

Monthly Highlights on the Climate System (October 2017)

Highlights in October 2017

- Monthly precipitation amount in western Japan was the heaviest on record for October since 1946.
- Monthly mean temperatures were significantly above normal in Okinawa/Amami.
- Monthly mean temperatures were extremely high from southeastern Canada to the northeastern USA and from the southwestern USA to the northwestern Mexico.
- In the equatorial Pacific, remarkably positive SST anomalies were observed west of 150°E and negative SST anomalies were observed east of 160°E.
- Convective activity was enhanced from the South China Sea to the seas east of the Philippines and over Central America.
- The westerly jet stream was displaced northward from its normal position over the area from East Asia to the Pacific.

Climate in Japan (Fig. 1):

- Monthly precipitation amounts were significantly above normal on the Pacific side of northern Japan and in eastern and western Japan, due to the influences from typhoons, low-pressure systems and fronts. In particular, monthly precipitation amount in western Japan was the heaviest on record for October since 1946.
- Monthly sunshine durations were significantly below normal in northern, eastern and western Japan.
- Monthly mean temperatures were significantly above normal in Okinawa/Amami, due to warm southerly wind.
- Eastern Japan, western Japan and Okinawa/Amami experienced heavy rain that caused river overflows and landslides, due to the passage of the typhoon LAN and influences from fronts.

World Climate:

- The monthly anomaly of the global average surface temperature in October 2017 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.31°C (3rd warmest since 1891) (preliminary value) (Fig. 2). On a longer time scale, global average surface temperatures have risen at a rate of about 0.66°C per century in October (preliminary value).
- Extreme climate events were as follows (Fig. 3).
 - Monthly precipitation amounts were extremely high in eastern Europe, and were extremely low in and around southwestern Europe.
 - Monthly mean temperatures were extremely high from Mauritius to Madagascar.
 - Monthly mean temperatures were extremely high from southeastern Canada to the northeastern USA and from the southwestern USA to northwestern Mexico.

Oceanographic Conditions (Fig. 4):

- In the equatorial Pacific, remarkably positive SST anomalies were observed west of 150°E and negative SST anomalies were observed east of 160°E. In the NINO.3 region, the monthly mean SST anomaly and the SST deviation from the latest sliding 30-year mean were both -0.6°C (Fig. 5).
- In the North Pacific, remarkably positive SST anomalies were observed from the western tropical region to south of Japan and from the western tropical region to the area near 35°N, 140°W.
- In the South Pacific, remarkably positive SST anomalies were observed from the eastern coast of Australia to the area near 40°S, 135°W, and remarkably negative SST anomalies were observed from the western coast of Chile to the area near 20°S, 110°W.
- In the Indian Ocean, remarkably positive SST anomalies were observed from the eastern coast of East

Africa to the area near 30°S, 100°E, in the Arabian Sea, and in the Bay of Bengal.

- In the North Atlantic, remarkably positive SST anomalies were observed from the eastern coast of the USA to the Iberian Peninsula, in the Gulf of Mexico, in the Caribbean Sea and in the area near the western coast of West Africa.

Tropics:

- Convective activity was enhanced from the South China Sea to the seas east of the Philippines and over Central America, and was suppressed over the equatorial Indian Ocean and over the seas east of 150°E in the equatorial Pacific (Fig. 6).
- The active phase of equatorial intraseasonal oscillations propagated eastward from the Indian Ocean to South America (Fig. 7).
- In the upper (lower) troposphere, anti-cyclonic (cyclonic) circulation anomalies straddling the equator were observed from the Indian Ocean to the Maritime Continent, and cyclonic (anti-cyclonic) circulation anomalies straddling the equator were observed from 150°E to the eastern Pacific (Fig.8).
- In the sea level pressure field, negative anomalies were observed over a wide area in the tropics, with clear negative anomalies over the seas east of the Philippines. The Southern Oscillation Index value was +1.1 (Fig. 5).

Extratropics:

- In the 500-hPa height field (Fig. 9), wave trains were clearly observed over the mid-latitudes in the Northern Hemisphere, with positive anomalies over eastern China, to the south of Alaska, over the northeastern part of North America and over western Europe, and negative anomalies over the Kamchatka Peninsula and eastern Europe.
- The subtropical jet stream was stronger over Eurasia. The westerly jet stream in the Northern Hemisphere was displaced northward from its normal position over the area from East Asia to the Pacific and was stronger than normal to the east of Japan. (Fig. 10).
- In the sea level pressure field (Fig. 11), positive anomalies were observed in and around the North Pole, which were surrounded by negative anomalies over the latitudinal band of 60°N except Siberia. Positive anomalies were zonally elongated over the area from eastern Eurasia to mid-latitudes in the Pacific including the southeastward extension of the Siberian High.
- Temperatures at 850-hPa were above normal over the area off the southwest coast of California, the area from the northeastern part of North America to the seas east of Greenland and western Europe, and below normal over the area from mid-latitudes in Eurasia to the Sea of Okhotsk (Fig. 12).
- Zonal mean temperatures in the troposphere were above normal except over the latitudinal band of 60°N.

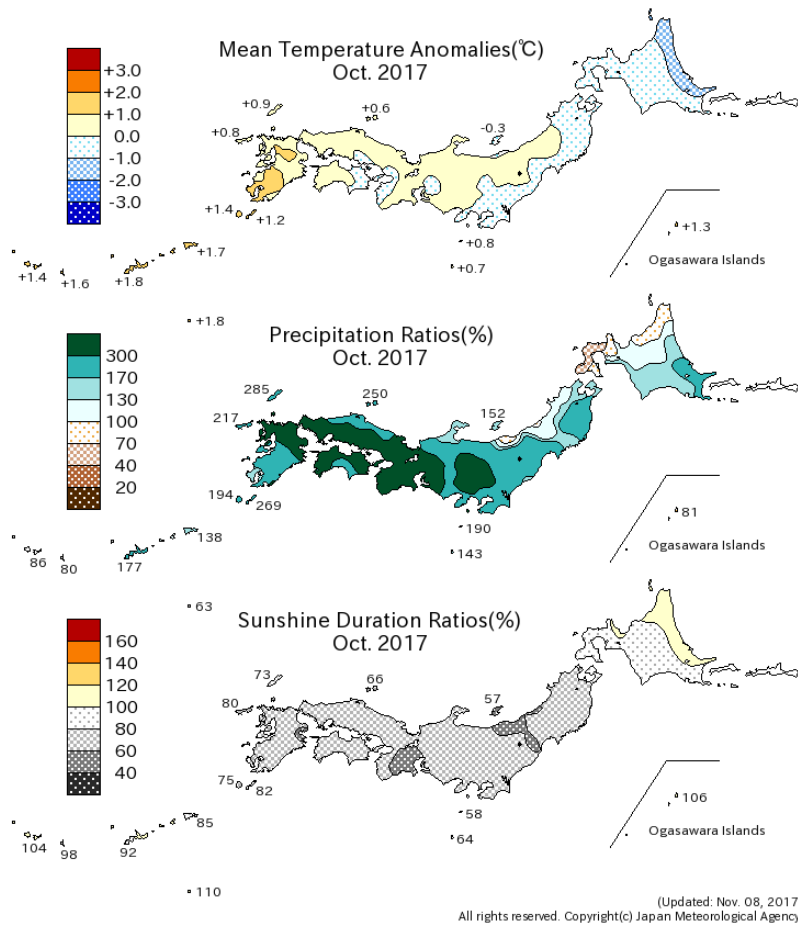


Fig. 1 Monthly climate anomaly/ratio over Japan (October 2017)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
The base period for the normal is 1981-2010.

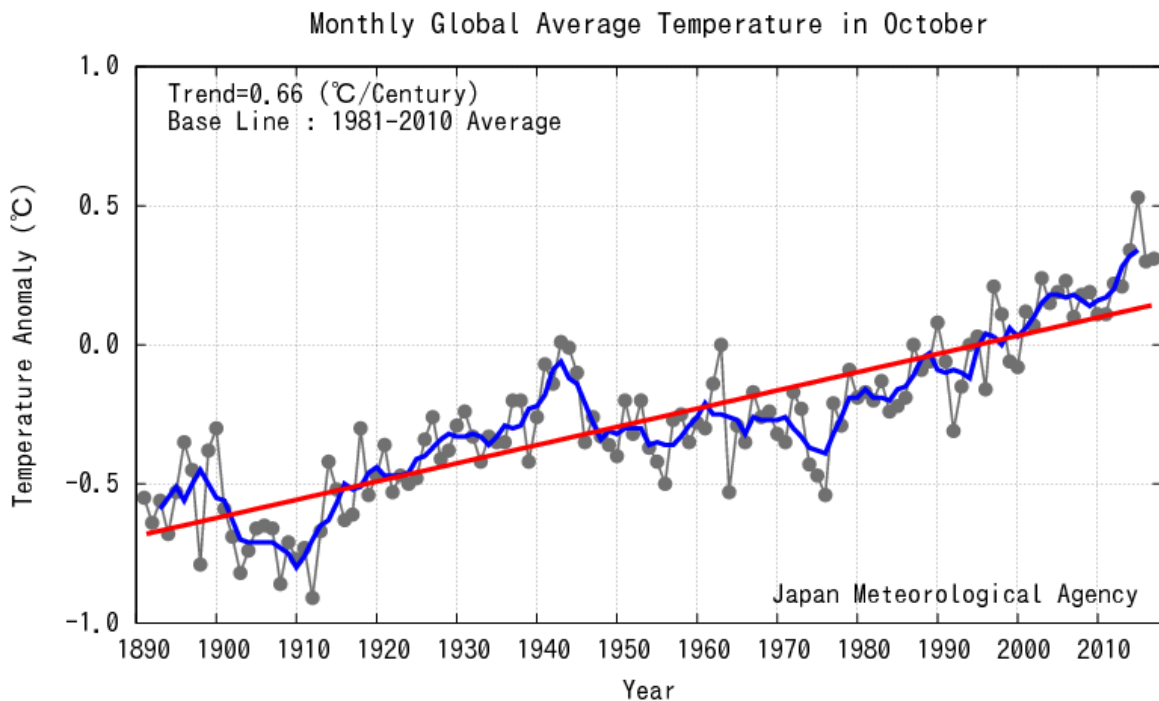


Fig. 2 Long-term change in monthly anomalies of global average surface temperature in October
The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations from the 1981-2010 average.

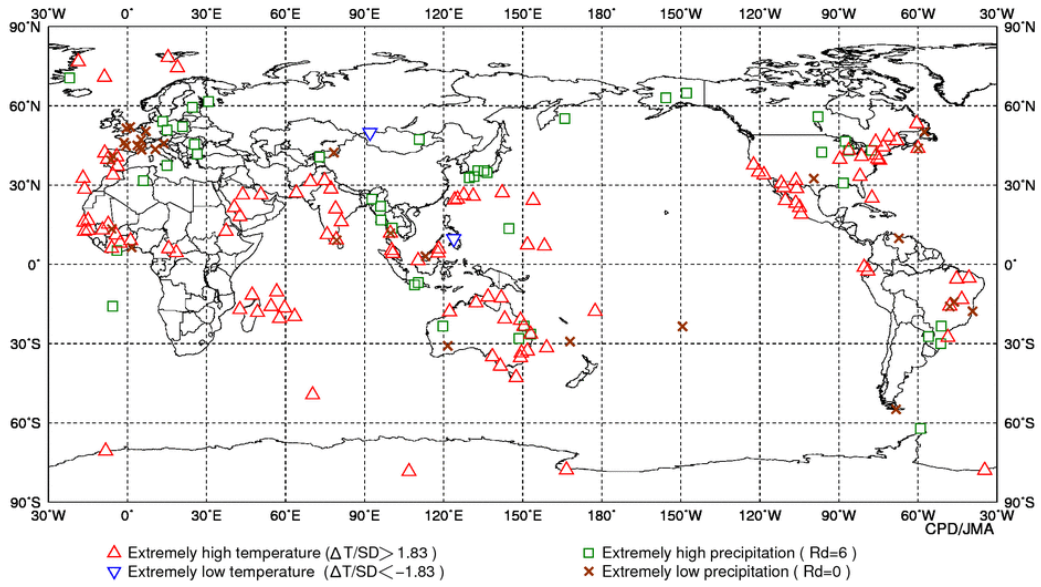


Fig. 3 Distribution of extreme climate events (October 2017)

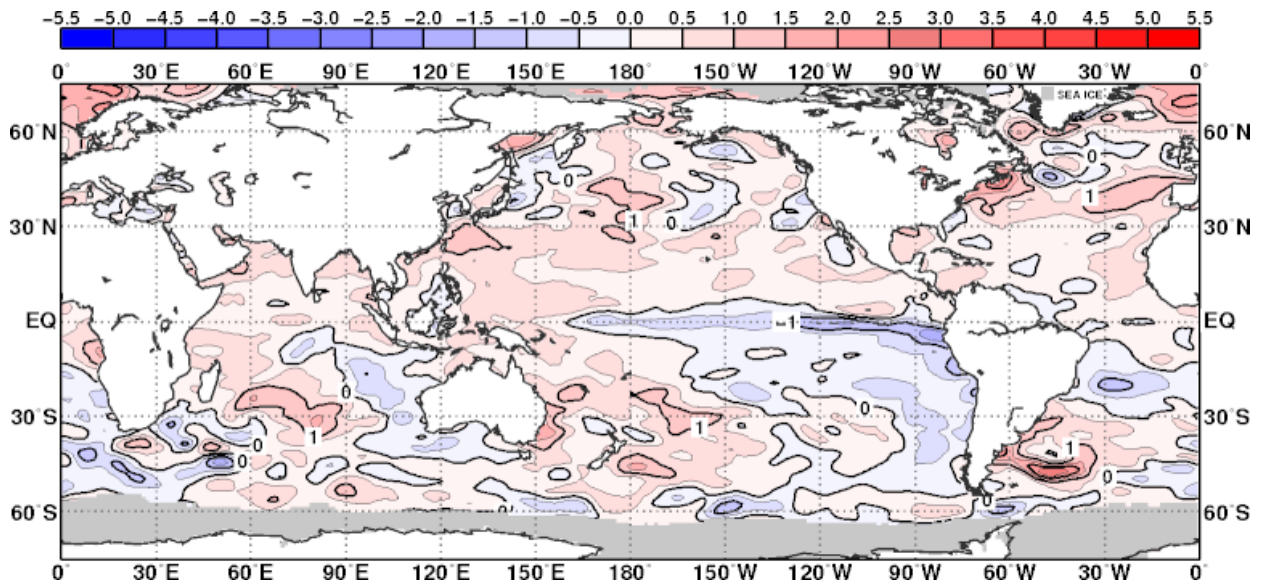


Fig. 4 Monthly mean sea surface temperature anomaly (October 2017)

The contour interval is 0.5 degree C. The base period for the normal is 1981-2010. Maximum coverage with sea ice is shaded in gray.

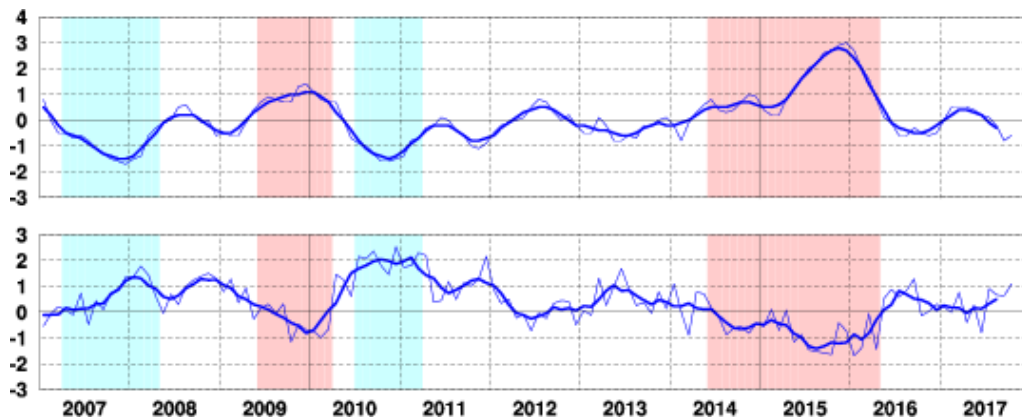


Fig. 5 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).

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.

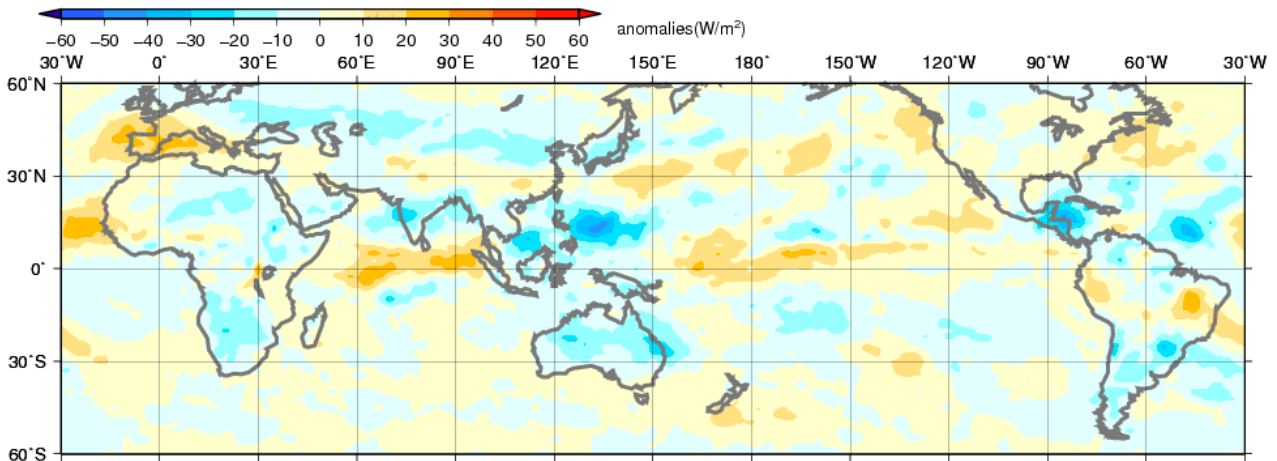


Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (October 2017)
 The contour interval is 10 W/m². The base period for the normal is 1981-2010. Original data provided by NOAA.

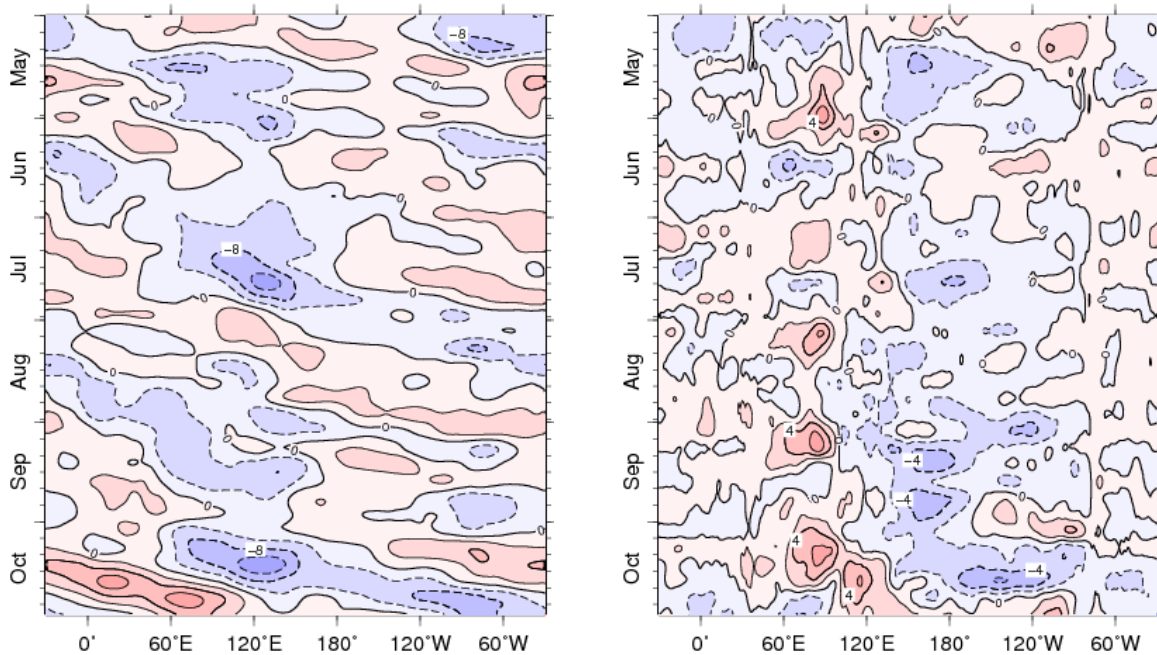


Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (May 2017 – October 2017)
 The contour intervals are 4x10⁶ m²/s (left) and 2 m/s (right). The base period for the normal is 1981-2010.

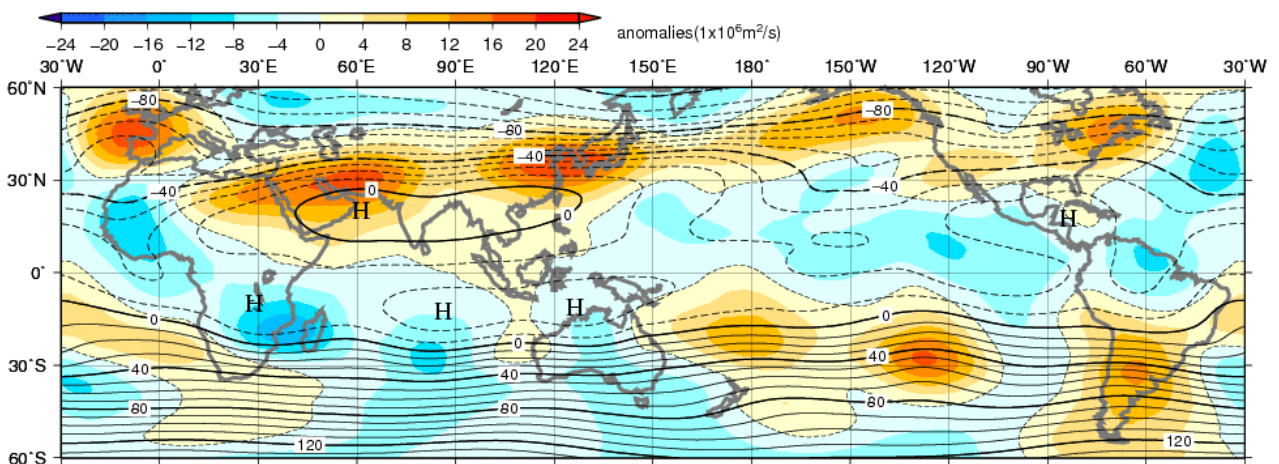


Fig. 8 Monthly mean 200-hPa stream function and anomaly (October 2017)
 The contour interval is 10x10⁶ m²/s. The base period for the normal is 1981-2010.

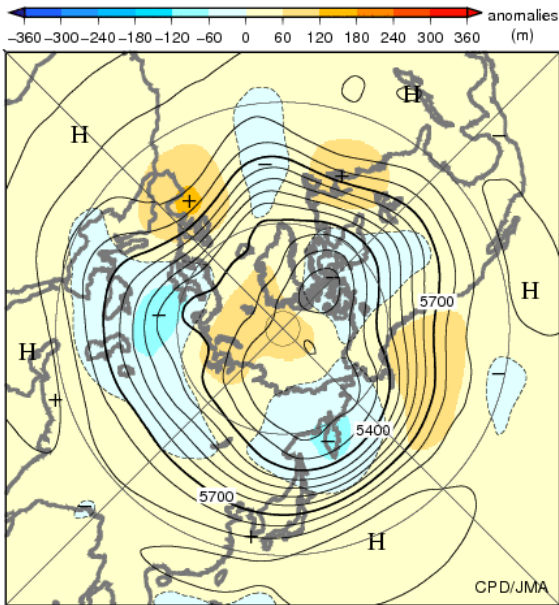


Fig. 9 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (October 2017)

The contours show 500-hPa height at intervals of 60 m. The shading indicates its anomalies. The base period for the normal is 1981-2010.

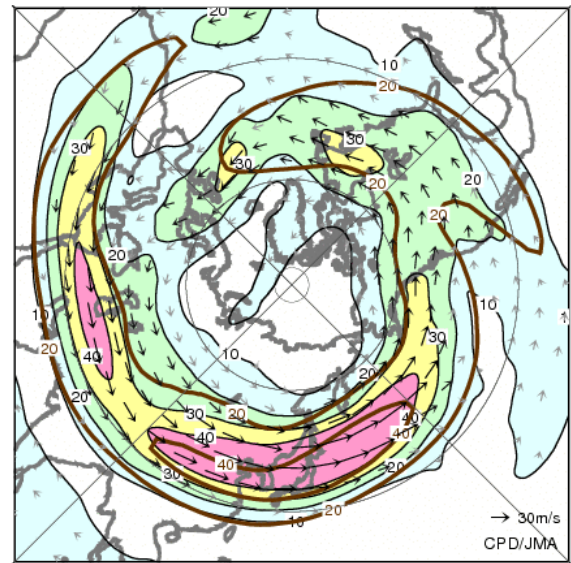


Fig. 10 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (October 2017)

The black lines show wind speed at intervals of 10 m/s. The brown lines show its normal at intervals of 20 m/s. The base period for the normal is 1981-2010.

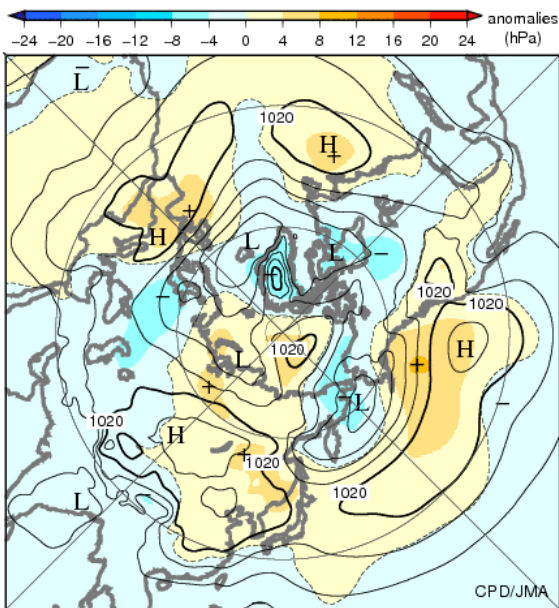


Fig. 11 Monthly mean sea level pressure and anomaly in the Northern Hemisphere (October 2017)

The contours show sea level pressure at intervals of 4 hPa. The shading indicates its anomalies. The base period for the normal is 1981-2010.

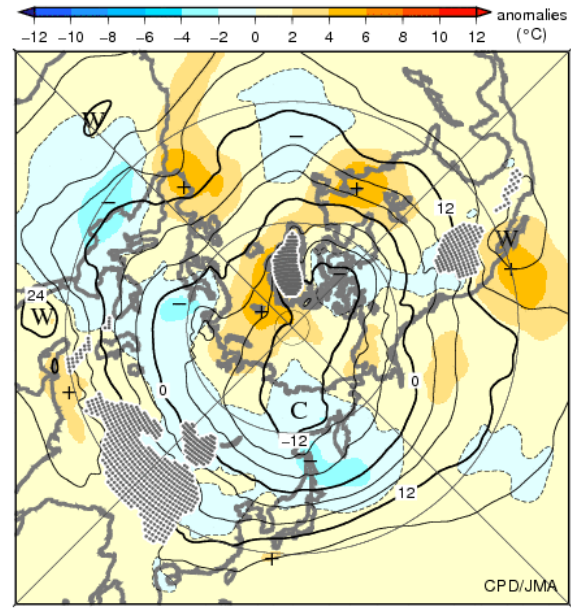


Fig. 12 Monthly mean 850-hPa temperature and anomaly in the Northern Hemisphere (October 2017)

The contours show 850-hPa temperature at intervals of 4 degree C. The shading indicates its anomalies. The base period for the normal is 1981-2010.

Detailed information on the climate system is available on the Tokyo Climate Center's website.

<http://ds.data.jma.go.jp/tcc/tcc/index.html>

This report is prepared by the Tokyo Climate Center, Climate Prediction Division, Global Environment and Marine Department, Japan Meteorological Agency.