

Seasonal Highlights on the Climate System (June 2019 – August 2019)

Highlights (June 2019 – August 2019)

- ENSO-neutral conditions persisted in boreal summer 2019, after the El Niño event continued from autumn 2018 to spring 2019 (see [El Niño Outlook](#) updated on 10 September 2019).
- Seasonal precipitation amounts were significantly above normal on the Pacific side of western Japan and in Okinawa/Amami.
- Seasonal mean temperatures were extremely high in and around Central Siberia, in southern India, from eastern Europe to the western part of Northern Africa, from Comoros to Mauritius, in and around Alaska, in and around Central America, from northern Polynesia to central Micronesia, and in eastern Australia.
- Convective activity was enhanced over Northern Africa and the southwestern tropical Indian Ocean, and was suppressed over the southeastern tropical Indian Ocean and Central America.
- In the 500-hPa height field, positive anomalies were seen from the west of Greenland via the northern polar region to Central Siberia, over southern Alaska, and over eastern Europe, and negative anomalies were seen over the seas west of Europe and over Western Russia.
- The subtropical jet stream shifted southward from its normal position over the eastern part of East Asia.

Climate in Japan (Fig. S1):

- Seasonal mean temperatures were above normal in northern and eastern Japan, and Okinawa/Amami.
- Seasonal precipitation amounts were significantly above normal on the Pacific side of western Japan and in Okinawa/Amami. In particular, western Japan often experienced heavy rains.
- Seasonal sunshine durations were below normal on the Pacific side of eastern Japan, in western Japan and in Okinawa/Amami.

World Climate (Fig. S2):

- Seasonal mean temperatures were extremely high in and around Central Siberia, in southern India, from eastern Europe to the western part of Northern Africa, from Comoros to Mauritius, in and around Alaska, in and around Central America, from northern Polynesia to central Micronesia, and in eastern Australia.
- Seasonal precipitation amounts were extremely high from western Europe to the western part of Northern Africa and the central USA.
- Seasonal precipitation amounts were extremely low in the northern part of Eastern Siberia, in and around central Europe, and in southern Mexico.

Oceanographic Conditions (Fig. S3):

- In the equatorial Pacific, remarkably positive SST anomalies were observed near the date line.
- In the North Pacific, remarkably positive SST anomalies were widely observed except for south of Japan and south of the Aleutian Islands.
- In the South Pacific, remarkably positive SST anomalies were observed in almost the entire region west of 140°W, and remarkably negative SST anomalies were observed from the western coast of Chile to near 20°S, 115°W.
- In the Indian Ocean, remarkably positive SST anomalies were observed in almost the entire region west of 100°E, and remarkably negative SST anomalies were observed south of Java and in the southwestern coast of Australia.
- In the North Atlantic, remarkably positive SST anomalies were observed from the Gulf of Mexico to the area near 35°N, 20°W and south of Greenland.

Tropics:

- Convective activity was enhanced over Northern Africa and the southwestern tropical Indian Ocean, and was suppressed over the southeastern tropical Indian Ocean and Central America (Fig. S4).
- In the upper troposphere, cyclonic circulation anomalies were seen over the western part of Australia, and anti-cyclonic circulation anomalies were seen over the northwestern and southern parts of Africa, and the seas east of Australia (Fig. S5).
- In the lower troposphere, cyclonic circulation anomalies were seen over the northwestern part of Africa, and anti-cyclonic circulation anomalies were seen over Australia and the eastern Pacific.
- In the sea level pressure field, in the equatorial area, positive anomalies were seen over the Maritime Continent and from the eastern Pacific to Africa, and negative anomalies were seen over the western Indian Ocean and near the date line.

Extratropics:

- In the 500-hPa height field (Fig. S6), positive anomalies were seen from the west of Greenland via the northern polar region to Central Siberia, over southern Alaska, and over eastern Europe, and negative anomalies were seen over the seas west of Europe and over Western Russia.
- The subtropical jet stream shifted southward from its normal position over the eastern part of East Asia, and was stronger than normal over the seas east of Japan. The westerly jet stream shifted southward from its normal position over the North Atlantic (Fig. S7).
- In the sea level pressure field (Fig. S8), positive anomalies were seen from Greenland to the northern polar region and from Eastern Siberia to southwestern Alaska, and negative anomalies were seen near the UK, from Western Russia to Western Siberia, and over the latitude band of 40°N in the eastern North Pacific.
- Temperatures at 850-hPa were above normal over Central Siberia, southern Alaska, the west of Greenland, and Europe, and below normal over the Sea of Okhotsk, northwestern Canada, the seas west of Europe, and Western Russia (Fig. S9).

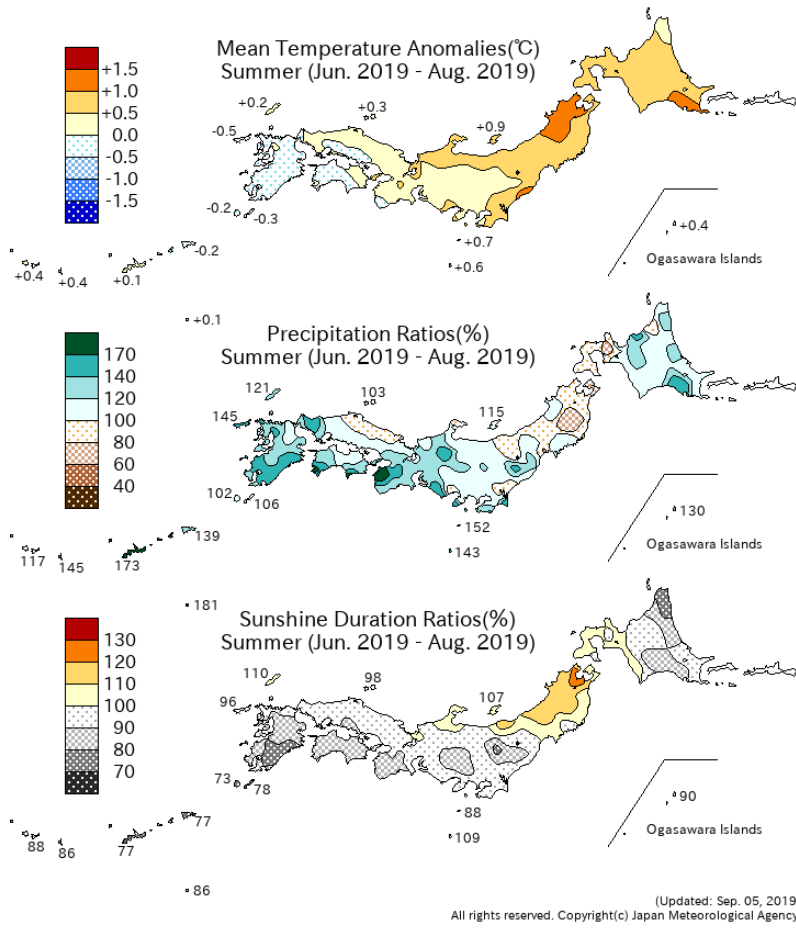


Fig. S1 Seasonal climate anomaly/ratio over Japan (June 2019 – August 2019)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
The base period for the normal is 1981-2010.

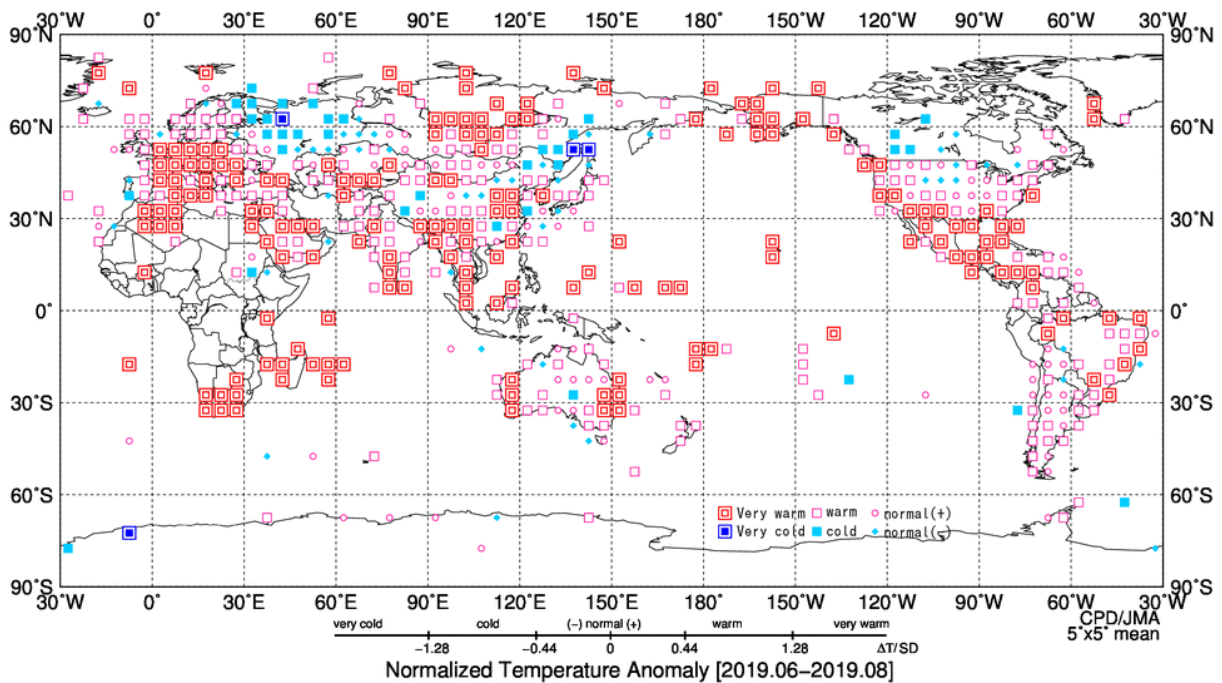


Fig. S2 Three-month mean temperature anomaly (normalized) category (June 2019 – August 2019)

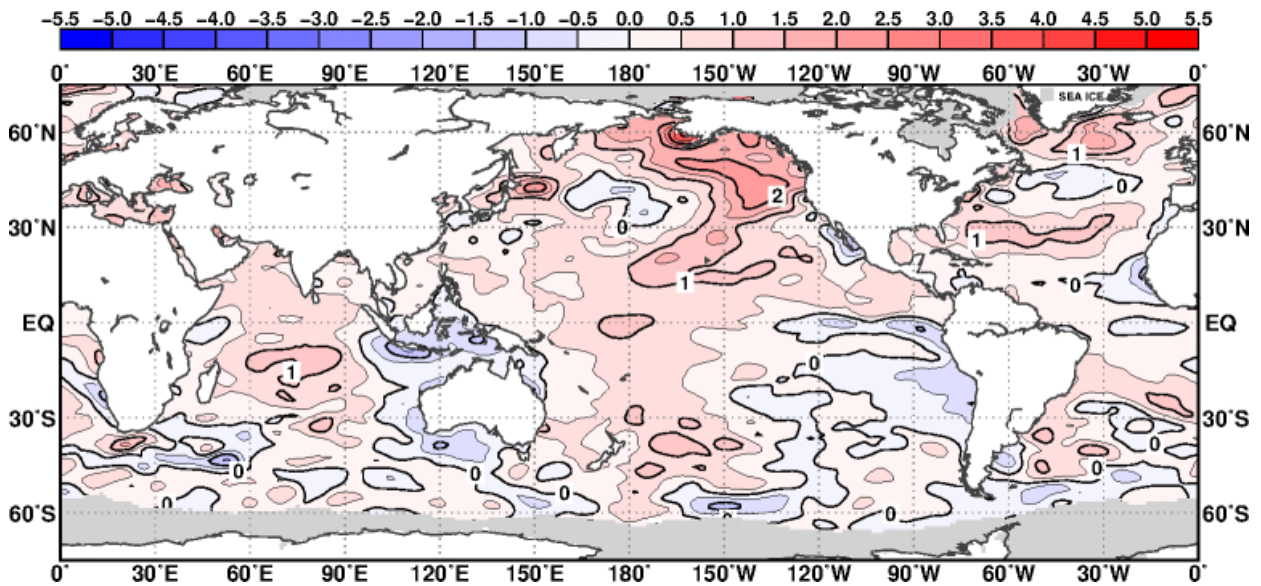


Fig. S3 Three-month mean sea surface temperature anomaly (June 2019 – August 2019)
 The contour interval is 0.5 degree C. The base period for the normal is 1981-2010. Maximum coverage with sea ice is shaded in gray.

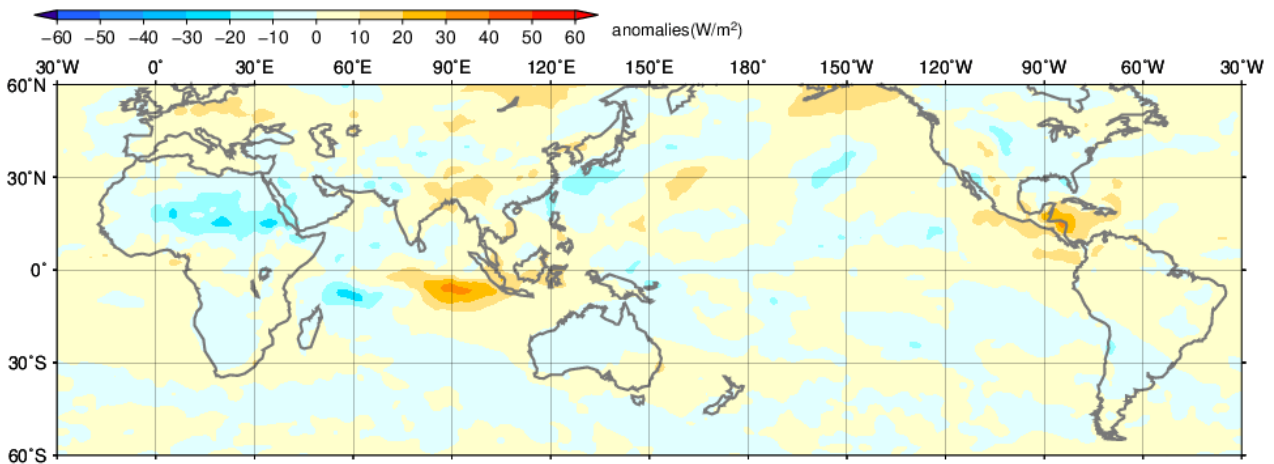


Fig. S4 Three-month mean Outgoing Longwave Radiation (OLR) anomaly (June 2019 – August 2019)
 The contour interval is 10 W/m². The base period for the normal is 1981-2010. Original data provided by NOAA.

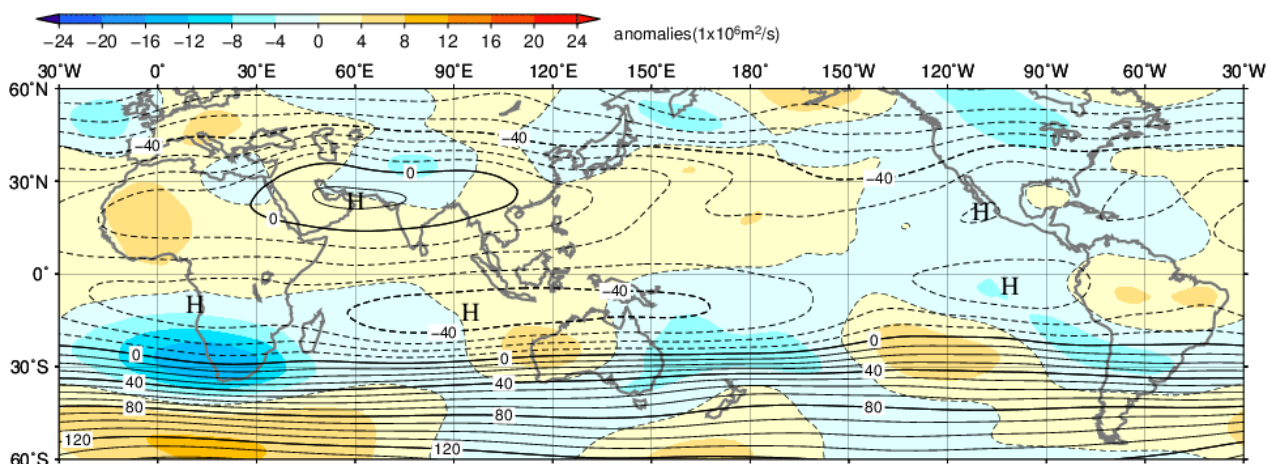


Fig. S5 Three-month mean 200-hPa stream function and anomaly (June 2019 – August 2019)
 The contour interval is 10x10⁶ m²/s. The base period for the normal is 1981-2010.

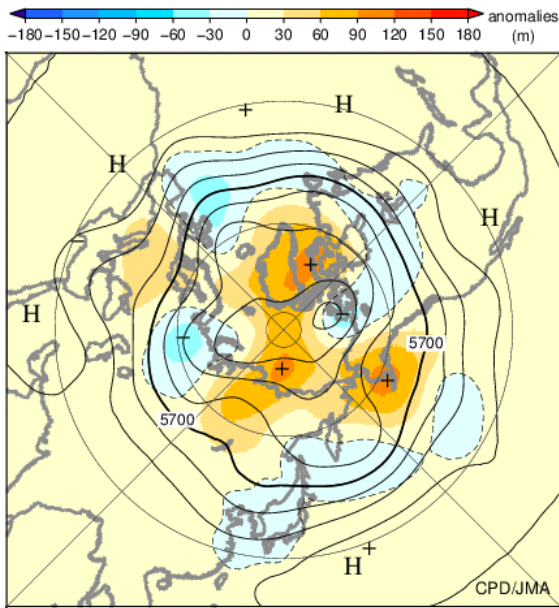


Fig. S6 Three-month mean 500-hPa height and anomaly in the Northern Hemisphere (June 2019 – August 2019)

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.

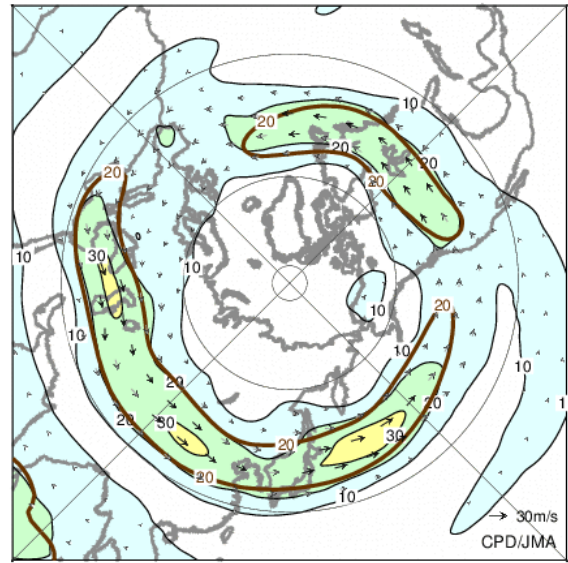


Fig. S7 Three-month mean 200-hPa wind speed and vectors in the Northern Hemisphere (June 2019 – August 2019)

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.

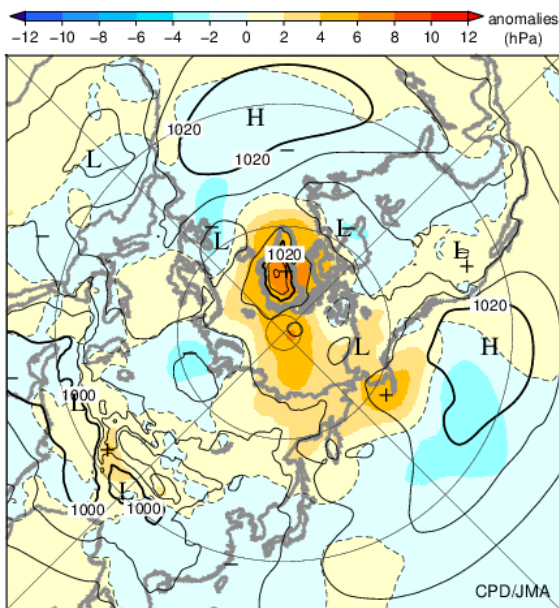


Fig. S8 Three-month mean sea level pressure and anomaly in the Northern Hemisphere (June 2019 – August 2019)

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.

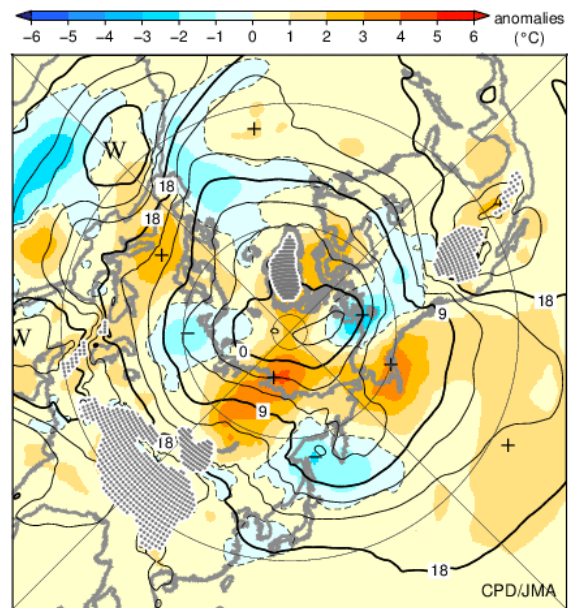


Fig. S9 Three-month mean 850-hPa temperature and anomaly in the Northern Hemisphere (June 2019 – August 2019)

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.