Seasonal Highlights on the Climate System (June 2018 – August 2018)

Highlights (June 2018 – August 2018)

- Seasonal mean temperature in eastern Japan and seasonal precipitation amount in Okinawa/Amami were the highest on record for boreal summer since 1946, respectively.
- Seasonal mean temperatures were extremely high from eastern Japan to northern China, from northeastern to western Europe, and from the western USA to northern 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, the polar vortex in the Northern Hemisphere shifted toward North America, and positive anomalies were seen over the mid-latitudes.
- 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. S1):

- Seasonal mean temperatures were significantly above normal in eastern and western Japan. Especially, seasonal mean temperature in eastern Japan was the highest on record for boreal summer since 1946.
- Seasonal precipitation amounts were significantly above normal on the Sea of Japan side of northern Japan, on the Pacific side of western Japan, and in Okinawa/Amami. Especially, seasonal precipitation amount in Okinawa/Amami was the highest on record for boreal summer since 1946.
- Seasonal sunshine durations were significantly above normal in eastern Japan and on the Sea of Japan side of western Japan.

World Climate (Fig. S2):

- Seasonal mean temperatures were extremely high from eastern Japan to central China, and seasonal precipitation amounts were extremely high from Hokkaido region of Japan to the Sea of Japan side of Kinki region of Japan and from southern Mongolia to northern China.
- Seasonal mean temperatures were extremely high from northeastern to western Europe and seasonal precipitation amounts were extremely low from central to western Europe.
- Seasonal mean temperatures were extremely high from the western USA to northern Mexico.

Oceanographic Conditions (Fig. S3):

- In the equatorial Pacific, remarkably positive SST anomalies were observed in the western part.
- In the North Pacific, remarkably positive SST anomalies were observed from the area near 5°N, 145°E to the western coast of Central America, and from east of Japan to the Gulf of Alaska.
- In the South Pacific, remarkably positive SST anomalies were observed from the eastern coast of Australia to the area near 35°S, 100°W, and remarkably negative SST anomalies were observed from the area near 10°S, 135°W to the area near 15°S, 90°W.
- In the Indian Ocean, remarkably positive SST anomalies were observed from the eastern coast of Africa to the area near 25°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 in the eastern part of the tropical region.

Tropics:

- Convective activity was enhanced from the Philippines to the 10-20°N latitude band in the North Pacific, and was suppressed over the Indian Ocean and the central part of the South Pacific (Fig. S4).
- In the upper troposphere, anti-cyclonic circulation anomalies were seen from East Asia to the seas east of Japan, especially 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 Central America (Fig. S5).
- 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, indicating the stronger-than-normal monsoon trough over the Southeast Asia.
- In the sea level pressure field, negative anomalies were seen from the Philippines to the central part of tropical North Pacific, and positive anomalies were seen in the wide areas in and around the Atlantic.

Extratropics:

- In the 500-hPa height field (Fig. S6), the polar vortex in the Northern Hemisphere shifted toward North America. Positive anomalies were generally distributed over the mid-latitudes. Positive anomalies were seen over the seas south of Alaska, the eastern part of North America, northern Europe, from Central to Eastern Siberia and over the northeastern part of East Asia, and negative anomalies were seen over the Mediterranean Sea and from the South China Sea to the seas south of Japan.
- The westerly jet stream displaced northward form its normal position from North America to the North Atlantic. The subtropical jet stream displaced northward form its normal position over East Asia and weaker than normal over mainland Japan.
- In the sea level pressure field (Fig. S8), negative anomalies were seen in and around Greenland and positive anomalies were seen over the mid-latitude North Pacific and North Atlantic. The extension of the North Pacific Subtropical High toward mainland Japan was stronger than normal.
- Temperatures at 850-hPa were above normal over the seas south of Alaska, the eastern part of North America, northern Europe, from Central to Eastern Siberia and the eastern part of East Asia, and below normal over northern Canada and the Sea of Okhotsk (Fig. S9).

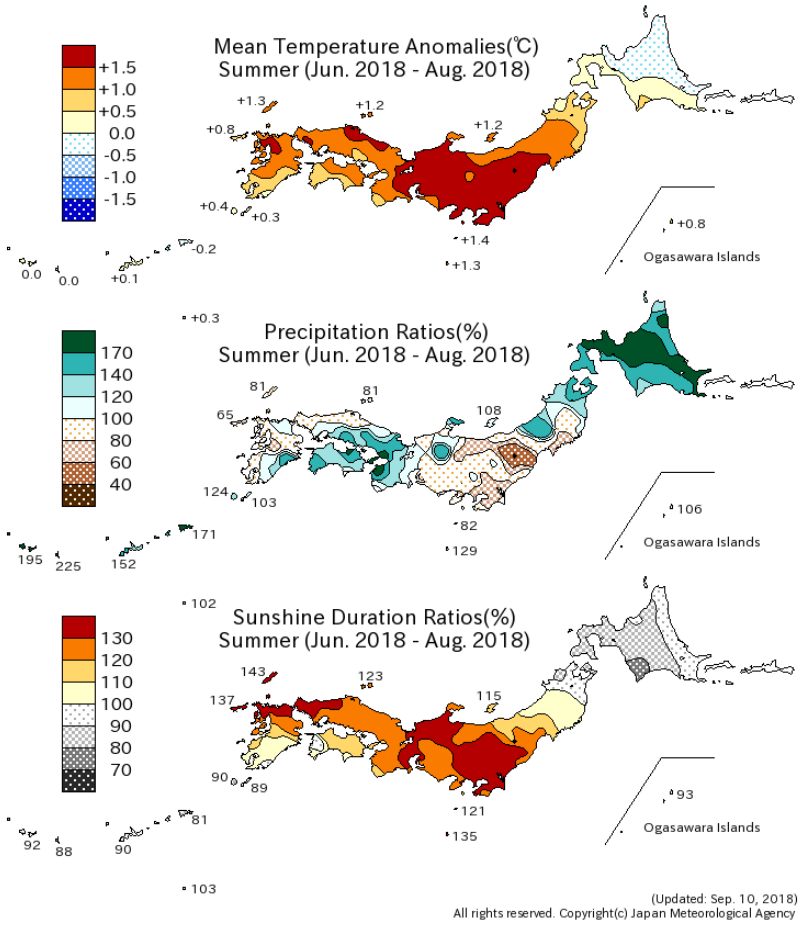

Fig. S1 Seasonal climate anomaly/ratio over Japan (June 2018 - August 2018)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
The base period for the normal is 1981-2010.

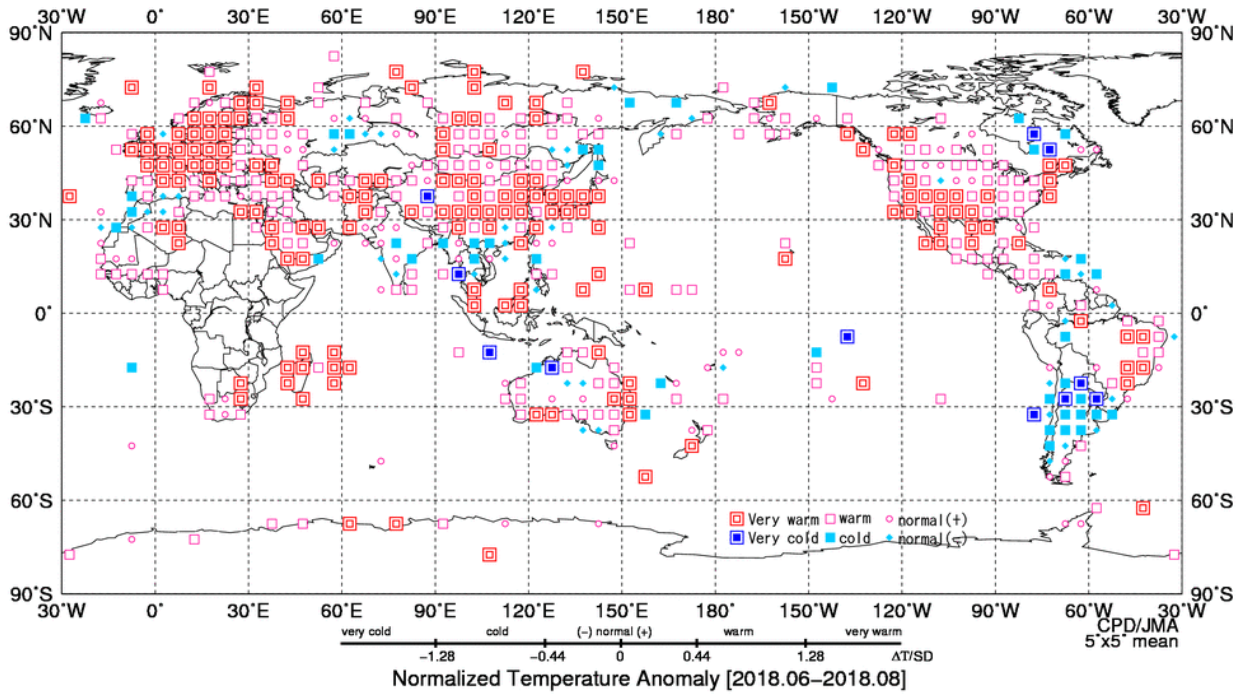

Fig. S2 Three-month mean temperature anomaly (normalized) category (June 2018 - August 2018)

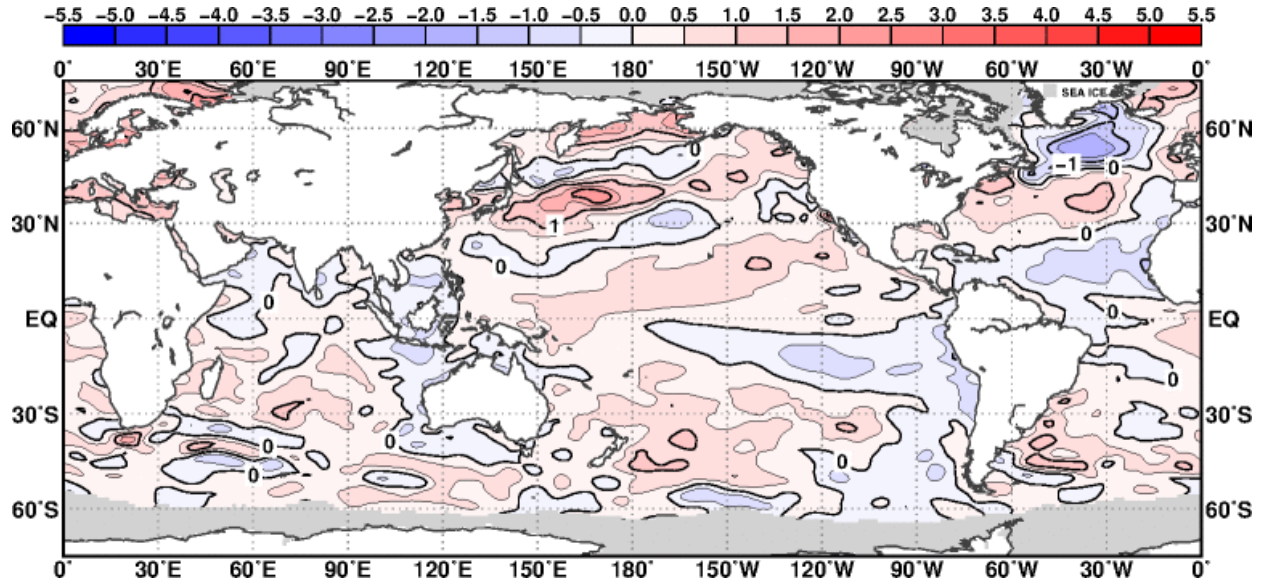

Fig. S3 Three-month mean sea surface temperature anomaly (June 2018 - August 2018)
The contour interval is 0.5 degree C. The base period for the normal is 1981-2010. Maximum coverage with sea ice is shaded in gray.

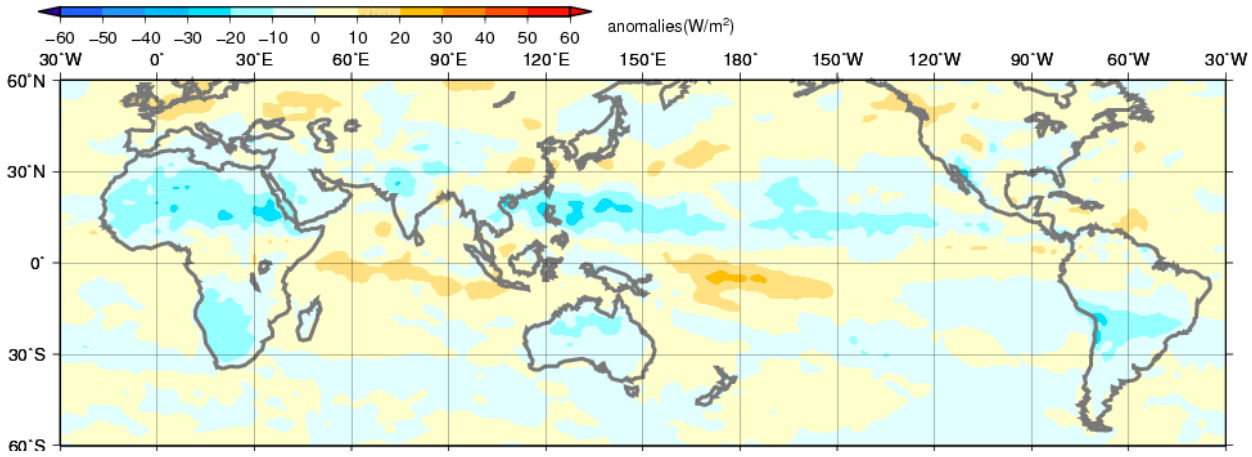

Fig. S4 Three-month mean Outgoing Longwave Radiation (OLR) anomaly (June 2018 - August 2018)
The contour interval is 10 W/m^2. The base period for the normal is 1981-2010. Original data provided by NOAA.

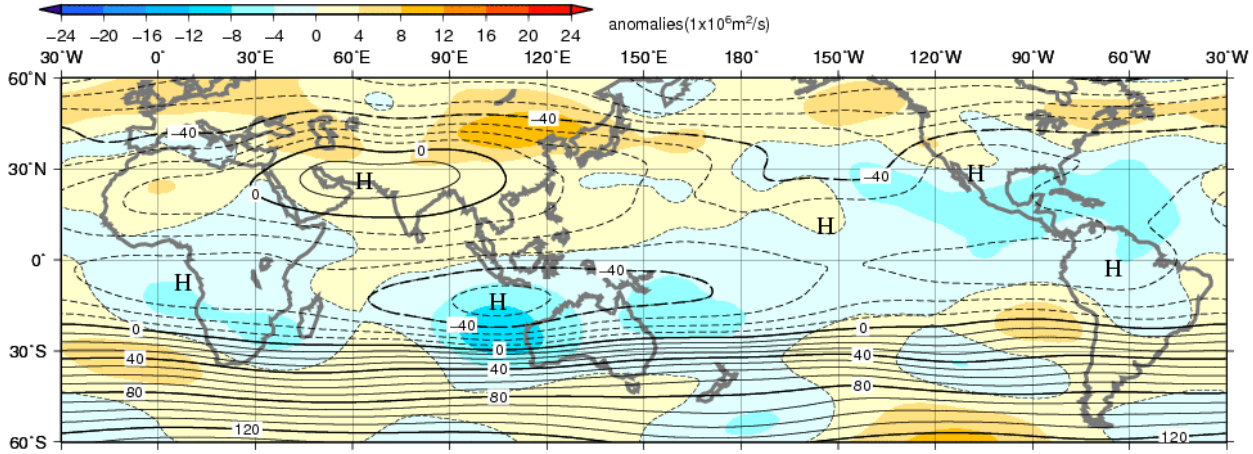

Fig. S5 Three-month mean 200-hPa stream function and anomaly (June 2018 - August 2018)
The contour interval is 10x10^6 m^2/s. The base period for the normal is 1981-2010.

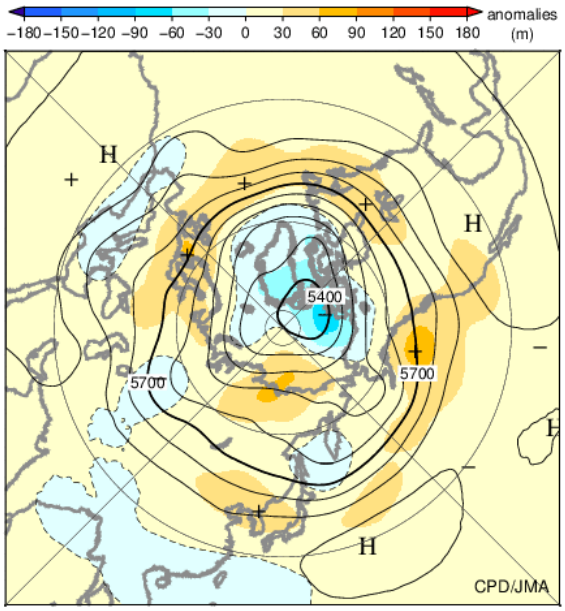

Fig. S6 Three-month mean 500-hPa height and anomaly in the Northern Hemisphere
(June 2018 – August 2018)

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.

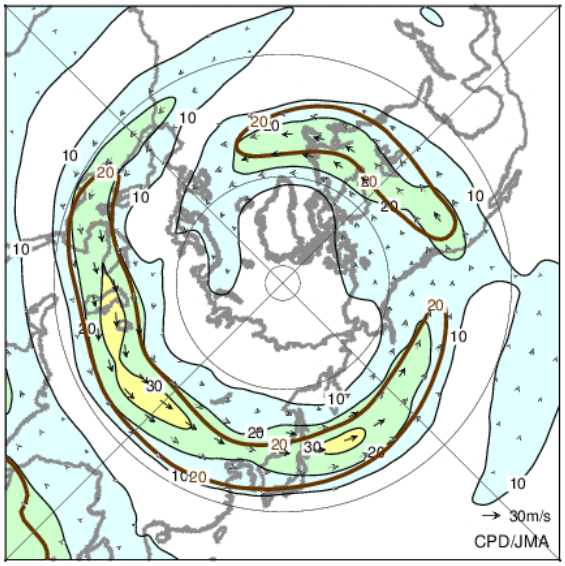

Fig. S7 Three-month mean 200-hPa wind speed and vectors in the Northern Hemisphere
(June 2018 - August 2018)

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.

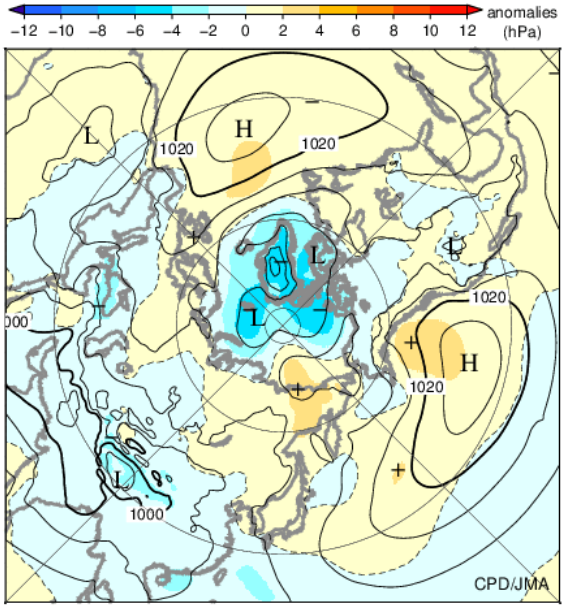

Fig. S8 Three-month mean sea level pressure and anomaly in the Northern Hemisphere
(June 2018 - August 2018)

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.

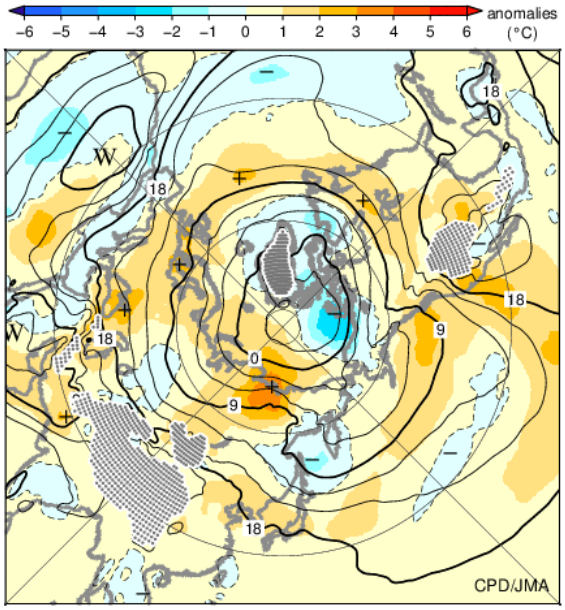

Fig. S9 Three-month mean 850-hPa temperature and anomaly in the Northern Hemisphere
(June 2018 - August 2018)

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.