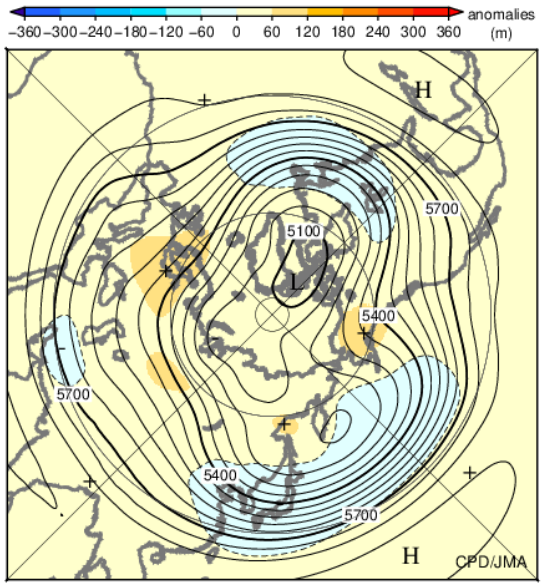

Fig. S6 Three-month mean 500-hPa height and anomaly in the Northern Hemisphere (December 2024 – February 2025)

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.

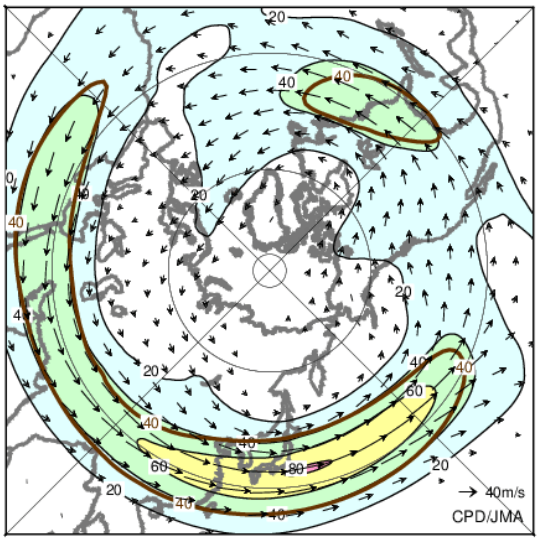

Fig. S7 Three-month mean 200-hPa wind speed and vectors in the Northern Hemisphere (December 2024 – February 2025)

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.

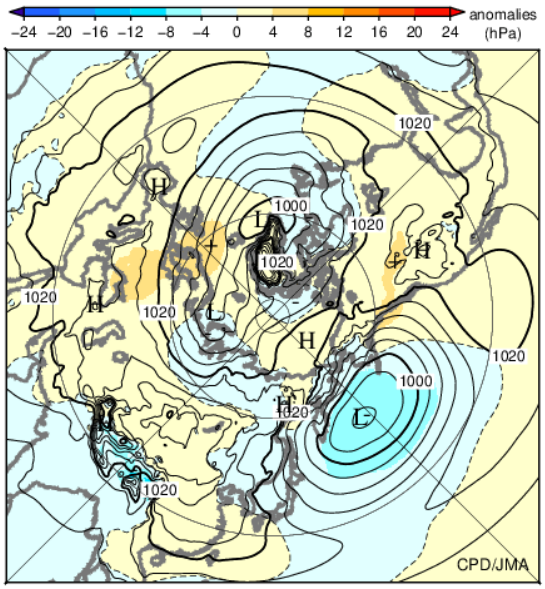

Fig. S8 Three-month mean sea level pressure and anomaly in the Northern Hemisphere (December 2024 – February 2025)

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.

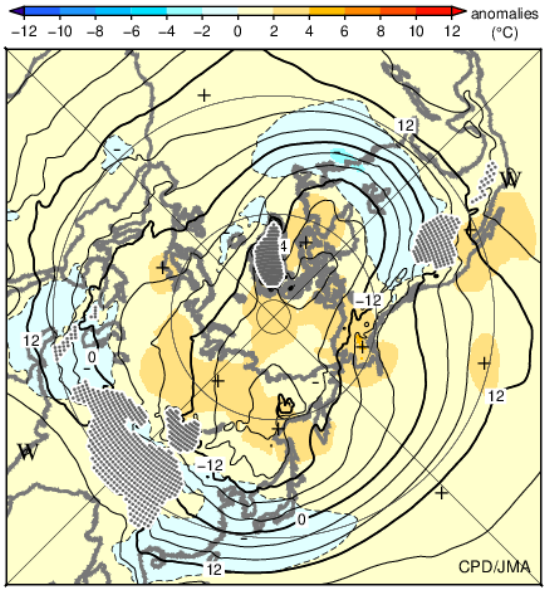

Fig. S9 Three-month mean 850-hPa temperature and anomaly in the Northern Hemisphere (December 2024 – February 2025)

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.