Monthly Highlights on the Climate System (June 2020)

Highlights in June 2020

- The monthly anomaly of the average temperature over Japan was the warmest for June since 1898.
- Monthly mean temperatures were significantly above normal all over Japan, and monthly precipitation amounts were significantly above normal in Okinawa/Amami.
- Monthly mean temperatures were extremely high from the northern part of Eastern Siberia to the northeastern part of Western Siberia, from the eastern part of East Asia to the northwestern part of Southeast Asia, in and around southwestern Russia, from northern to eastern Europe, from the western part of Western Africa to the western part of Middle Africa, from the northeastern to central USA, in the northern part of South America, from northern to eastern Australia, and from western to southwestern Australia.
- In the equatorial Pacific, remarkably positive SST anomalies were observed over the western part, and remarkably negative SST anomalies were observed over the eastern part.
- Convective activity was enhanced over the southwestern tropical Indian Ocean and South Asia, and suppressed from the northern part of the South China Sea to the seas northeast of the Philippines and over the western and central equatorial Pacific.
- In the 500-hPa height field, positive anomalies were seen over the seas south of Greenland, northeastern Europe, and the northern part of Eastern Siberia, and negative anomalies were seen over southern Europe, Western Siberia, the southwestern part of Eastern Siberia, and southern Alaska.
- The subtropical jet stream was stronger than normal over Northern Africa and Central Asia, and shifted northward from its normal position over East Asia.

Climate in Japan (Fig. 1):

- The monthly anomaly of the average temperature over Japan was +1.80°C (the warmest for June since 1898).
- Monthly mean temperatures were significantly above normal all over Japan due to warm-air inflow, and the highest in eastern Japan and tied with 2005 as the highest in western Japan on record for June since 1946.
- In Okinawa/Amami, monthly precipitation amounts were significantly above normal due to the Baiu front and moist-air inflow.
- Monthly sunshine durations were significantly above normal on the Sea of Japan side of eastern Japan, because the region was repeatedly under the influence of 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 +0.41°C (2nd warmest for June since 1891) (preliminary value) (Fig. 2). On a longer time scale, global average surface temperatures have risen at a rate of about 0.73°C per century in June (preliminary value).
- Extreme climate events were as follows (Fig. 3).
  - Monthly mean temperatures were extremely high from the northern part of Eastern Siberia to the northeastern part of Western Siberia, from the eastern part of East Asia to the northwestern part of Southeast Asia, in and around southwestern Russia, from northern to eastern Europe, from the western part of Western Africa to the western part of Middle Africa, from the northeastern to central USA, in the northern part of South America, from northern to eastern Australia, and from western to southwestern Australia.
  - Monthly precipitation amounts were extremely high from the northwestern to central part of Southeast Asia, from western Europe to the northern part of Northern Africa, and from central to southeastern Mexico.

Oceanographic Conditions (Fig. 4)**:**

- In the equatorial Pacific, remarkably positive SST anomalies were observed over the western part, and remarkably negative SST anomalies were observed over the eastern part. In the NINO.3 region, the monthly mean SST anomaly was -0.7˚C and the SST deviation from the latest sliding 30-year mean was -0.8˚C (Fig. 5).
- In the North Pacific, remarkably positive SST anomalies were observed from the area around Japan to the Bering Sea, from the South China Sea to the western coast of North America and over the area off the southwestern coast of Mexico.
- In the South Pacific, remarkably positive SST anomalies were observed in the east of New Zealand and from the western to the central tropical region, and remarkably negative SST anomalies were observed in the area around 45°S, 110°W.
- In the Indian Ocean, remarkably positive SST anomalies were observed from the western to the central tropical region and the Arabian Sea.
- In the North Atlantic, remarkably positive SST anomalies were observed in the east of the Bahamas and from the tropical region to the Strait of Gibraltar.

Tropics:

- Convective activity was enhanced over the southwestern tropical Indian Ocean and South Asia, and suppressed from the northern part of the South China Sea to the seas northeast of the Philippines and over the western and central equatorial Pacific (Fig. 6).
- The active phase of equatorial intraseasonal oscillation was seen from Africa to the Indian Ocean in early June, and became obscure afterward (Fig. 7).
- In the upper troposphere, anti-cyclonic circulation anomalies were seen over a wide area of both hemispheres except the western tropical Pacific (Fig. 8).
- In the lower troposphere, cyclonic circulation anomalies straddling the equator were seen over the western tropical Indian Ocean, and anti-cyclonic circulation anomalies straddling the equator were seen over the western tropical Pacific.
- In the sea level pressure field, in the equatorial area, positive anomalies were seen over the Pacific, and negative anomalies were seen from South America to the Atlantic and over the Indian Ocean. The Southern Oscillation Index value was -0.6 (Fig. 5).

Extratropics:

- In the 500-hPa height field (Fig. 9), positive anomalies were seen over the seas south of Greenland, northeastern Europe, and the northern part of Eastern Siberia, and negative anomalies were seen over southern Europe, Western Siberia, the southwestern part of Eastern Siberia, and southern Alaska.
- The subtropical jet stream was stronger than normal over Northern Africa and Central Asia, and shifted northward from its normal position over East Asia (Fig. 10).
- In the sea level pressure field (Fig. 11), positive anomalies were seen over the seas south of Greenland, from northeastern Europe to Western Russia, and near the Kamchatka Peninsula, and negative anomalies were seen over southern Europe, from the Kara Sea to Central Siberia, from central China to Japan, and over northwestern and central North America.
- Temperatures at 850-hPa were above normal over eastern Europe, the northern part of Eastern Siberia, East Asia, and central North America, and below normal over Western Russia and the southwestern part of Eastern Siberia (Fig. 12).
- Zonal mean temperatures in the troposphere were above normal over a wide area except near 70°S.

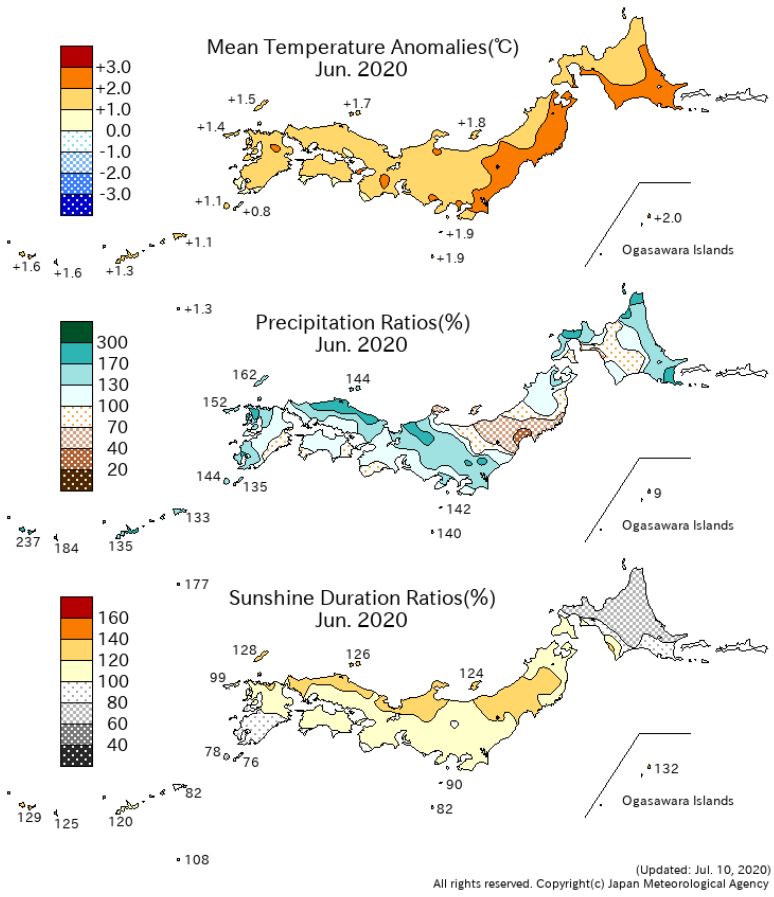

Fig. 1 Monthly climate anomaly/ratio over Japan (June 2020)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
The base period for the normal is 1981-2010.

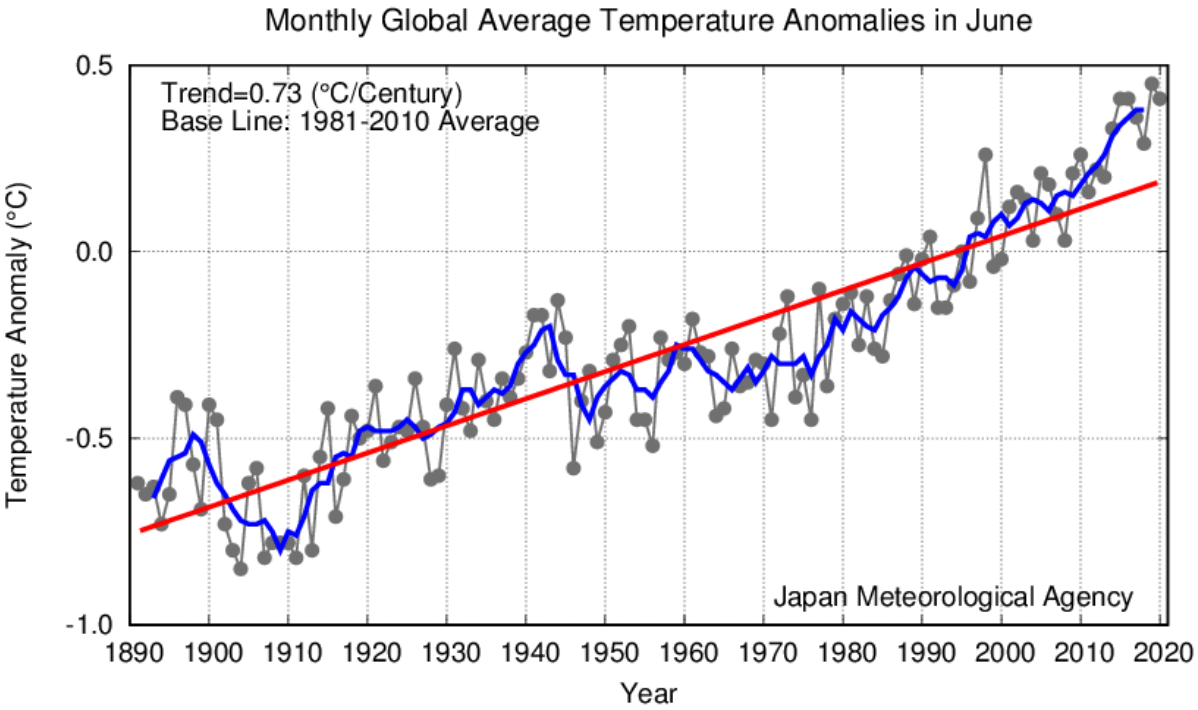

Fig. 2 Long-term change in monthly anomalies of global average surface temperature in June
The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations from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

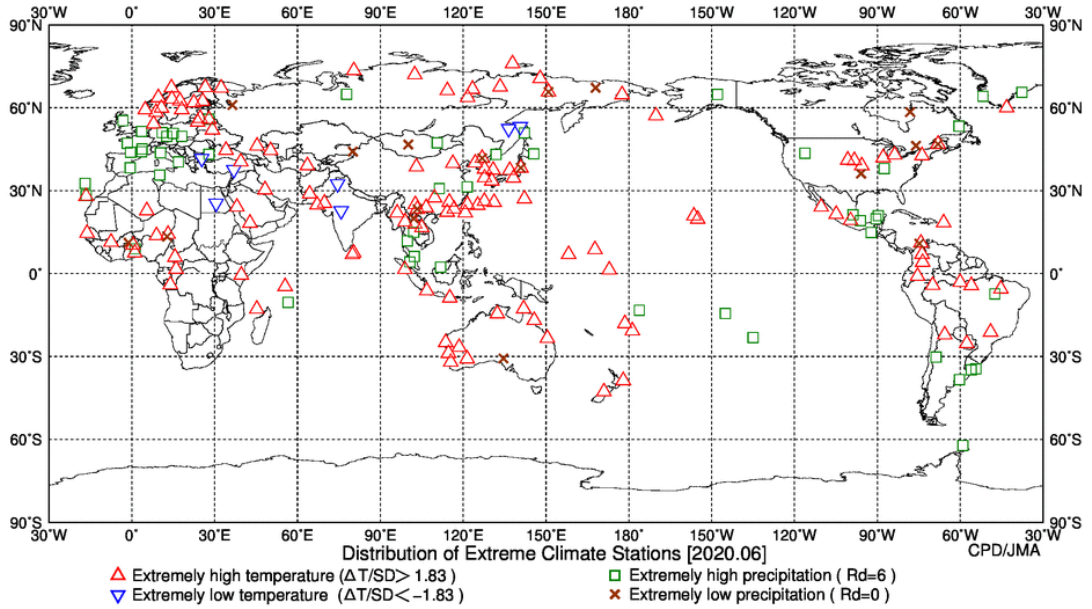

Fig. 3 Distribution of extreme climate stations (June 2020)

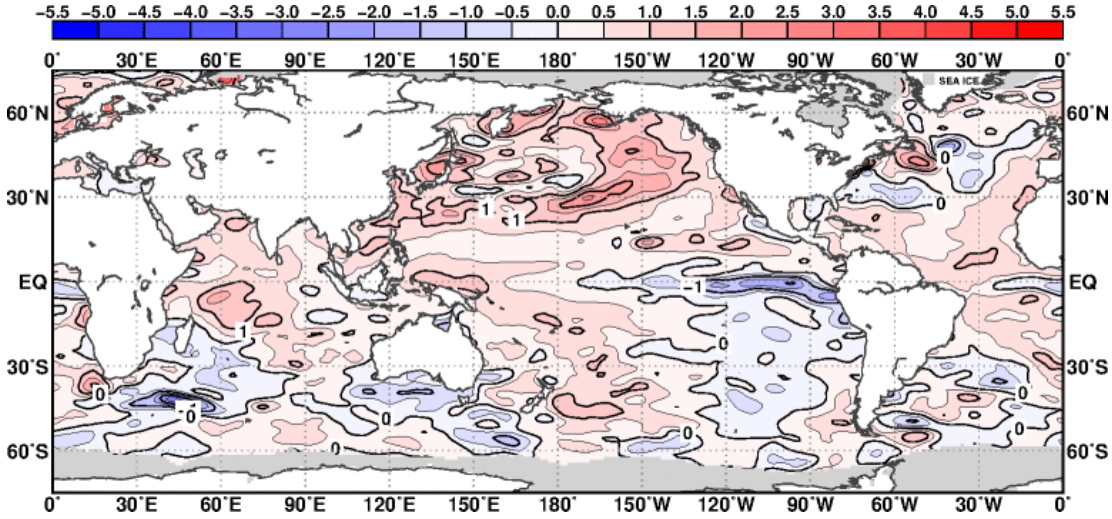

Fig. 4 Monthly mean sea surface temperature anomaly (June 2020)
The contour interval is 0.5 degree C. The base period for the normal is 1981-2010. Maximum coverage with sea ice is shaded in gray.

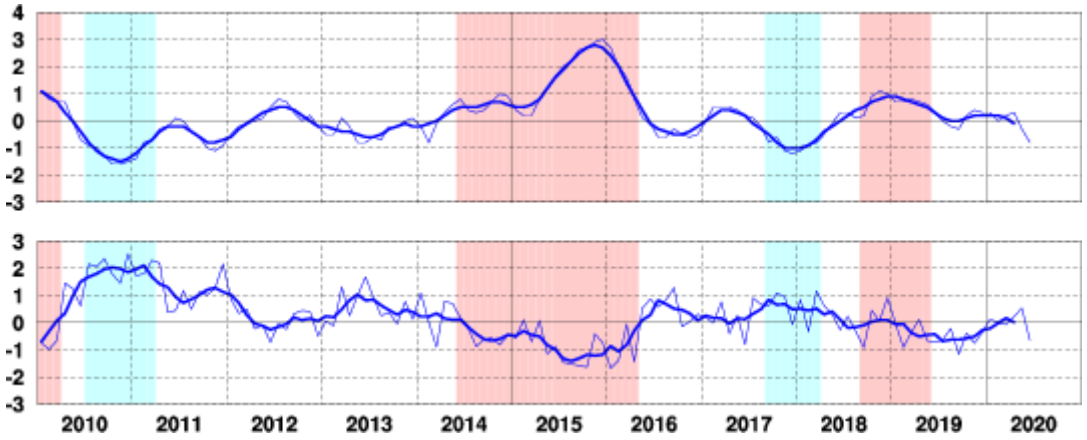

Fig. 5 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).
Thin blue lines represent monthly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

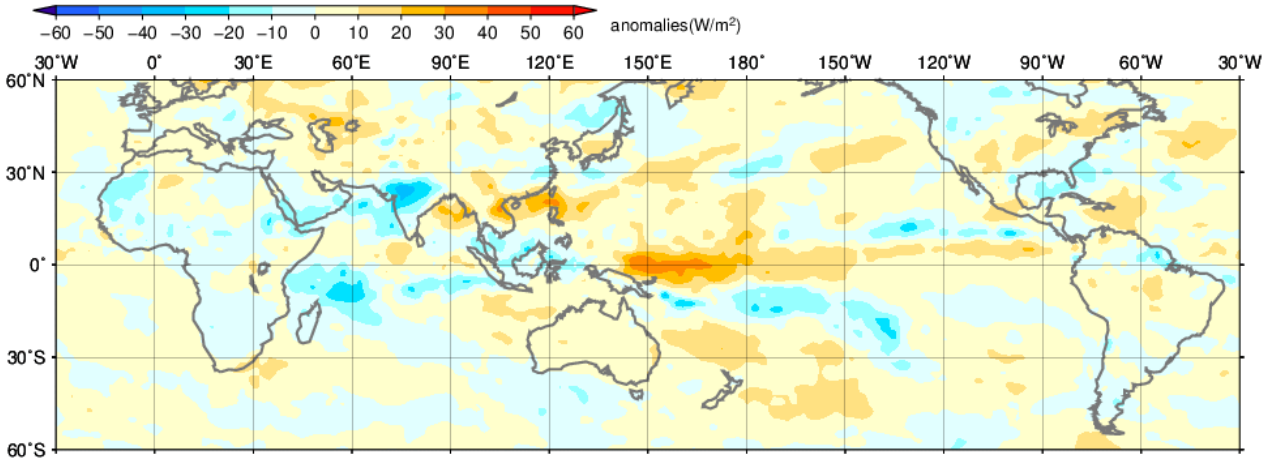

Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (June 2020)
The contour interval is 10 W/m^2. The base period for the normal is 1981-2010. Original data provided by NOAA.

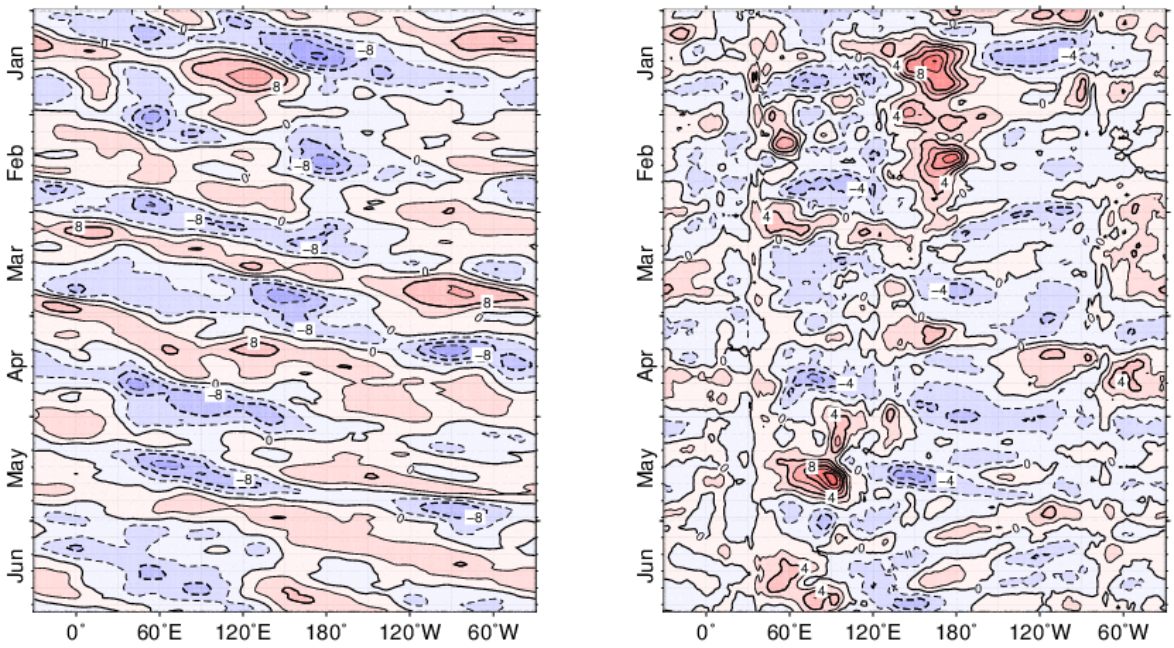

Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (January 2020 – June 2020)
The contour intervals are 4x10^6 m^2/s (left) and 2 m/s (right). The base period for the normal is 1981-2010.

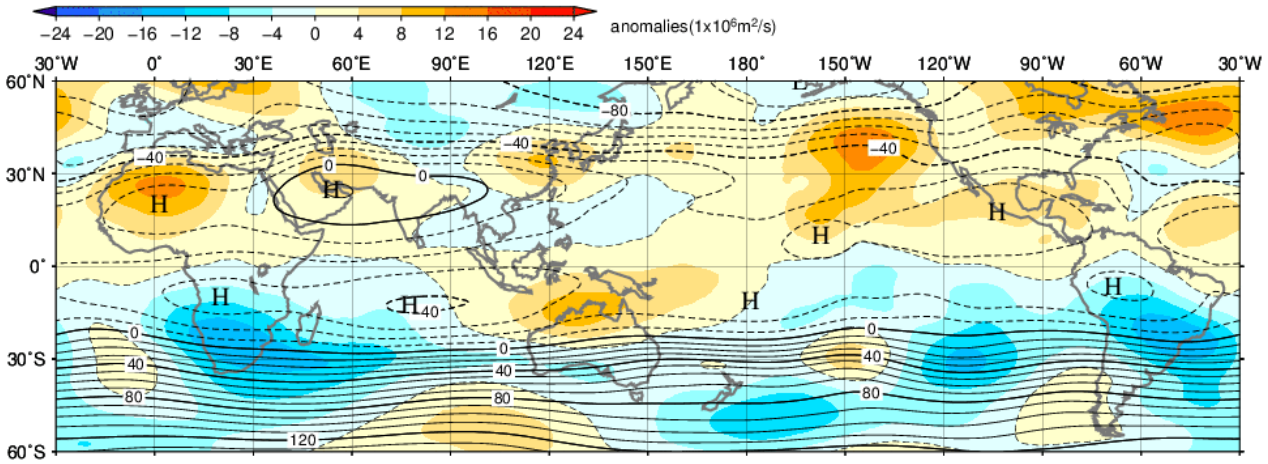

Fig. 8 Monthly mean 200-hPa stream function and anomaly (June 2020)
The contour interval is 10x10^6 m^2/s. The base period for the normal is 1981-2010.

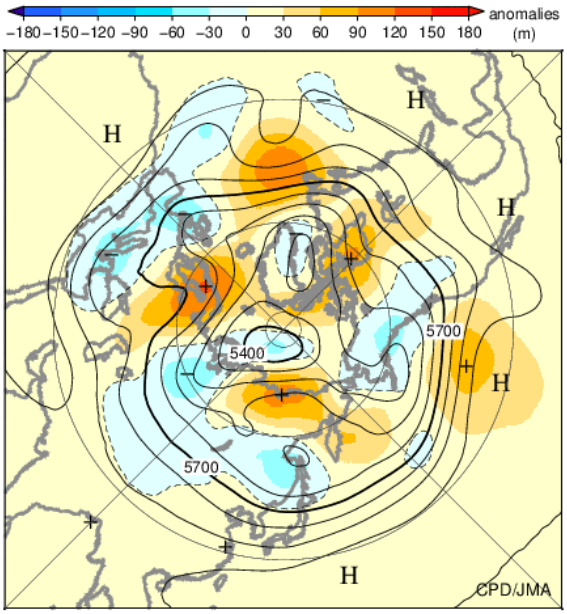

Fig. 9 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (June 2020)

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.

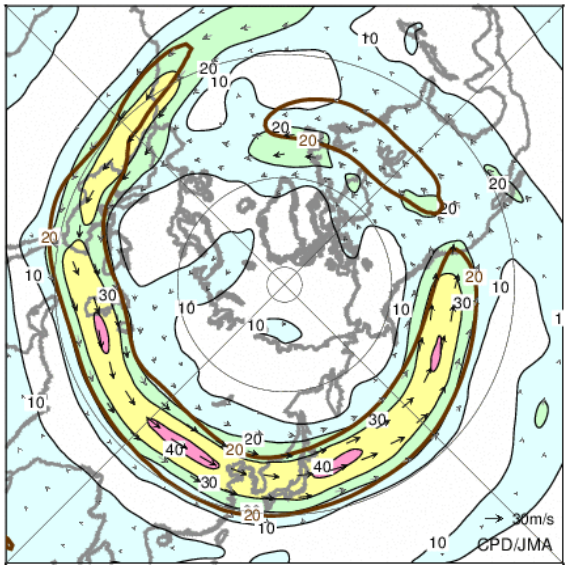

Fig. 10 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (June 2020)

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.

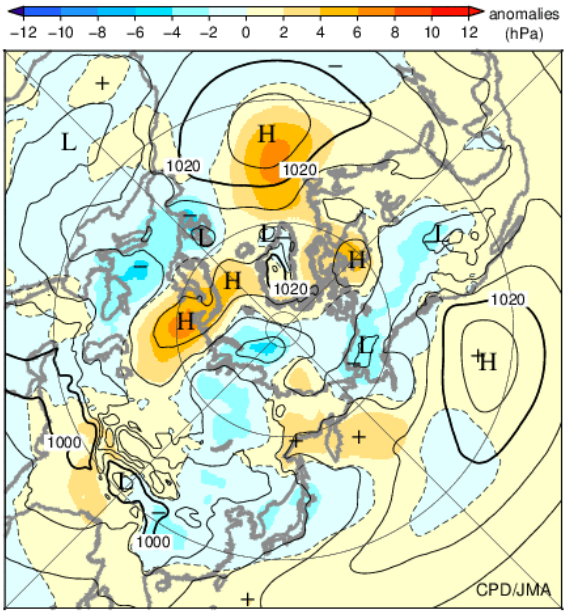

Fig. 11 Monthly mean sea level pressure and anomaly in the Northern Hemisphere (June 2020)

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.

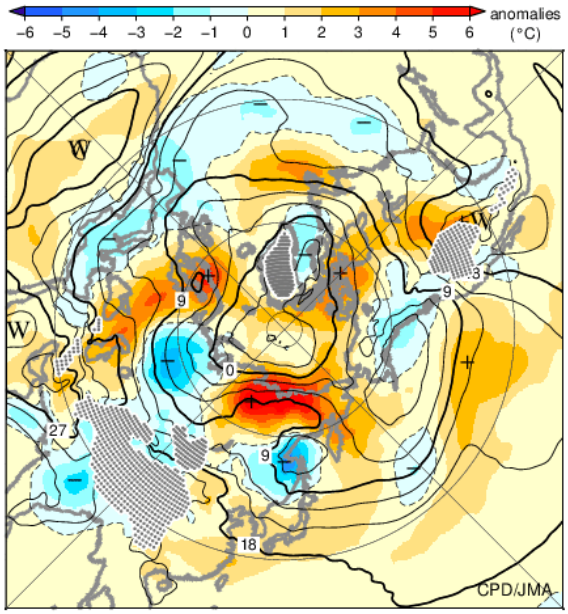

Fig. 12 Monthly mean 850-hPa temperature and anomaly in the Northern Hemisphere (June 2020)

The contours show 850-hPa temperature at intervals of 3 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.