

## Monthly Highlights on the Climate System (August 2021)

### Highlights in August 2021

- Though ENSO-neutral conditions persisted (see [El Niño Outlook](#) updated on 10 September 2021) negative SST anomalies were observed from the central to eastern part of the equatorial pacific except east of 110°W. In the Indian Ocean, remarkably positive SST anomalies were observed south of Sumatra.
- Active stationary fronts formed between the Okhotsk High and the North Pacific Subtropical High and moist air along them brought record-breaking monthly precipitation amounts to western Japan.
- Monthly precipitation amounts were extremely high from eastern Japan to central China and from central to western Indonesia, and extremely low in southeastern Canada.
- Convective activity was enhanced from southwest of Sumatra to the Maritime Continent, and suppressed from the Bay of Bengal to the Philippines.
- Corresponding to above-mentioned convective activity anomalies, the subtropical jet stream shifted southward from its normal position from Eurasia to Japan, and meandered southward over the area west of Japan.

**Notice:** The new climatological normal (1991-2020 average) has been used unless otherwise stated.

### Climate in Japan (Fig. 1):

- Monthly precipitation amounts were significantly above normal in western Japan and on the Pacific side of eastern Japan due to active stationary fronts and moist air inflow into the main island of Japan in the middle of August. Monthly sunshine durations were significantly below normal and monthly mean temperatures were below normal in western Japan, and monthly sunshine durations were below normal in eastern Japan due to cloudy and rainy weather conditions associated with the fronts. Monthly precipitation amounts were below normal on the Sea of Japan side of northern Japan due to high-pressure systems that often covered the region.
- Since Okinawa/Amami was affected by tropical cyclones and depressions in early August, monthly mean temperatures of the region were below normal.

### 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 +0.27°C (4th warmest for August since 1891) (preliminary value) (Fig. 2). On a longer time scale, global average surface temperatures have risen at a rate of about 0.70°C per century in August (preliminary value).
- Extreme climate events were as follows (Fig. 3).
  - Monthly mean temperatures were extremely high in and around the Indochina Peninsula, from the southwestern part of Central Asia to southwestern Russia, from Iceland to southeastern Greenland, from southern Europe to the northern part of Northern Africa, from the western part of Middle Africa to Ascension Island, from southeastern Canada to the northeastern USA, from northwestern Brazil to central Peru, and from eastern Australia to central Indonesia.
  - Monthly precipitation amounts were extremely high in and around Mongolia, from eastern Japan to central China, from central to western Indonesia, from southwestern Russia to central Europe, from the Midwest to southeastern USA, from northwestern Canada to the northwestern USA, in Southern Mexico, in and around western Colombia, and in and around northern Brazil.
  - Monthly precipitation amounts were extremely low in and around the central Indochina Peninsula, in the central part of Eastern Siberia, from the southern part of Central Siberia to the southeastern part of Western Siberia, in and around southwestern Russia, and in southeastern Canada.

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

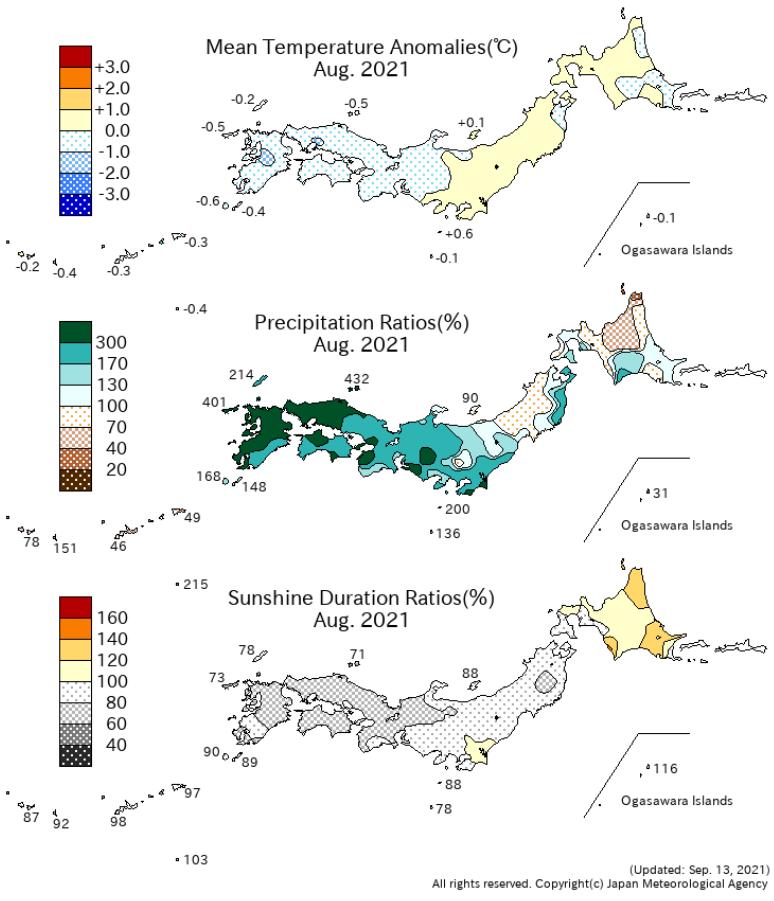
- In the equatorial Pacific, negative SST anomalies were observed from the central to eastern part except east of 110°W. The monthly mean SST anomaly averaged over the NINO.3 region and the SST deviation from the latest sliding 30-year mean over the region were both -0.3°C (Fig. 5).
- In the North Pacific, remarkably positive SST anomalies were observed in the western tropical region, from the area near the Kamchatka Peninsula to the area around the Aleutian islands, and off the western coast of North America.
- In the South Pacific, remarkably positive SST anomalies were observed in the western tropical region and in the area near 30°S, 150°W, and remarkably negative SST anomalies were observed from the central to eastern tropical region.
- In the Indian Ocean, remarkably positive SST anomalies were observed south of Sumatra.
- In the North Atlantic, remarkably positive SST anomalies were observed off the eastern coast of North America. Remarkably positive SST anomalies were also observed in the equatorial Atlantic.

### **Tropics:**

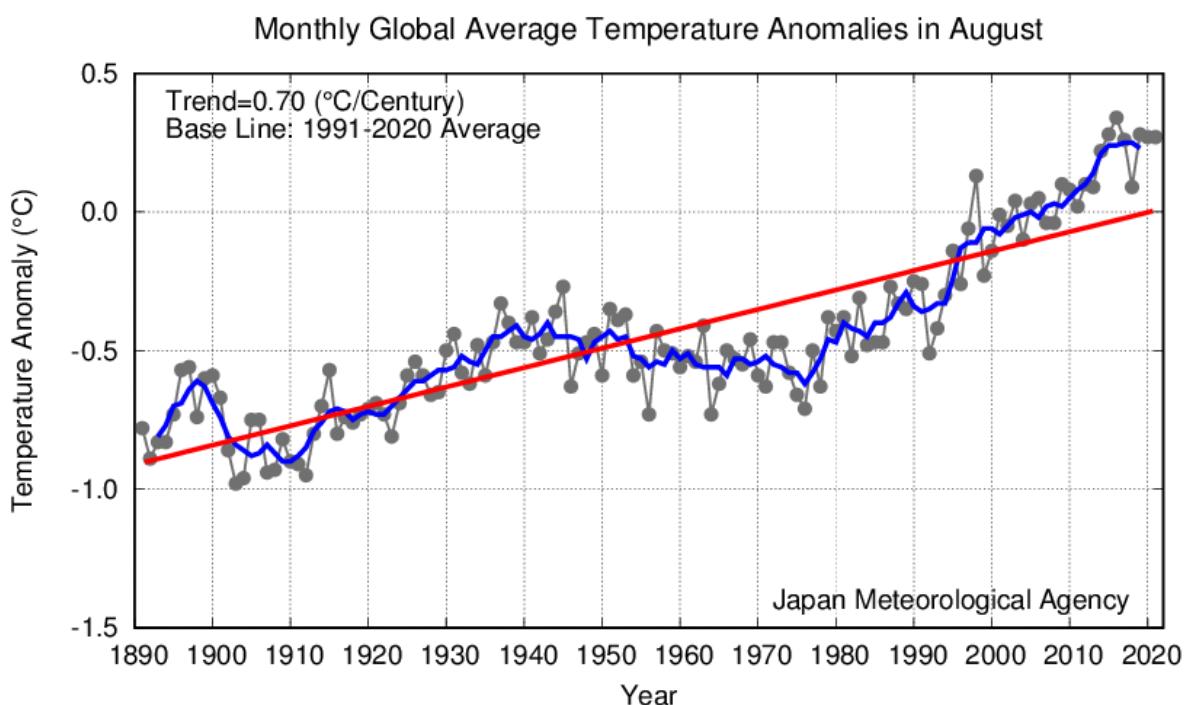
- Convective activity was enhanced from southwest of Sumatra to the Maritime Continent and over the area off the southwestern coast of Mexico, and suppressed from the Bay of Bengal to the Philippines, over the western equatorial Pacific and the western tropical North Pacific (Fig. 6).
- The active phase of equatorial intraseasonal oscillation propagated eastward from South America to the western Indian Ocean in the first half of the month, and became obscure afterward (Fig. 7).
- In the upper troposphere, anti-cyclonic circulation anomalies were seen from northern India to southern China, and cyclonic circulation anomalies were seen over the seas east of the Philippines and northwestern Australia. Anti-cyclonic circulation anomalies straddling the equator were seen over the eastern tropical Pacific (Fig. 8).
- In the lower troposphere, cyclonic circulation anomalies were seen over the northern tropical Indian Ocean, and anti-cyclonic circulation anomalies were seen from the South China Sea to the seas south of Japan.
- In the sea level pressure field, positive anomalies were widely seen over the tropical Pacific, especially significant from the central to eastern tropical South Pacific, and negative anomalies were seen over the equatorial Atlantic. The Southern Oscillation Index value was +0.9 (Fig. 5).

### **Extratropics:**

- In the 500-hPa height field (Fig. 9), wave trains were dominant from the North Atlantic to Central Asia and from Eastern Siberia to the North Pacific, with positive anomalies over Western Russia and Eastern Siberia, and negative anomalies over Europe and the seas south of the Aleutian Islands. In addition, zonally elongated negative anomalies were seen over the latitude band of 40°N in Central and East Asia, with remarkable anomalies to the west of Japan.
- The subtropical jet stream shifted southward from its normal position from Eurasia to Japan, and meandered southward over the area west of Japan. The polar front jet stream was clearly seen over northern Eurasia (Fig. 10).
- In the sea level pressure field (Fig. 11), positive anomalies were seen over the Sea of Okhotsk. The westward expansion of the North Pacific Subtropical High was stronger than normal over the seas south of Japan.
- Temperatures at 850-hPa were above normal over eastern North America and from Western Russia to Eastern Siberia, and below normal over northern East Asia and the seas south of the Aleutian Islands (Fig. 12).
- Zonal mean temperatures in the troposphere were significantly above normal over the latitude band of 60°N, and below normal over the latitude band of 60°S. In the lower stratosphere, zonal mean temperatures were below normal over the latitude bands 50° to 70° S.



**Fig. 1 Monthly climate anomaly/ratio over Japan (August 2021)**  
 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 August**  
 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.

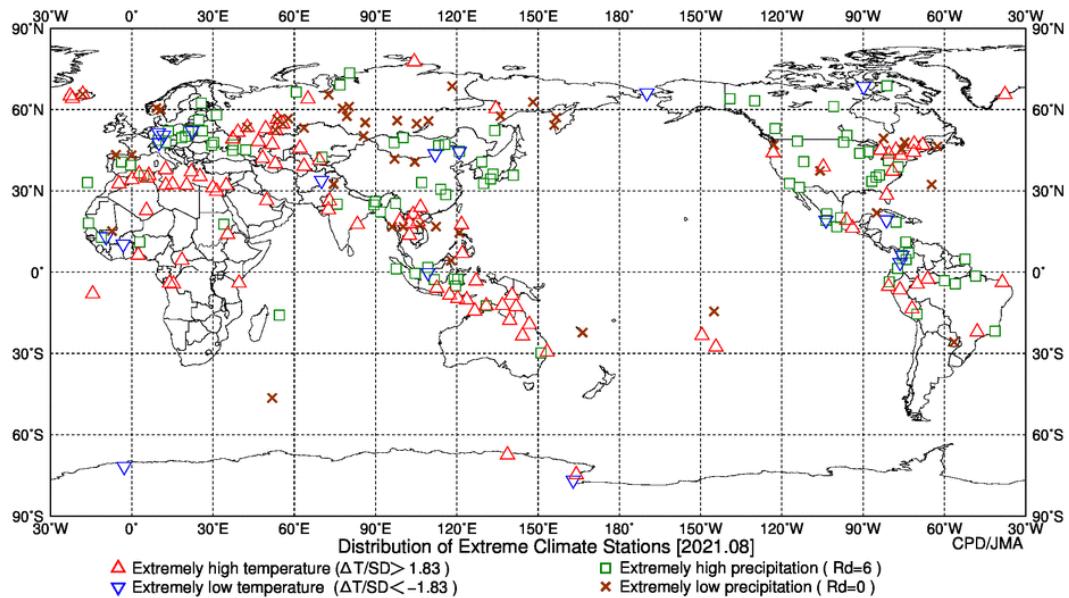


Fig. 3 Distribution of extreme climate stations (August 2021)

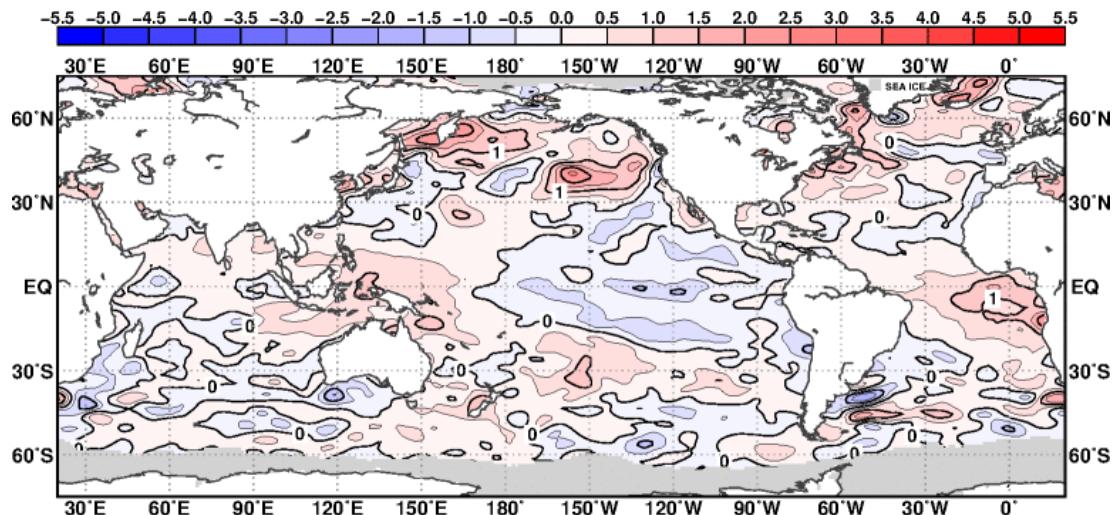


Fig. 4 Monthly mean sea surface temperature anomaly (August 2021)

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.

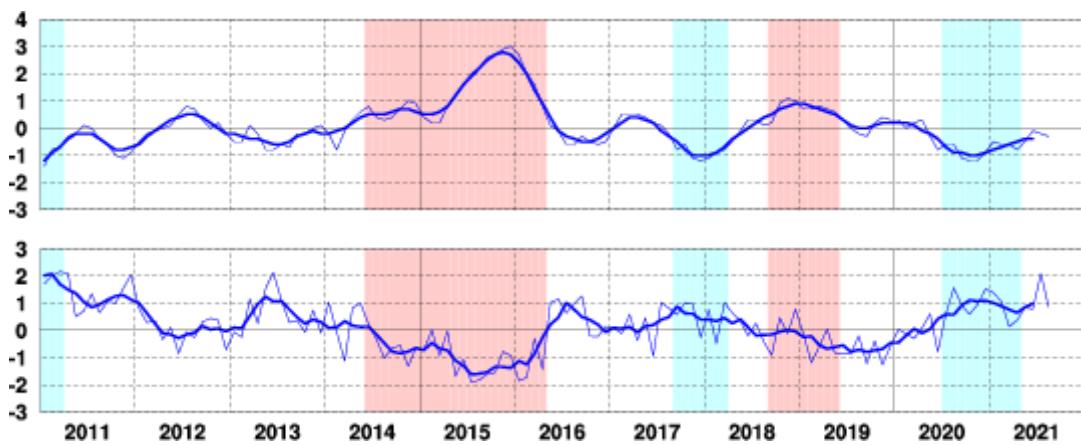


Fig. 5 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1991-2020 base period (lower).

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.

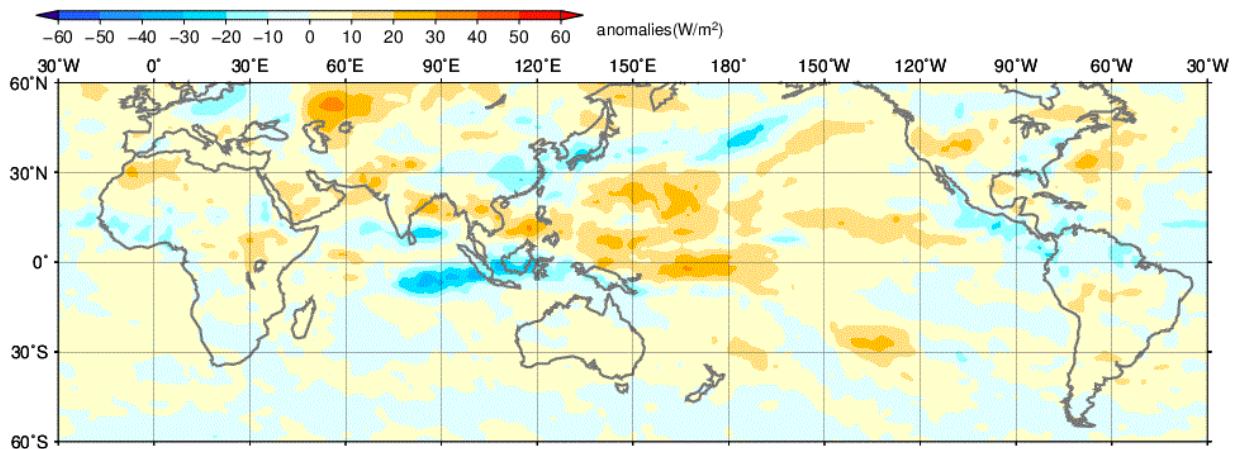


Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (August 2021)

The contour interval is 10 W/m<sup>2</sup>. The base period for the normal is 1991-2020. Original data provided by NOAA.

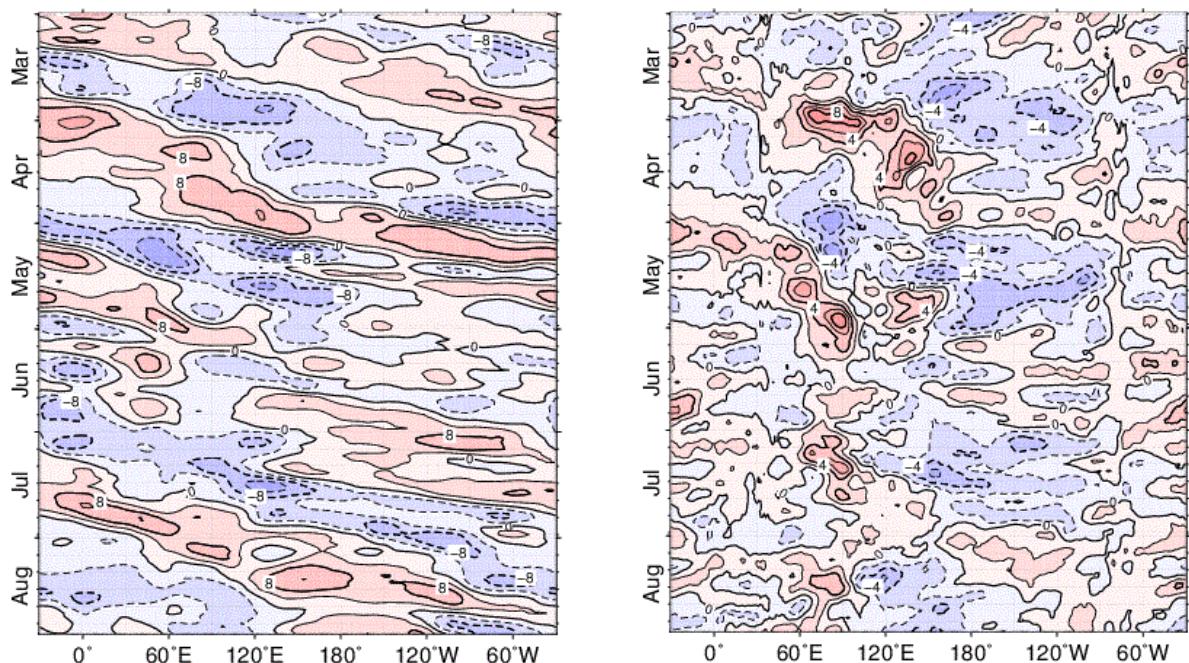


Fig. 7 Time-Latitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (March 2021 – August 2021)

The contour intervals are 4x10<sup>6</sup> m<sup>2</sup>/s (left) and 2 m/s (right). The base period for the normal is 1991-2020.

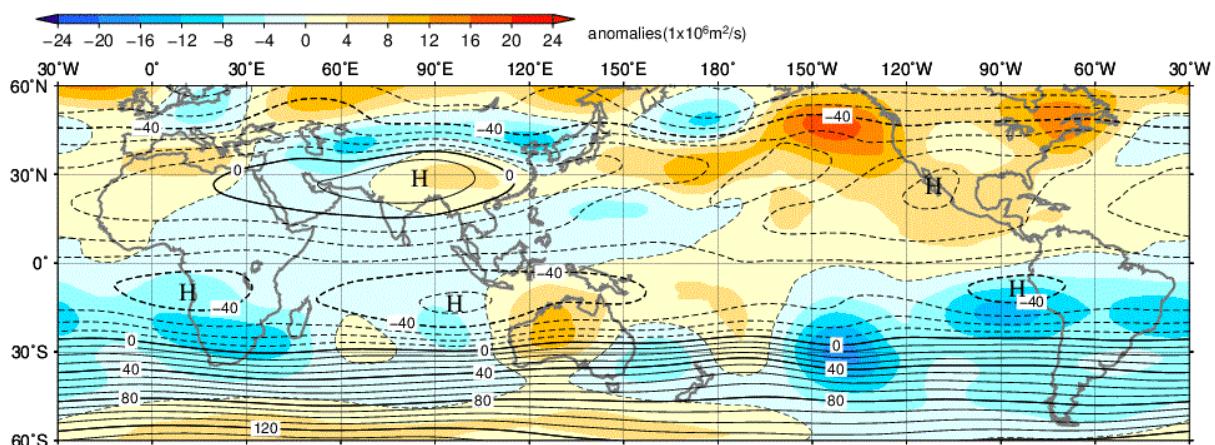


Fig. 8 Monthly mean 200-hPa stream function and anomaly (August 2021)

The contour interval is 10x10<sup>6</sup> m<sup>2</sup>/s. The base period for the normal is 1991-2020.

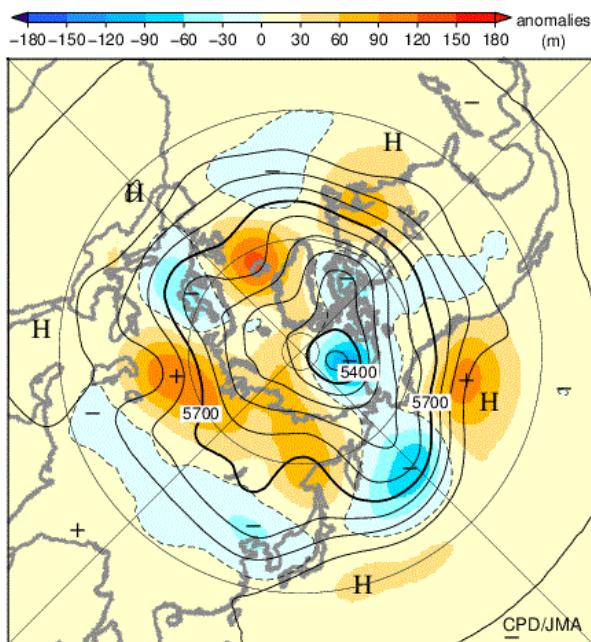


Fig. 9 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (August 2021)

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.

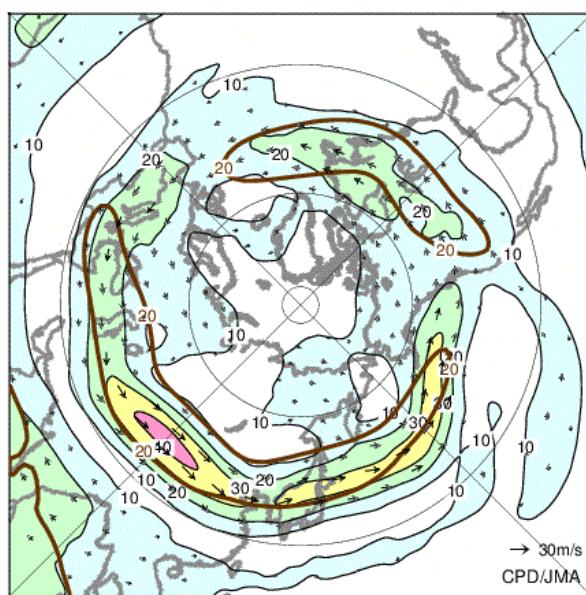


Fig. 10 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (August 2021)

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 1991-2020.

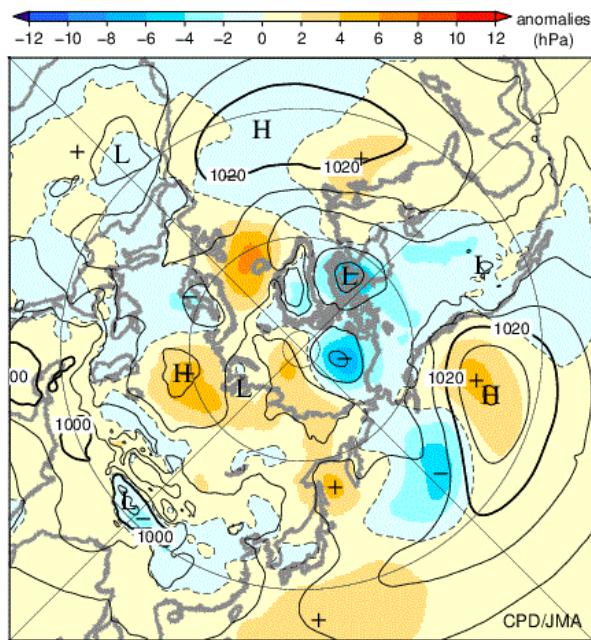


Fig. 11 Monthly mean sea level pressure and anomaly in the Northern Hemisphere (August 2021)

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.

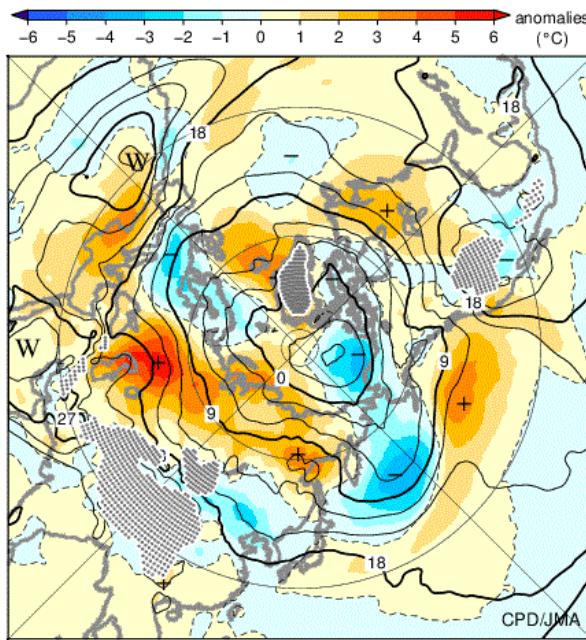


Fig. 12 Monthly mean 850-hPa temperature and anomaly in the Northern Hemisphere (August 2021)

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