

## Monthly Highlights on the Climate System (August 2018)

### Highlights in August 2018

- Monthly mean temperatures were significantly above normal in eastern and western Japan.
- Monthly precipitation amounts were significantly above normal on the Sea of Japan side of northern and eastern Japan, and in Okinawa/Amami.
- Monthly mean temperatures were extremely high from northern Kyushu region of Japan to northwestern China, from Western Russia to southwestern Europe, in and around the northeastern USA, and from the southwestern USA to central Mexico.
- In the equatorial Pacific, remarkably positive SST anomalies were observed in the western part.
- Convective activity was enhanced from the Philippines to the 10-20°N latitude band in the North Pacific.
- In the 500-hPa height field, positive anomalies were seen over northeastern China, the seas south of Alaska, eastern Canada, Western Russia and in and around the Laptev Sea.
- The subtropical jet stream was stronger than normal over Eurasia and displaced northward from its normal position over the eastern part of East Asia.
- The North Pacific Subtropical High was stronger than normal to the seas southeast of Japan. The northeastward extension of the Tibetan High was also seen and the Tibetan High covered a large part of Japan.

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

- In eastern and western Japan, monthly mean temperatures were significantly above normal, and on the Sea of Japan side of western Japan, monthly precipitation amounts were significantly below normal and monthly sunshine durations were significantly above normal, because the Tibetan High covered those regions with fine and very hot days.
- Monthly precipitation amounts were significantly above normal with heavy rainfalls on the Sea of Japan side of northern and eastern Japan, and in Okinawa/Amami, due to active fronts and approaches of typhoons, respectively.

### World Climate:

- The monthly anomaly of the global average surface temperature in August 2018 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.27°C (6th warmest since 1891) (preliminary value) (Fig. 2). On a longer time scale, global average surface temperatures have risen at a rate of about 0.68°C per century in August (preliminary value).
- Extreme climate events were as follows (Fig. 3).
  - Monthly mean temperatures were extremely high from northern Kyushu region of Japan to northwestern China, from Western Russia to southwestern Europe, in and around the northeastern USA, and from the southwestern USA to central Mexico.
  - Monthly precipitation amounts were extremely high from Mongolia to northern China, in and around the northern part of Southeast Asia, from southern Europe to southeastern Algeria, and from the northeastern to southern USA.

### Oceanographic Conditions (Fig. 4):

- In the equatorial Pacific, remarkably positive SST anomalies were observed in the western part. In the NINO.3 region, the monthly mean SST anomaly and the SST deviation from the latest sliding 30-year mean were both +0.1°C (Fig.5).
- In the North Pacific, remarkably positive SST anomalies were observed from the area near 5°N, 165°E to the western coast of Central America, from east of Japan to south of the Aleutian Islands, and in the Gulf of

Alaska, and remarkably negative SST anomalies were observed from the area near 30°N, 175°E to the area near 30°N, 160°W.

- In the South Pacific, remarkably positive SST anomalies were observed from the eastern coast of Australia to the area near 30°S, 105°W, and remarkably negative SST anomalies were observed from the western coast of Chile to the area near 10°S, 135°W.
- In the Indian Ocean, remarkably positive SST anomalies were observed from the eastern coast of Africa to the area near 20°S, 100°E, and remarkably negative SST anomalies were observed south of Java.
- In the North Atlantic, remarkably positive SST anomalies were observed from the eastern coast of North America to the area near 40°N, 25°W, and remarkably negative SST anomalies were observed south of Greenland and from the western coast of West Africa to the area near 15°N, 60°W.

### **Tropics:**

- Convective activity was enhanced from the Philippines to the 10-20°N latitude band in the North Pacific, and was suppressed from the Indian Ocean to the eastern part of the Maritime Continent, over the latitude band of 30°N in the western North Pacific, and over the western North Atlantic (Fig. 6).
- The active phase of equatorial intraseasonal oscillation was seen over the equatorial Pacific in early August and became obscure afterward (Fig. 7).
- In the upper troposphere, anti-cyclonic circulation anomalies were seen over the northeastern part of East Asia, indicating a stronger-than-normal northeastward extension of the Tibetan High which covered a large part of Japan. Anti-cyclonic circulation anomalies were also seen in and around Australia and cyclonic circulation anomalies were seen over the western part of the tropical North Atlantic (Fig. 8).
- In the lower troposphere, cyclonic circulation anomalies were seen from the northern part of the South China Sea to the seas east of the Philippines and the monsoon trough over the Southeast Asia was stronger than normal. Anti-cyclonic circulation anomalies were seen over the western part of the tropical North Atlantic.
- In the sea level pressure field, negative anomalies were seen from the Bay of Bengal to the central part of the tropical North Pacific and positive anomalies were seen over the wide areas in and around the Atlantic. The Southern Oscillation Index value was -0.3 (Fig. 5).

### **Extratropics:**

- In the 500-hPa height field (Fig. 9), the polar vortex in the Northern Hemisphere shifted toward North America. Wave train was seen from the northeastern part of East Asia to the northern part of the North Pacific. Positive anomalies were seen over northeastern China, the seas south of Alaska, eastern Canada, Western Russia and in and around the Laptev Sea, and negative anomalies were seen over northern Canada, in and around the Kuril Islands and over the Mediterranean Sea.
- The westerly jet stream displaced northward from its normal position from North America to Europe and the polar front jet stream meandered over northern Eurasia. The subtropical jet stream was stronger than normal over Eurasia and displaced northward from its normal position over the eastern part of East Asia (Fig. 10).
- In the sea level pressure field (Fig. 11), the North Pacific Subtropical High was stronger than normal to the seas southeast of Japan. Positive anomalies were seen over the seas south of Alaska, the northern part of the North Atlantic, Western Russia, northeastern China and in and around Eastern Siberia, and negative anomalies were seen over the northern Canada and from southeastern China to the East China Sea.
- Temperatures at 850-hPa were above normal over the northeastern part of North America, southwestern Europe, from eastern Europe to Western Russia and in and around the Laptev Sea, and below normal over northern Canada and in and around the Kuril Islands (Fig. 12).
- Zonal mean temperatures in the troposphere were above normal in the Northern Hemisphere over the mid- and high-latitudes except over the latitude band of 60°N.

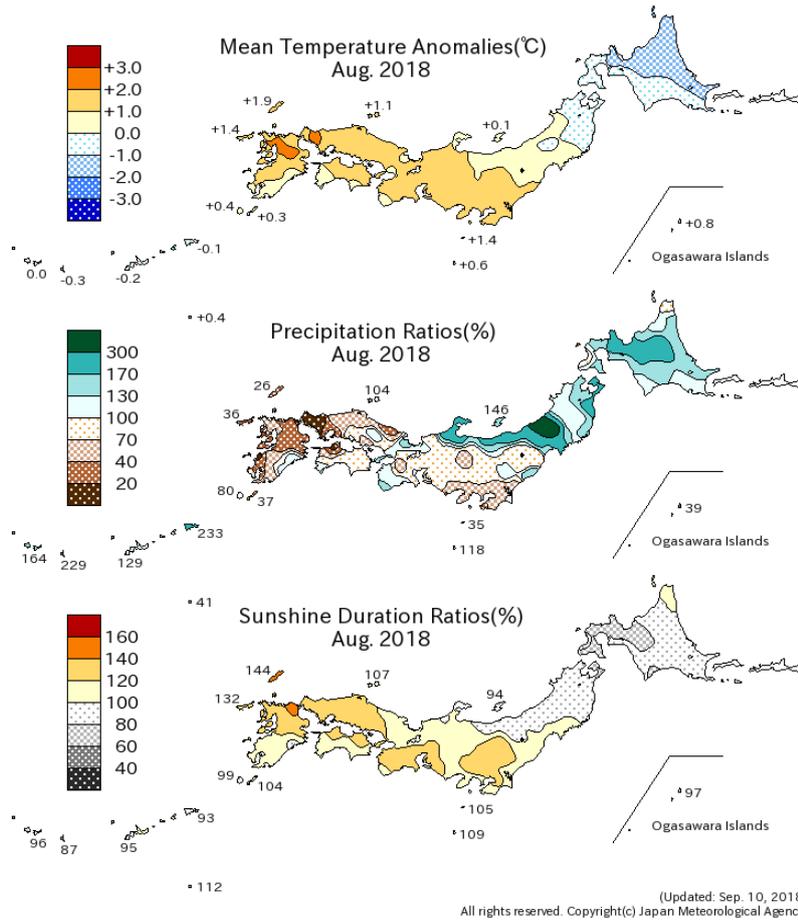


Fig. 1 Monthly climate anomaly/ratio over Japan (August 2018)  
Top: temperature anomalies (degree C)  
Middle: precipitation ratio (%)  
Bottom: sunshine duration ratio (%)  
The base period for the normal is 1981-2010.

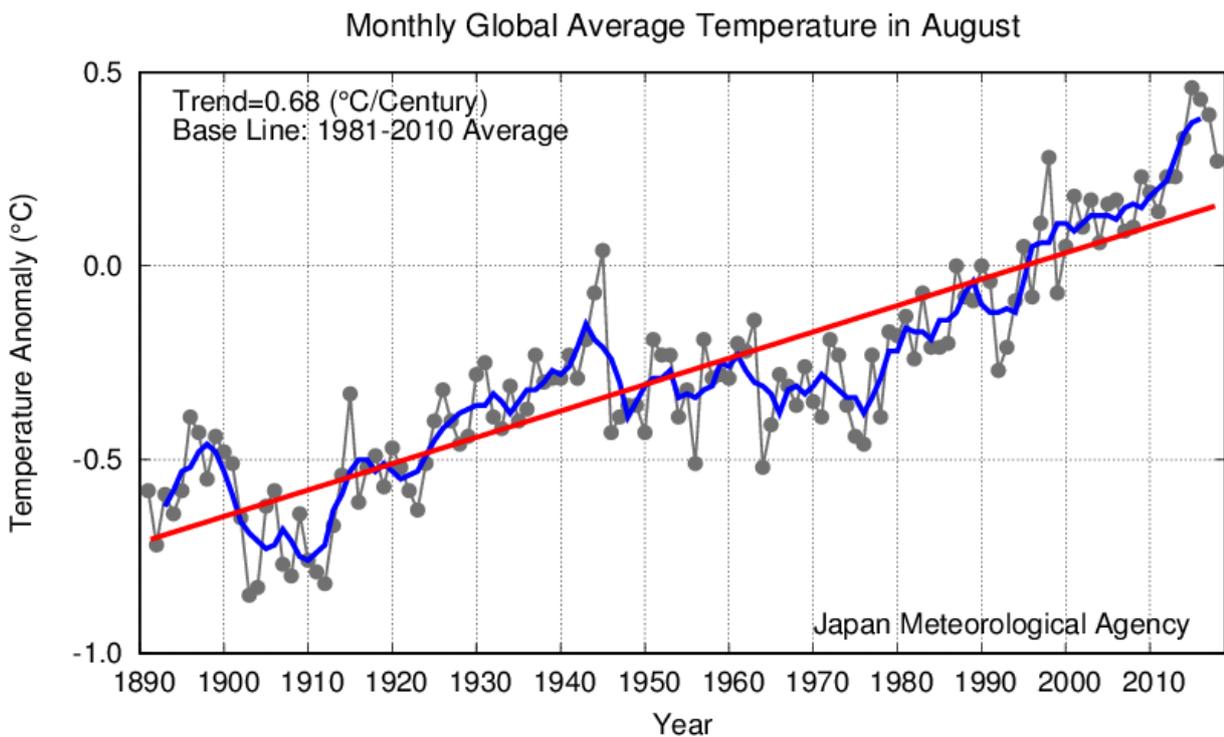


Fig. 2 Long-term change in monthly anomalies of global average surface temperature in August  
The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations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

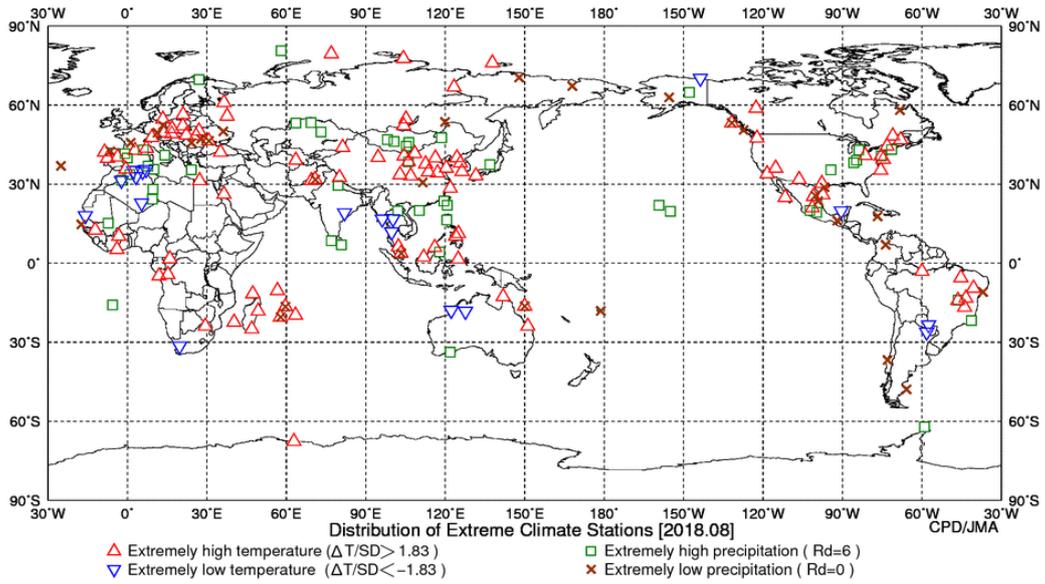


Fig. 3 Distribution of extreme climate stations (August 2018)

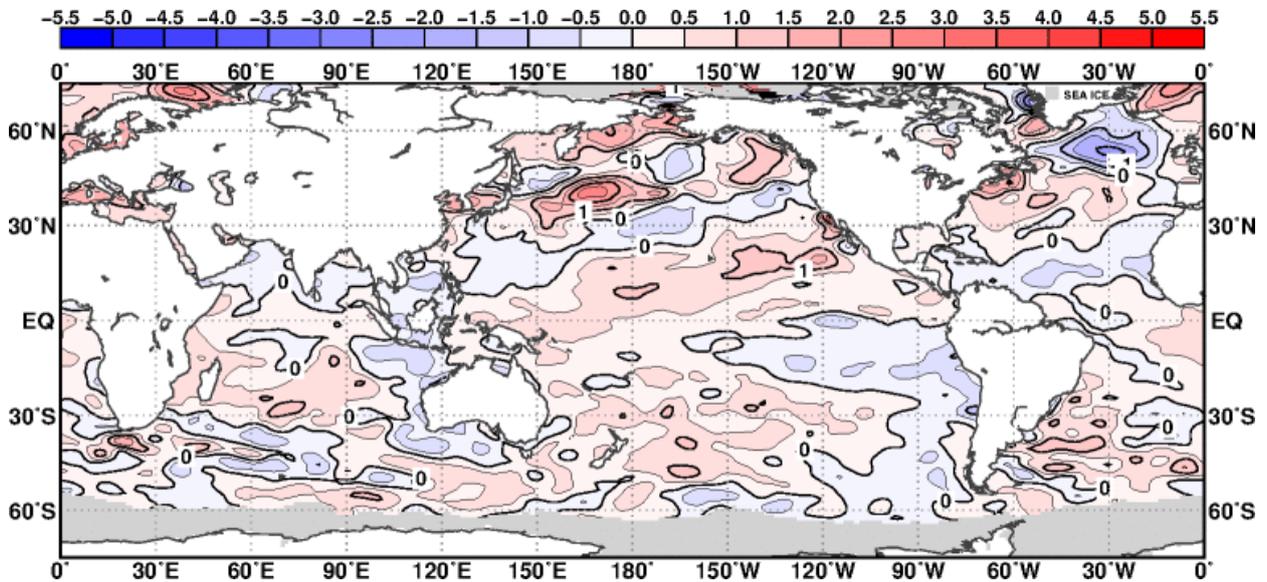


Fig. 4 Monthly mean sea surface temperature anomaly (August 2018)

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.

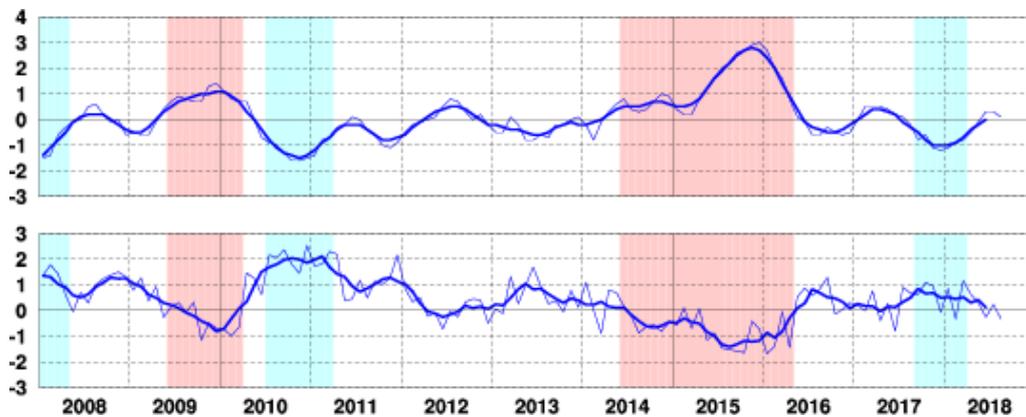


Fig. 5 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).

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.

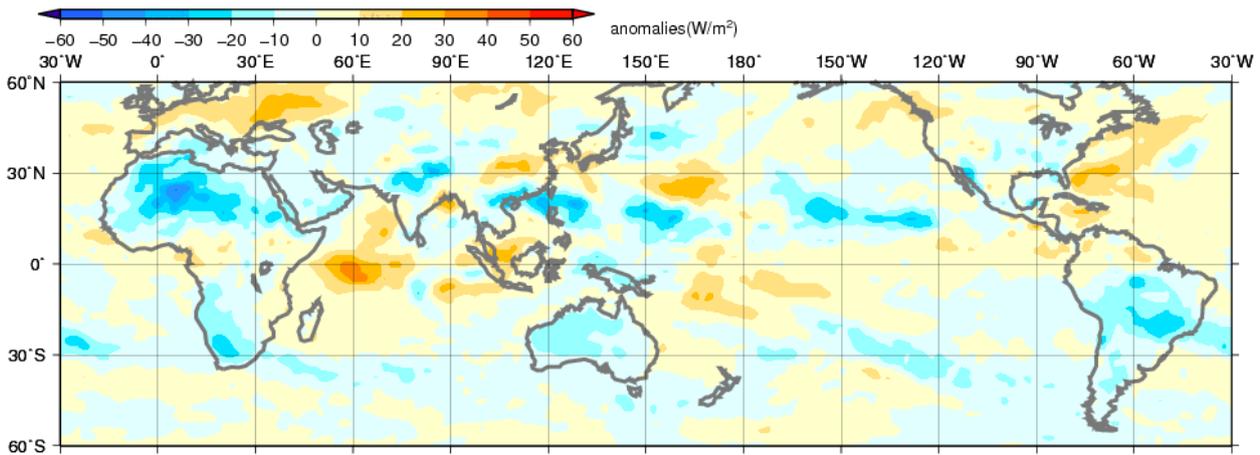


Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (August 2018)  
 The contour interval is 10 W/m<sup>2</sup>. The base period for the normal is 1981-2010. Original data provided by NOAA.

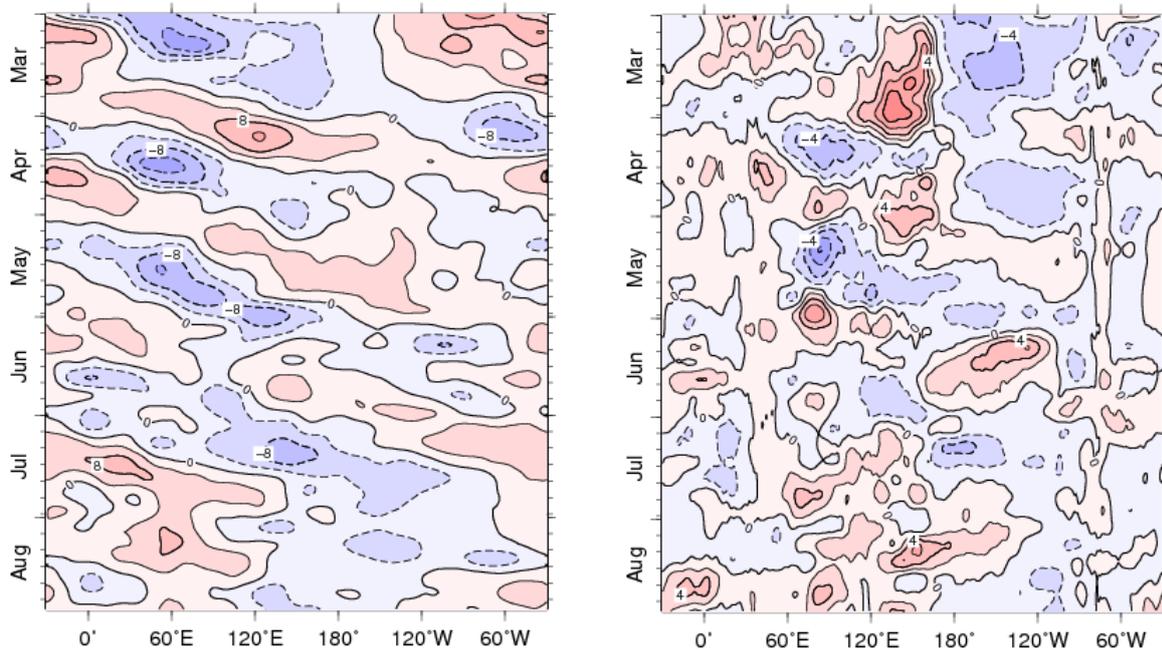


Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (March 2018 – August 2018)  
 The contour intervals are  $4 \times 10^6$  m<sup>2</sup>/s (left) and 2 m/s (right). The base period for the normal is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

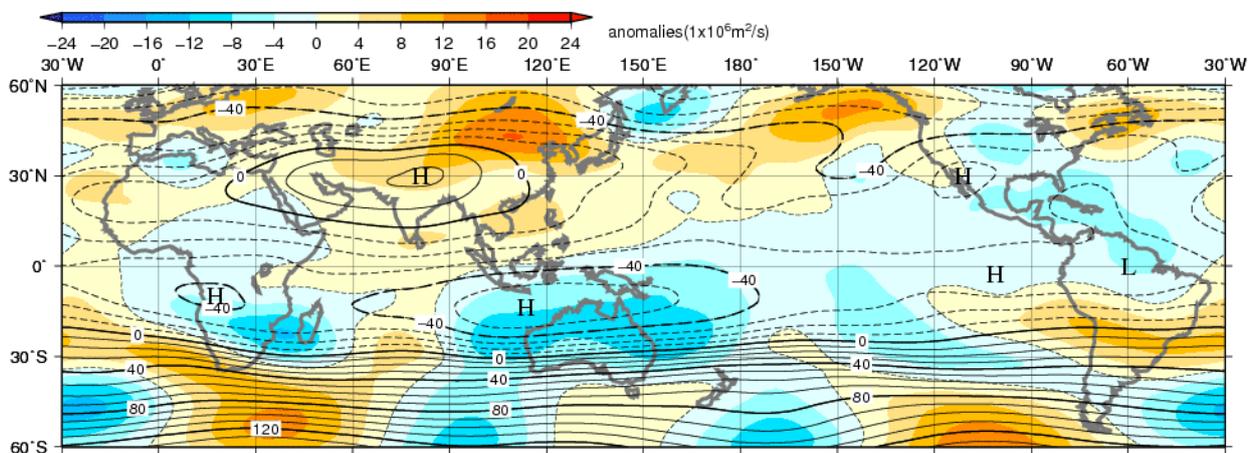


Fig. 8 Monthly mean 200-hPa stream function and anomaly (August 2018)  
 The contour interval is  $10 \times 10^6$  m<sup>2</sup>/s. The base period for the normal is 1981-2010.

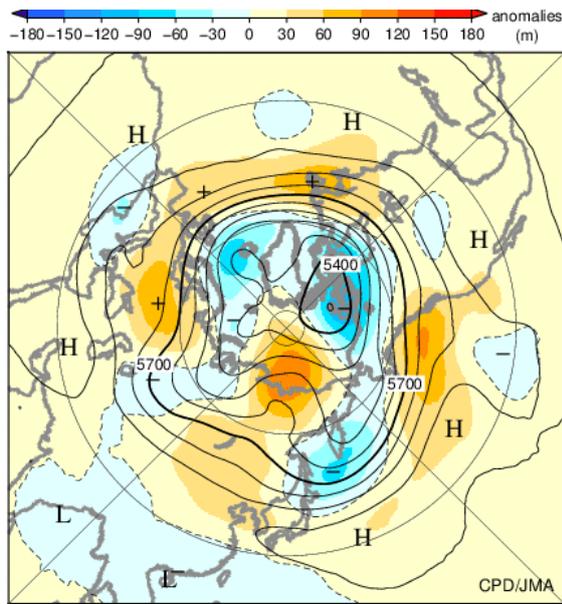


Fig. 9 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (August 2018)

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.

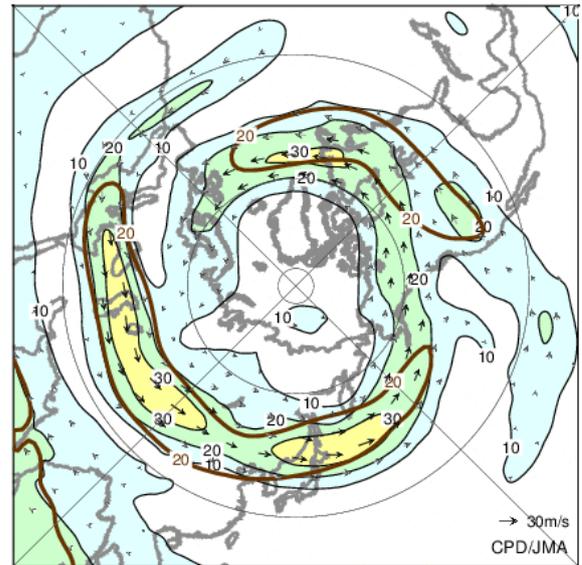


Fig. 10 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (August 2018)

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.

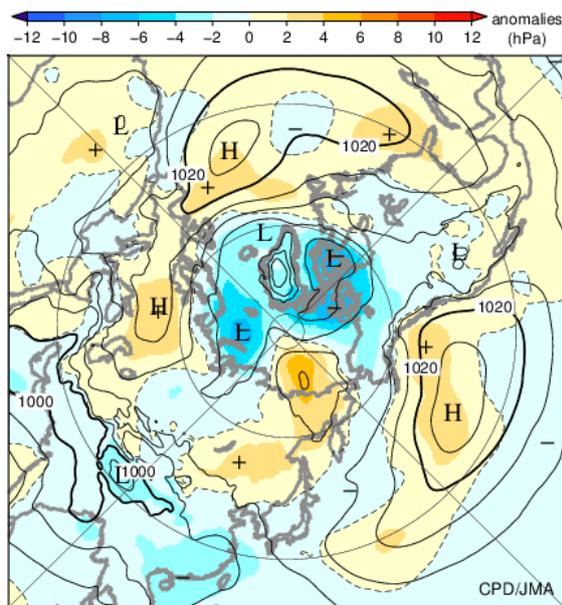


Fig. 11 Monthly mean sea level pressure and anomaly in the Northern Hemisphere (August 2018)

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.

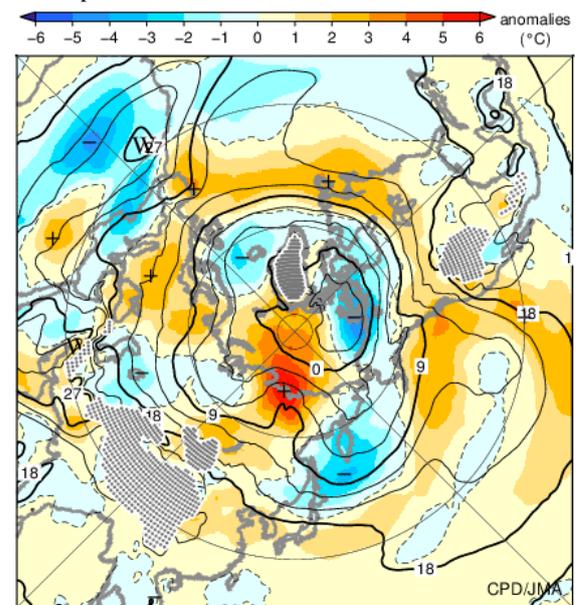


Fig. 12 Monthly mean 850-hPa temperature and anomaly in the Northern Hemisphere (August 2018)

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.