

Monthly Highlights on the Climate System (October 2018)

Highlights in October 2018

- It is considered that El Niño conditions are present in the equatorial Pacific (see [El Niño Outlook](#) updated on 9 November 2018).
- Monthly precipitation amounts were above normal in Hokkaido and Okinawa/Amami, and monthly mean temperature was significantly below normal in Okinawa/Amami.
- Monthly mean temperatures were extremely high from eastern Japan to central Micronesia, from northeastern Turkey to central Europe, from southeastern Alaska to the northeastern part of Eastern Siberia, and in eastern Australia.
- Convective activity was enhanced from Western Africa to the Arabian Peninsula and was suppressed over the eastern part of the tropical South Indian Ocean and around the Philippines.
- In the 500-hPa height field, wave trains were dominant over mid- and high-latitudes with positive anomalies over Central Siberia and the seas east of Japan, and negative anomalies from eastern Canada to Greenland. Zonally elongated negative anomalies were seen over southern Eurasia.
- The subtropical jet stream shifted southward from its normal position over southern Eurasia.

Climate in Japan (Fig. 1):

- From the end of September to the beginning of October, typhoons TRAMI and KONG-REY approached Japan repeatedly, which brought wind storm and heavy rain in various parts of the country. Monthly precipitation amounts were above normal in Hokkaido and Okinawa/Amami due to typhoons, low pressures and fronts. Meanwhile, on the Pacific side of eastern and western Japan, monthly precipitation amounts were below normal due to weak influences of southerly moist airflow. Monthly mean temperature was significantly above normal in northern Japan. In Okinawa/Amami, monthly mean temperature was significantly below normal and the lowest for October in 32 years.

World Climate:

- The monthly anomaly of the global average surface temperature in October 2018 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.37°C (2nd 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 mean temperatures were extremely high from eastern Japan to central Micronesia, from northeastern Turkey to central Europe, from southeastern Alaska to the northeastern part of Eastern Siberia, and in eastern Australia.
 - Monthly mean temperatures were extremely low in and around southern China, and in southeastern Canada.
 - Monthly precipitation amounts were extremely high from northern Japan to southern Korea, from southern Europe to the northwestern part of Northern Africa, in and around the southern part of Western Africa, from the Midwest USA to central Mexico, and from western Brazil to northern Argentina.

Oceanographic Conditions (Fig. 4):

- In the equatorial Pacific, positive SST anomalies were observed in almost the entire region, in particular remarkably positive SST anomalies were observed in the western part. In the NINO.3 region, the monthly mean SST anomaly was +0.8°C, and the SST deviation from the latest sliding 30-year mean was +0.9°C (Fig.5).
- In the North Pacific, remarkably positive SST anomalies were observed from western to central parts of the

tropical region, from south of Japan to far east of Japan, and from the Sea of Okhotsk to the western coast of North America.

- In the South Pacific, remarkably positive SST anomalies were observed in the western tropical region, and from the area near New Zealand to the area near 25°S, 90°W.
- In the Indian Ocean, remarkably positive SST anomalies were observed from southeast of Madagascar to the area near 25°S, 100°E, in the area near the eastern coast of Somalia, in the eastern part of the Arabian Sea, and in the Bay of Bengal.
- In the North Atlantic, remarkably positive SST anomalies were observed from the Gulf of Mexico to the area near 45°N, 25°W, and in the equatorial area, and remarkably negative SST anomalies were observed south of Greenland and from the area near 30°N, 60°W to the area near 30°N, 40°W.

Tropics:

- Convective activity was enhanced from Western Africa to the Arabian Peninsula and the eastern part of the tropical North Pacific, and was suppressed over the eastern part of the tropical South Indian Ocean and around the Philippines (Fig. 6).
- The active phase of equatorial intraseasonal oscillation propagated eastward from Africa to the Indian Ocean in the first half of the month and became obscure afterward (Fig. 7).
- In the upper troposphere, cyclonic circulation anomalies were seen from Northern Africa to southern Eurasia and the western coast of the USA, and anti-cyclonic circulation anomalies were seen over the eastern part of the USA (Fig. 8).
- In the lower troposphere, anticyclonic circulation anomalies were seen from India to the Philippines, and cyclonic circulation anomalies were seen over the central and eastern part of the tropical North Pacific. Westerly Asian monsoon flow was weaker than normal.
- In the sea level pressure field, positive anomalies were seen from the eastern Indian Ocean to the western Pacific, and negative anomalies were seen in and around the Atlantic. The Southern Oscillation Index value was +0.4 (Fig. 5).

Extratropics:

- In the 500-hPa height field (Fig. 9), wave trains were dominant over mid- and high-latitudes with positive anomalies over Alaska, the UK, eastern Europe, Central Siberia and the seas east of Japan, and negative anomalies to the south of the Aleutian Islands, from eastern Canada to Greenland and over Western Russia. Zonally elongated negative anomalies were seen over southern Eurasia.
- The subtropical jet stream shifted southward from its normal position over southern Eurasia, and meandered northward to the east of Japan. The westerly jet stream was stronger than normal from the eastern part of North America to northern Europe, and the meandering of the polar front jet stream was clearly seen over northern Eurasia (Fig. 10).
- In the sea level pressure field (Fig. 11), enhanced cyclones were seen over the Aleutian Island and from the seas east of Greenland to Western Russia. Positive anomalies were seen from southern Eurasia to the seas southeast of Japan.
- Temperatures at 850-hPa were above normal over Europe and from Central Siberia to Alaska, and below normal over central to eastern Canada and the southern part of East Asia (Fig. 12).
- Zonal mean temperatures in the troposphere were clearly above normal over high-latitude in the Northern Hemisphere.

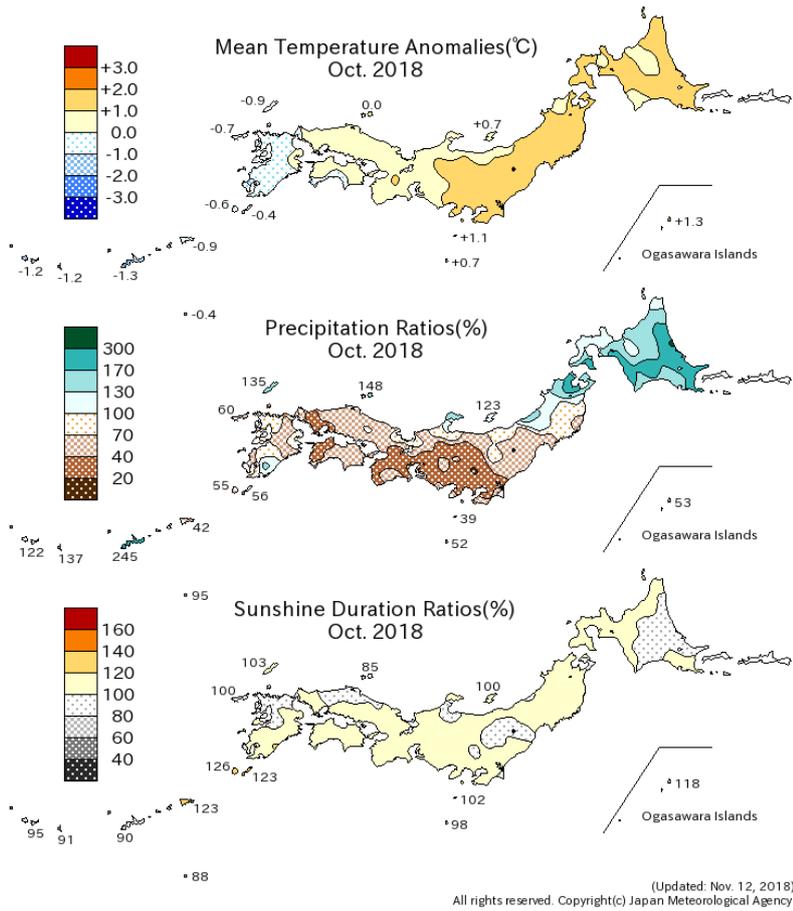


Fig. 1 Monthly climate anomaly/ratio over Japan (October 2018)
 Top: temperature anomalies (degree C)
 Middle: precipitation ratio (%)
 Bottom: sunshine duration ratio (%)
 The base period for the normal is 1981-2010.

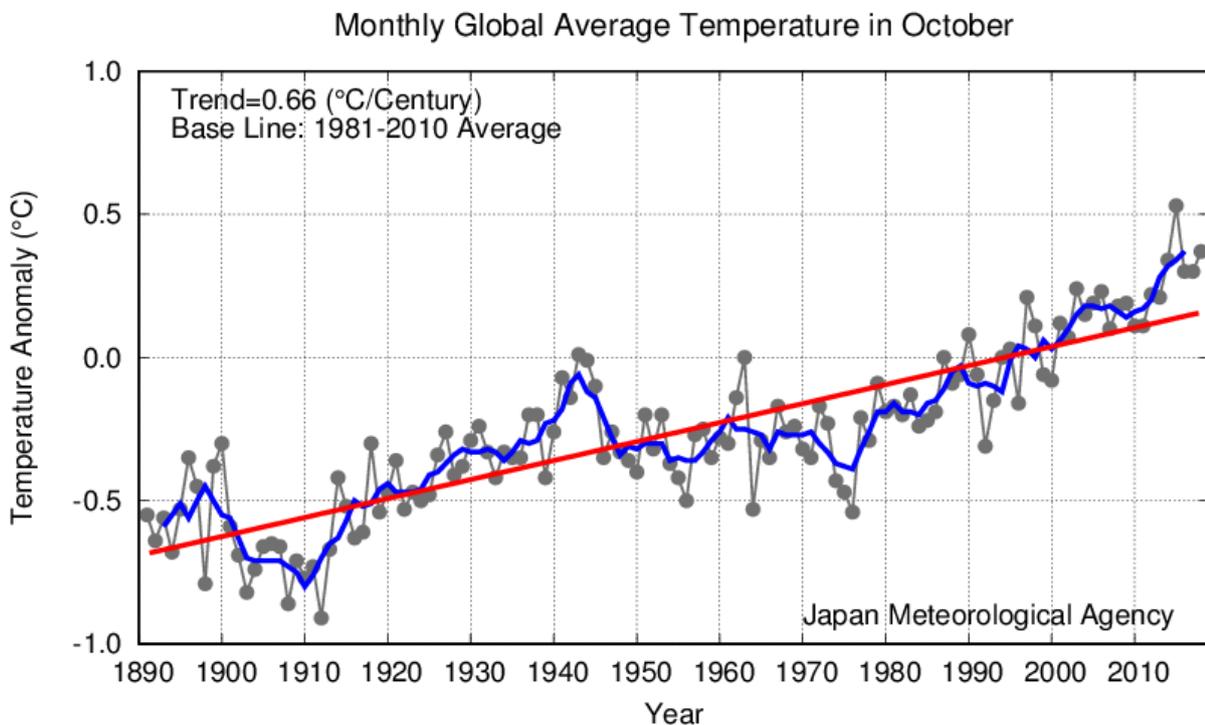


Fig. 2 Long-term change in monthly anomalies of global average surface temperature in October
 The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations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

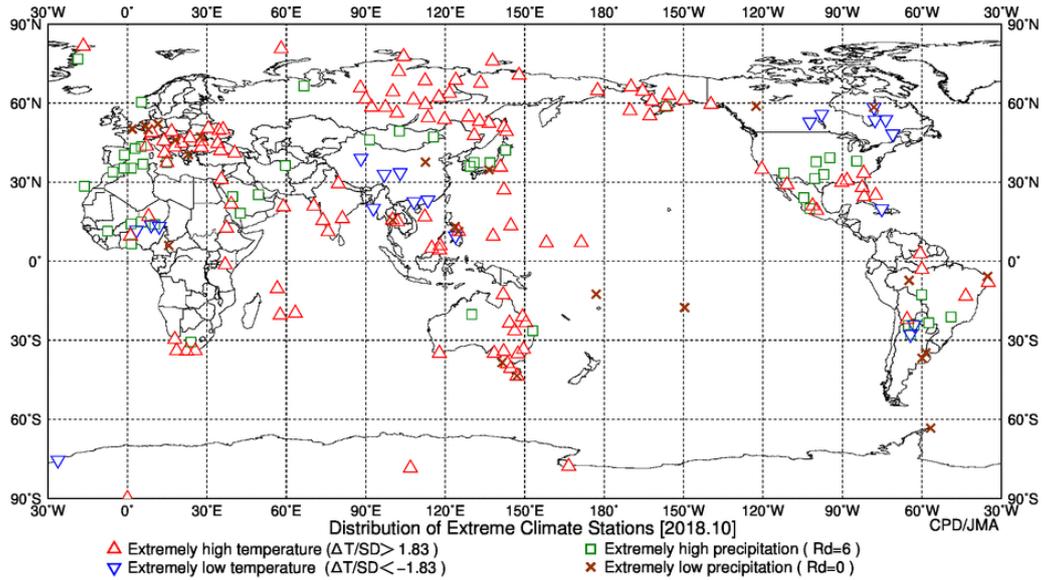


Fig. 3 Distribution of extreme climate stations (October 2018)

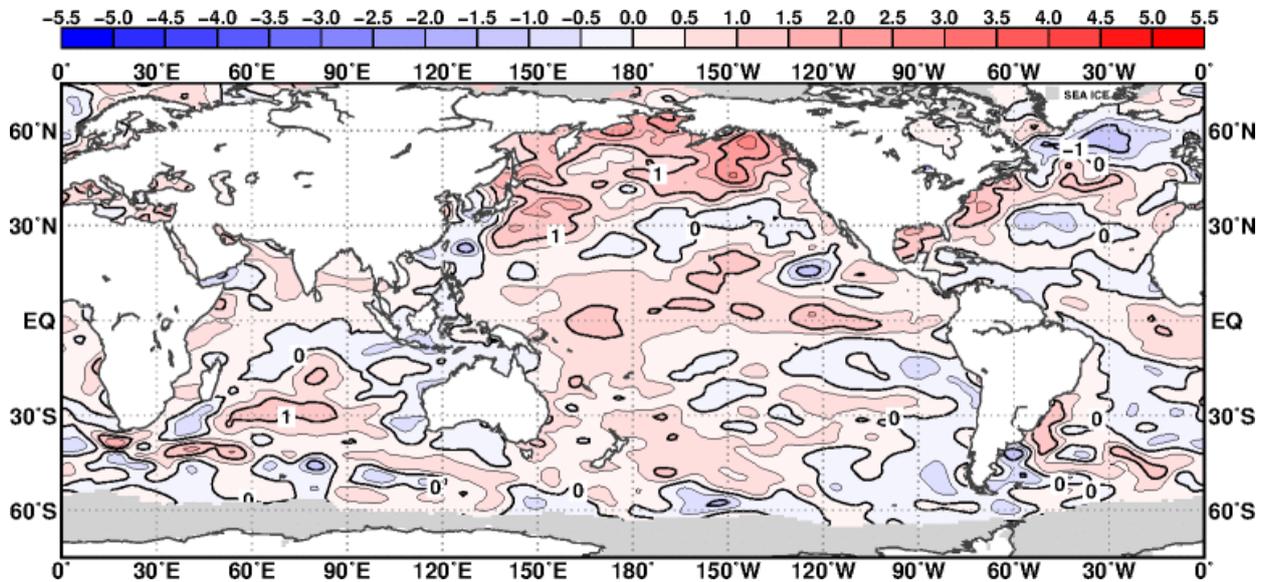


Fig. 4 Monthly mean sea surface temperature anomaly (October 2018)

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.

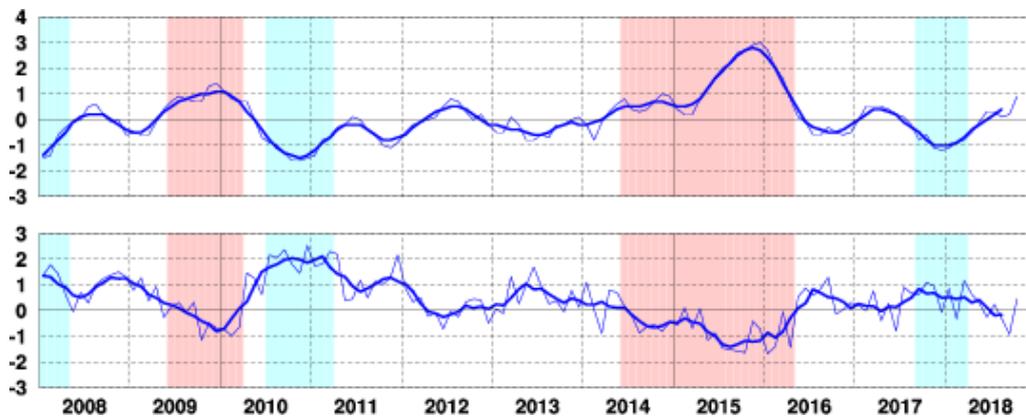


Fig. 5 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).

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.

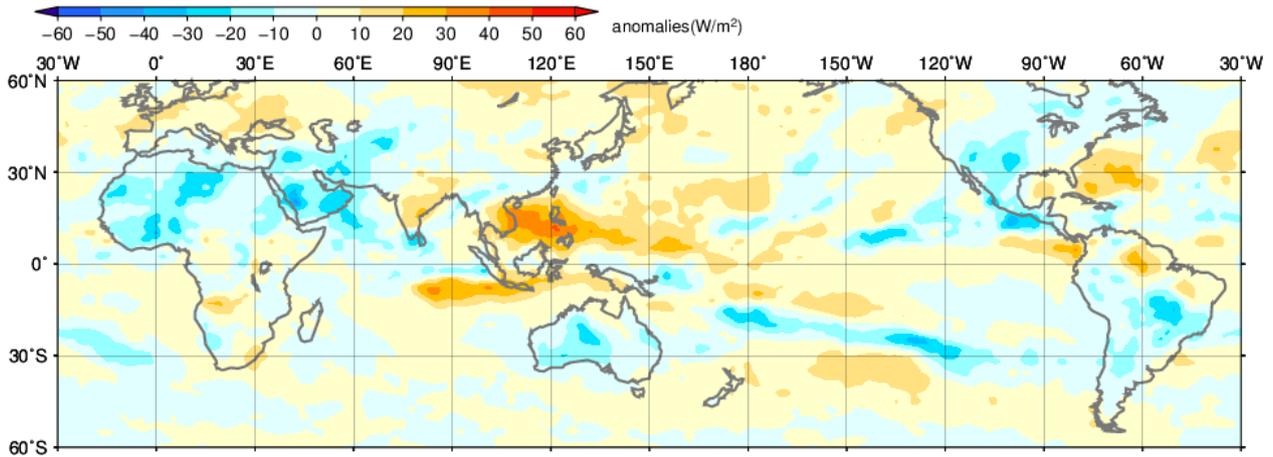


Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (October 2018)
 The contour interval is 10 W/m². The base period for the normal is 1981-2010. Original data provided by NOAA.

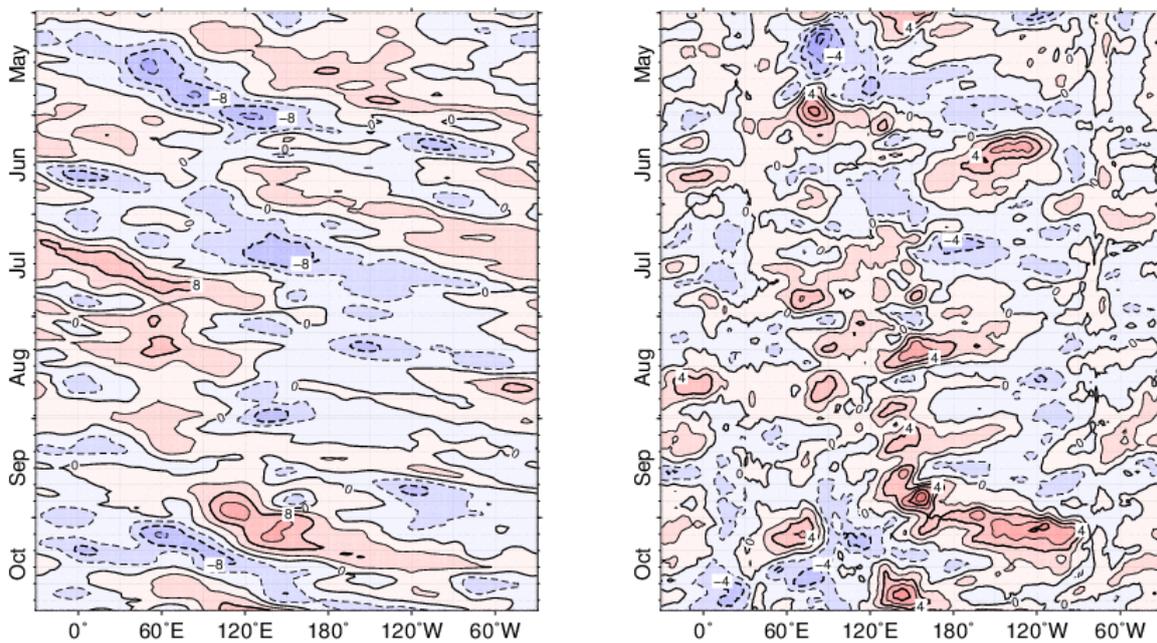


Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (May 2018 – October 2018)
 The contour intervals are 4×10^6 m²/s (left) and 2 m/s (right). The base period for the normal is 1981-2010.

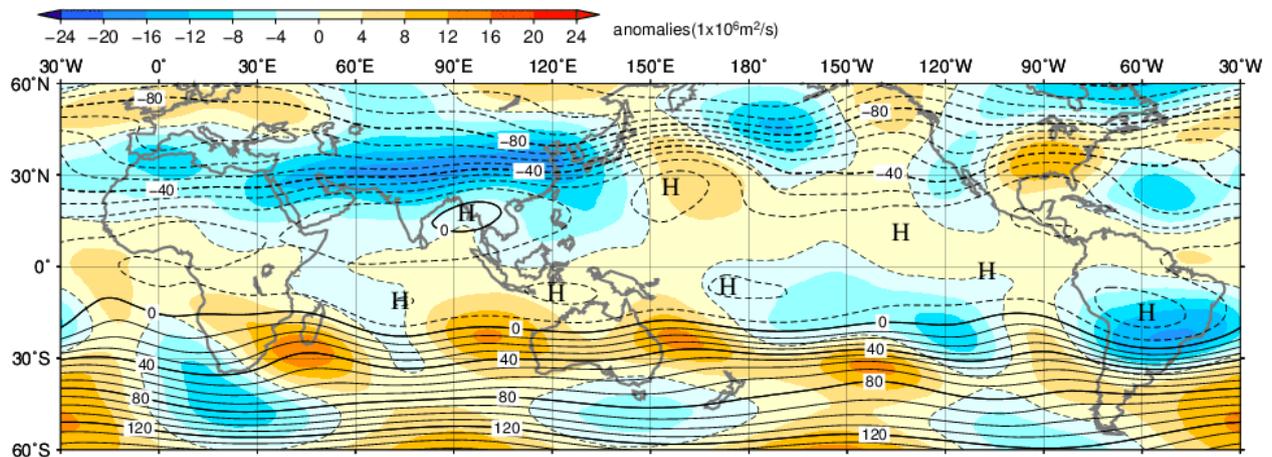


Fig. 8 Monthly mean 200-hPa stream function and anomaly (October 2018)
 The contour interval is 10×10^6 m²/s. The base period for the normal is 1981-2010.

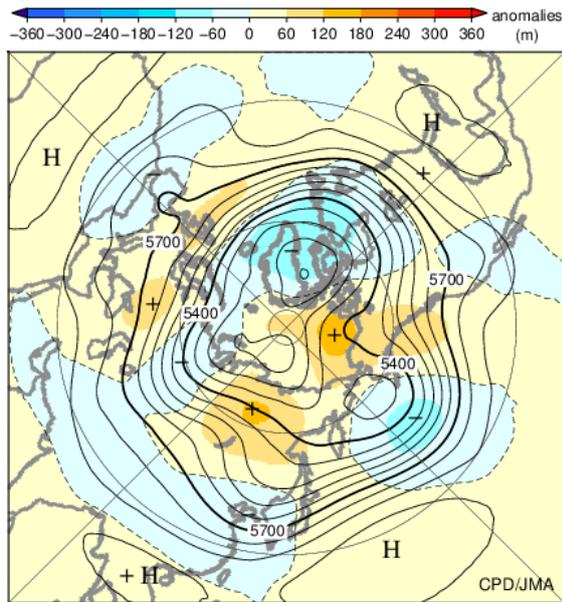


Fig. 9 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (October 2018)

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.

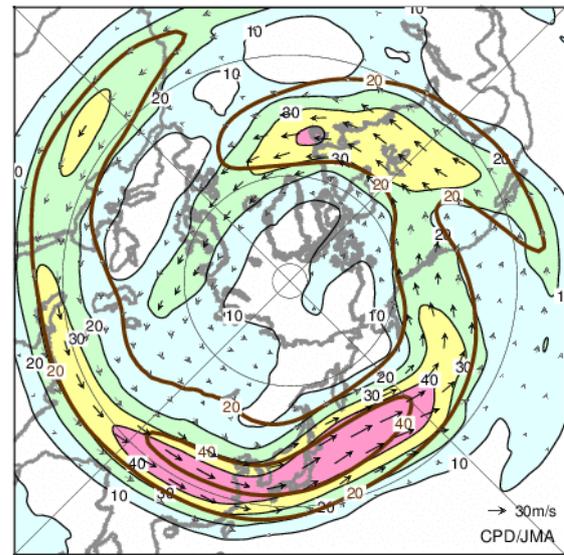


Fig. 10 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (October 2018)

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.

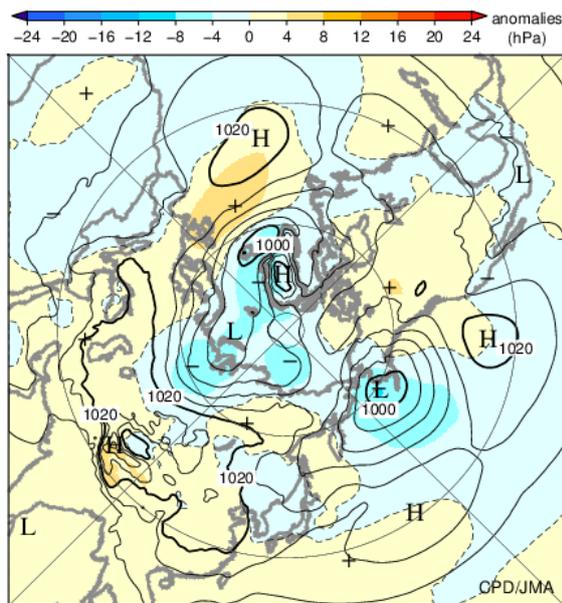


Fig. 11 Monthly mean sea level pressure and anomaly in the Northern Hemisphere (October 2018)

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.

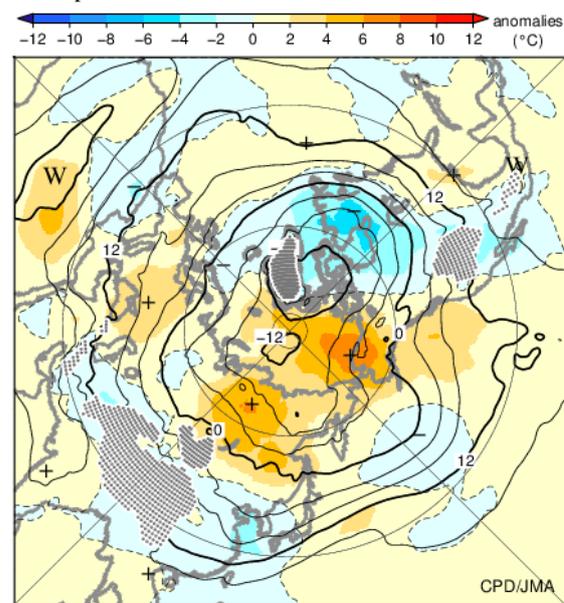


Fig. 12 Monthly mean 850-hPa temperature and anomaly in the Northern Hemisphere (October 2018)

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.

<https://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.