Monthly Highlights on the Climate System (July 2017)

Highlights in July 2017

- Monthly mean temperatures were above normal all over Japan, especially in northern and western Japan.
- Monthly mean temperatures were extremely high in and around the Korean Peninsula to the southern part of Central Asia.
- In the equatorial Pacific, positive SST anomalies were dominant from the western part to the central part.
- Convective activity was enhanced from northern India to the Philippines and over the eastern Maritime Continent.
- In the 500-hPa height field, an annular pattern was pronounced with positive anomalies over the mid-latitudes, especially the latitude band between 40˚N and 50˚N from Central Asia to the seas east of Japan.
- The westward extension of the Pacific High to the East China Sea was clearly observed.

Climate in Japan (Fig. 1):

- Monthly mean temperatures were significantly above normal in northern and western Japan and above normal in eastern Japan and Okinawa/Amami, due to warm southerly wind and high-pressure systems that tended to cover islands of Japan.
- Monthly sunshine durations were significantly above normal on the Pacific side of northern Japan due to the low influence of the Baiu front.
- Monthly precipitation amounts were significantly above normal on the Sea of Japan side of eastern Japan.
- Heavy rains were observed on the Sea of Japan side and caused serious damages including river overflows and landslides due to influence of the Baiu front.

World Climate:

- The monthly anomaly of the global average surface temperature in July 2017 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.41°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 0.69°C per century in July (preliminary value).
- Extreme climate events were as follows (Fig. 3).
  - Monthly mean temperatures were extremely high in and around the Korean Peninsula to the southern part of Central Asia.
  - Monthly mean temperatures were extremely high in and around Saudi Arabia.
  - Monthly mean temperatures were extremely high from eastern to central Australia.

Oceanographic Conditions (Fig. 4):

- In the equatorial Pacific, positive SST anomalies were dominant from the western part to the central part. In the NINO.3 region, the monthly mean SST anomaly was +0.2˚C and the SST deviation from the latest sliding 30-year mean was +0.1˚C (Fig. 5).
- In the North Pacific, remarkably positive SST anomalies were observed from near the Philippines to near 30˚N, 135˚W, around Japan and around the Bering Sea. In the South Pacific, remarkably positive SST anomalies were widely observed north of 30˚S from the western part to the central part.
- In the Indian Ocean, remarkably positive SST anomalies were observed from the eastern coast of East Africa to near 30˚S, 100˚E and also from the eastern coast of East Africa to near Sri Lanka.
- In the North Atlantic, remarkably positive SST anomalies were observed near the eastern coast of North America and in the tropical region.

Tropics:

- Convective activity was enhanced from northern India to the Philippines and over the eastern Maritime Continent, and was suppressed over the central North Indian Ocean and the seas east of the Philippines (Fig. 6).
- The active phase of equatorial intraseasonal oscillations propagated eastward from the Indian Ocean to the Pacific (Fig. 7).
- In the upper troposphere, the Tibetan High was stronger than normal particularly over its northeastern part (Fig. 8). The mid-Pacific trough was enhanced and extended westward to the seas southeast of Japan.
- In the lower troposphere, westerly wind was stronger than normal over the South China Sea and the enhanced monsoon trough was observed from the Indochina Peninsula to the Philippines.
- In the sea level pressure field, positive anomalies were seen over a wide area of the tropics except the western Indian Ocean. The Southern Oscillation Index value was +0.9 (Fig. 5).

Extratropics:

- In the 500-hPa height field (Fig. 9), an annular pattern was pronounced with negative anomalies over the high-latitudes and positive anomalies over the mid-latitudes, especially the latitude band between 40˚N and 50˚N from Central Asia to the seas east of Japan. Ridges developed around the Aleutian Islands and the western coast of North America. In the first half of July, ridges were observed from the northeastern part of China to northern Japan.
- The jet stream was displaced northward from its normal position over Eurasia, and was stronger than normal from North America to the Atlantic (Fig. 10).
- In the sea level pressure field (Fig. 11), the westward extension of the Pacific High to the East China Sea was clearly observed, while negative anomalies were distributed from northern Japan to around the Kamchatka Peninsula. Negative anomalies were also seen over the seas southeast of Japan partly because of the tropical cyclones.
- Temperatures at 850-hPa were above normal from Middle East to Central – East Asia and over the western USA, and were below normal over northern Europe, the northern part of Central – Eastern Siberia and eastern Canada (Fig. 12).
- Zonal mean temperatures in the troposphere were above normal from the mid-latitudes in the Northern Hemisphere to the tropics.

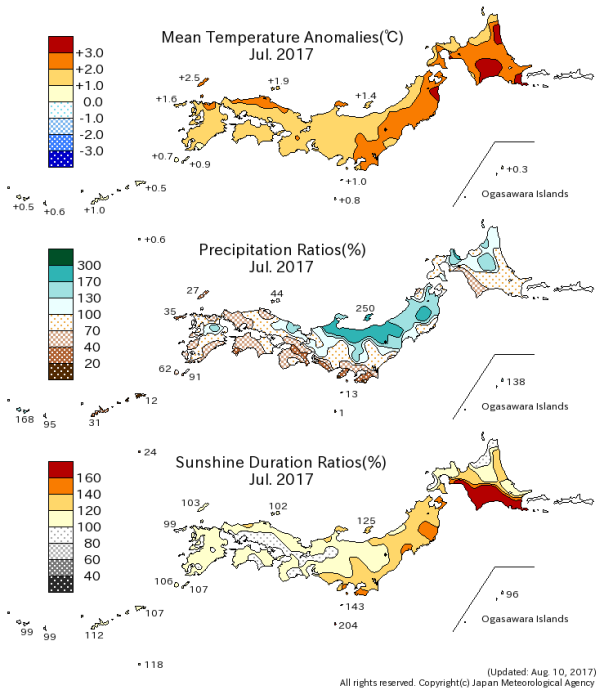

Fig. 1 Monthly climate anomaly/ratio over Japan (July 2017)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
The base period for the normal is 1981-2010.

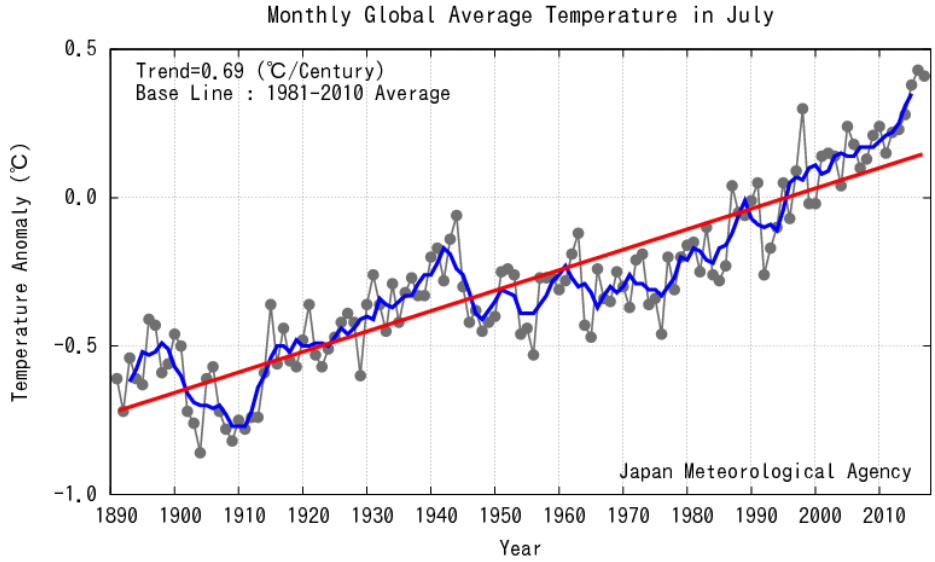

Fig. 2 Long-term change in monthly anomalies of global average surface temperature in July
The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations from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

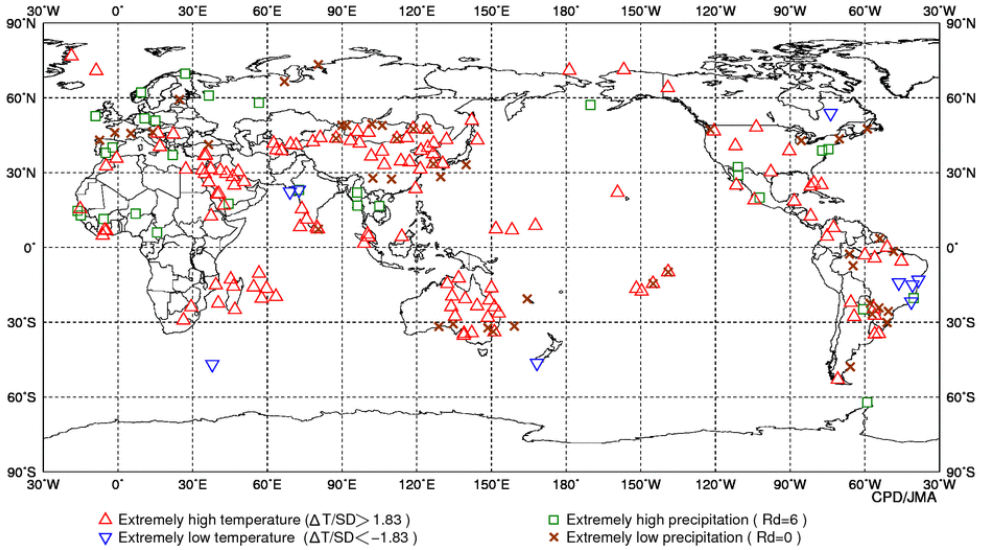

Fig. 3 Distribution of extreme climate events (July 2017)

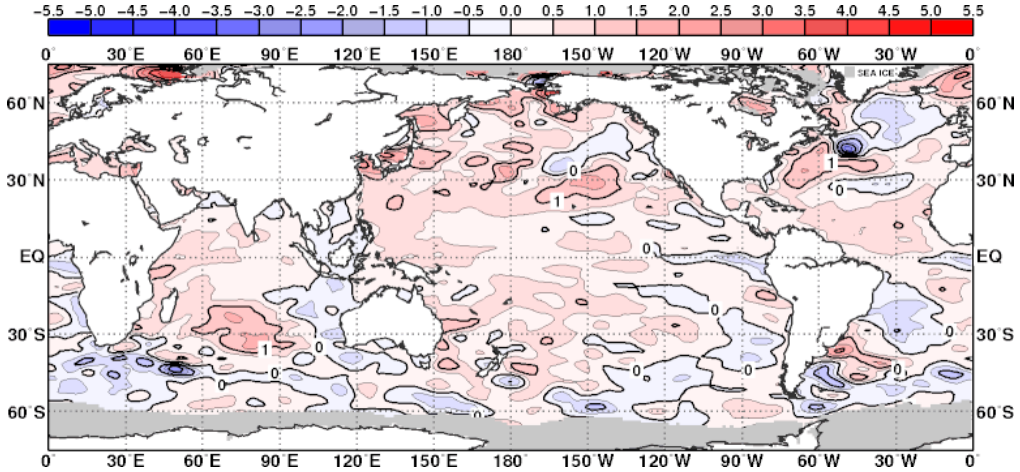

Fig. 4 Monthly mean sea surface temperature anomaly (July 2017)
The contour interval is 0.5 degree C. The base period for the normal is 1981-2010. Maximum coverage with sea ice is shaded in gray.

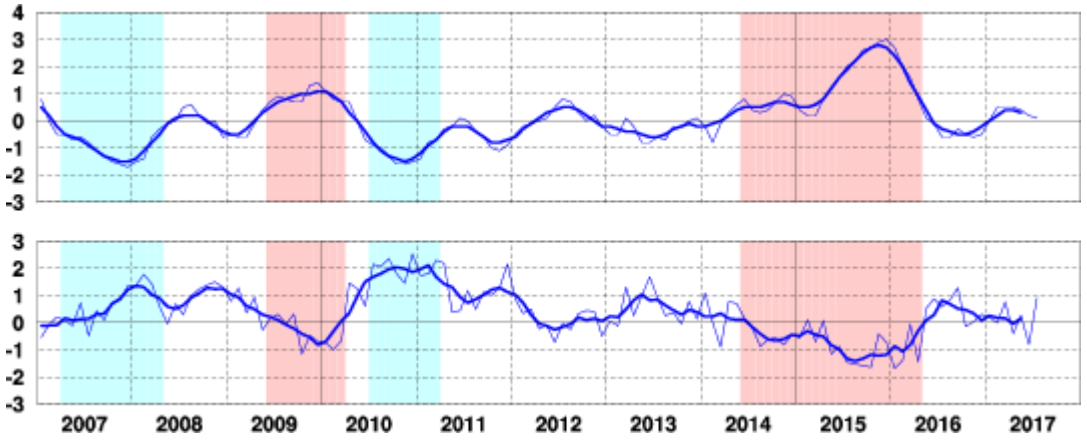

Fig. 5 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).
Thin blue lines represent monthly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

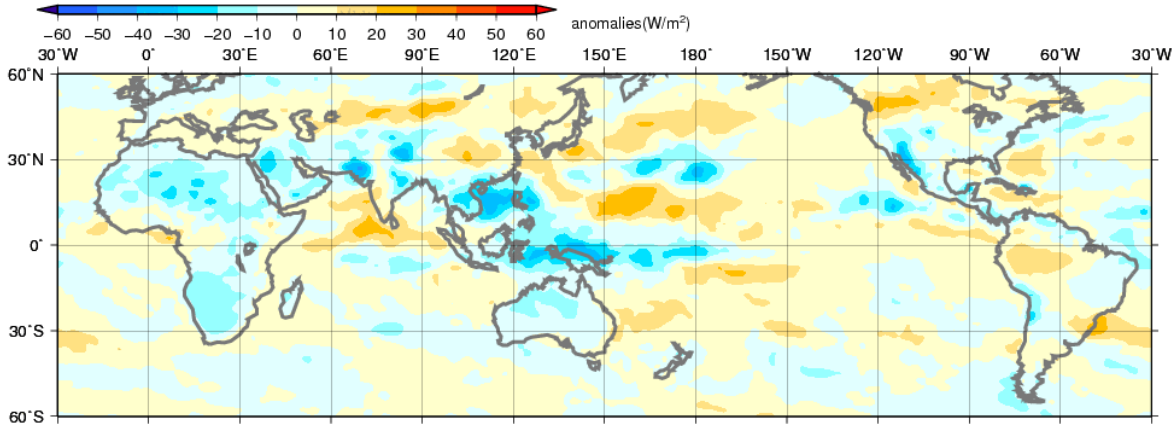

Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (July 2017)
The contour interval is 10 W/m^2. The base period for the normal is 1981-2010. Original data provided by NOAA.

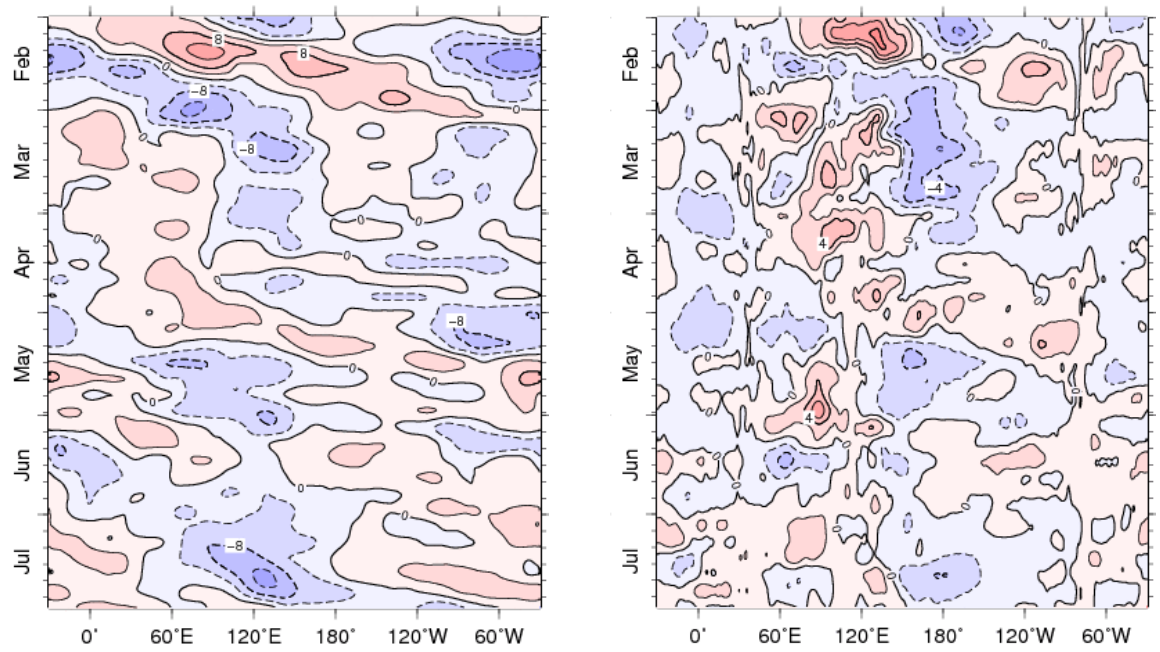

Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (February 2017 – July 2017)
The contour intervals are 4x10^6 m^2/s (left) and 2 m/s (right). The base period for the normal is 1981-2010.

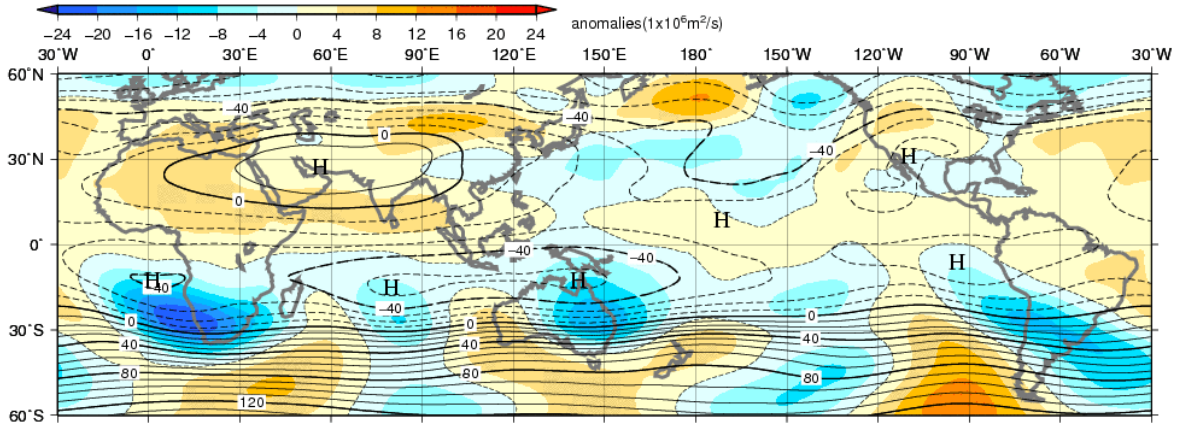

Fig. 8 Monthly mean 200-hPa stream function and anomaly (July 2017)

The contour interval is 10x10^6 m^2/s. The base period for the normal is 1981-2010.

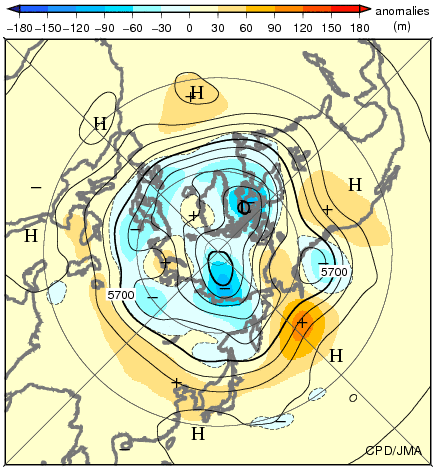

Fig. 9 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (July 2017)

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.

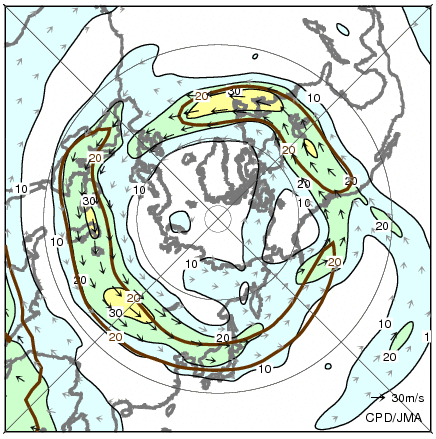

Fig. 10 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (July 2017)

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.

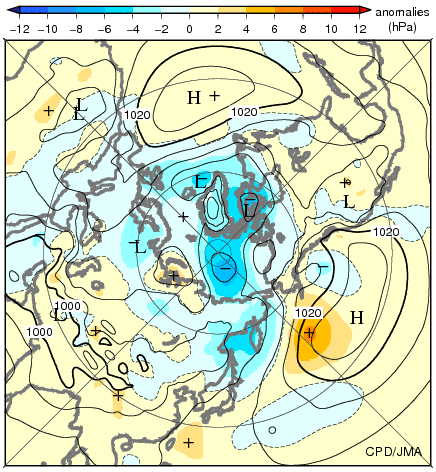

Fig. 11 Monthly mean sea level pressure and anomaly in the Northern Hemisphere (July 2017)

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.

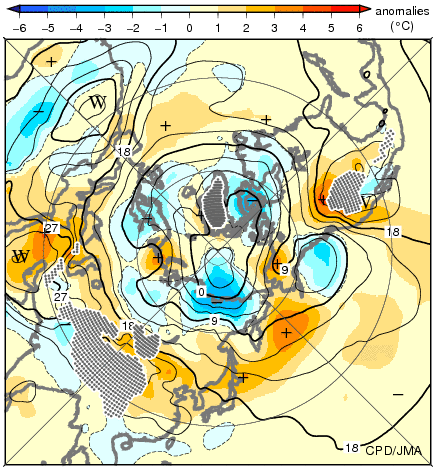

Fig. 12 Monthly mean 850-hPa temperature and anomaly in the Northern Hemisphere (July 2017)

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.
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.