Seasonal Highlights on the Climate System (June – August 2021)

Highlights (June – August 2021)

- Though ENSO-neutral conditions has persisted through the season (see El Niño Outlook updated on 10 September 2021) negative SST anomalies were observed from the central to eastern part of the equatorial Pacific.
- In Japan seasonal precipitation amounts were significantly above normal on the Pacific side of eastern Japan and in western Japan, mainly due to active stationary fronts and moist wet-air inflow in August
- Seasonal mean temperatures were extremely high from eastern part of Central Siberia to the northeastern part of East Asia, from southern Europe to the southwestern part of Northern Africa, and from the central to western part of North America.
- In the Indian Ocean, remarkably positive SST anomalies were observed south of Sumatra.
- Convective activity was enhanced from southwest of Sumatra to the Maritime Continent, over the seas south of Japan and the equatorial Atlantic, and suppressed over the Arabian Sea, from the Bay of Bengal to the Philippines and over the seas east of New Guinea.
- The convective activity over the Asian summer monsoon region was weaker than normal and the subtropical jet stream shifted southward from its normal position over Eurasia.
- The polar vortex in the Northern Hemisphere was stronger than normal and the polar front jet stream was clearly seen over northern Eurasia.

Notice: From this issue onward, the new climatological normal (1991-2020 average) is used unless otherwise stated.

Climate in Japan (Fig. S1):

- Seasonal precipitation amounts were significantly above normal on the Pacific side of eastern Japan and in western Japan, mainly due to active stationary fronts and moist air inflow in August (see also "Monthly Highlights on the Climate System" for August 2021). Seasonal precipitation amounts on the Sea of Japan side of northern Japan were significantly below normal.
- Seasonal mean temperatures and seasonal sunshine durations were significantly above normal in northern Japan. Seasonal mean temperatures were above normal in eastern Japan and seasonal sunshine durations were above normal on Sea of Japan side of eastern Japan. These can be attributed to high-pressure systems in early June and late July.
- Sunshine durations were below normal in Okinawa/Amami due to tropical cyclones passed around the region.

World Climate (Fig. S2):

- Seasonal mean temperatures were extremely high from eastern part of Central Siberia to the northeastern part of East Asia, in southern China, from the western part of Central Asia to eastern Europe, from southern Europe to the southwestern part of Northern Africa, from the western part of Middle Africa to Ascension Island, from the central to western part of North America, and in northern Australia.
- Seasonal mean temperatures were extremely low in the Atlantic side of Antarctica.
- Seasonal precipitation amounts were extremely high on the Pacific side of eastern Japan, in central China, in the southeastern part of Central Siberia, in central Mongolia, in the north area of the Black Sea, in central Europe, in northern Canada, from the northeastern to southern USA, and from northern to western Colombia.
- Seasonal precipitation amounts were extremely low from the northwestern part of Eastern Siberia to the southern part of Central Siberia, from Hokkaido region of Japan to the southern part of Eastern Siberia, in

and around Western Russia, from southwestern Norway to eastern Iceland, in and around the central Mediterranean Sea, and in and around the Midwest USA.

Oceanographic Conditions (Fig. S3)**:**

- In the equatorial Pacific, negative SST anomalies were observed from the central to eastern part.
- In the North Pacific, remarkably positive SST anomalies were widely observed from east of Japan to 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 in the area near 15˚S, 130˚W.
- In the Indian Ocean, remarkably positive SST anomalies were observed south of Sumatra.
- In the North Atlantic, remarkably positive SST anomalies were observed from the eastern coast of North America to the area near 35˚N, 45˚W. Remarkably positive SST anomalies were also observed in the equatorial Atlantic.

Tropics:

- Convective activity was enhanced from southwest of Sumatra to the Maritime Continent, over the seas south of Japan and the equatorial Atlantic, and suppressed over the Arabian Sea, from the Bay of Bengal to the Philippines and over the seas east of New Guinea (Fig. S4). The convective activity over the Asian summer monsoon region was weaker than normal.
- In the upper troposphere, anti-cyclonic circulation anomalies were seen from northern India to southern China, from Middle Africa to the tropical South Atlantic, south of Sumatra and over the eastern tropical South Pacific (Fig. S5).
- In the lower troposphere, cyclonic circulation anomalies straddling the equator were seen over the eastern tropical Indian Ocean and the tropical Atlantic, and anti-cyclonic circulation anomalies straddling the equator were seen over the western tropical Pacific.
- 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.

Extratropics:

- In the 500-hPa height field (Fig. S6), the polar vortex in the Northern Hemisphere was stronger than normal. Positive anomalies were seen over the mid-latitudes of North America and the latitude band of 60°N from the North Atlantic to Eurasia.
- The subtropical jet stream shifted southward from its normal position over Eurasia and the polar front jet stream was clearly seen over northern Eurasia (Fig. S7).
- In the sea level pressure field (Fig. S8), positive anomalies were seen from northern Europe to Western Russia and around the Kuril Islands, and negative anomalies were widely seen over the northern polar region.
- Temperatures at 850-hPa were significantly above normal over western North America, around the central Mediterranean Sea, around the Caspian Sea, and from Central Siberia to Sakhalin, and below normal over northern East Asia and the seas north of Alaska (Fig. S9).

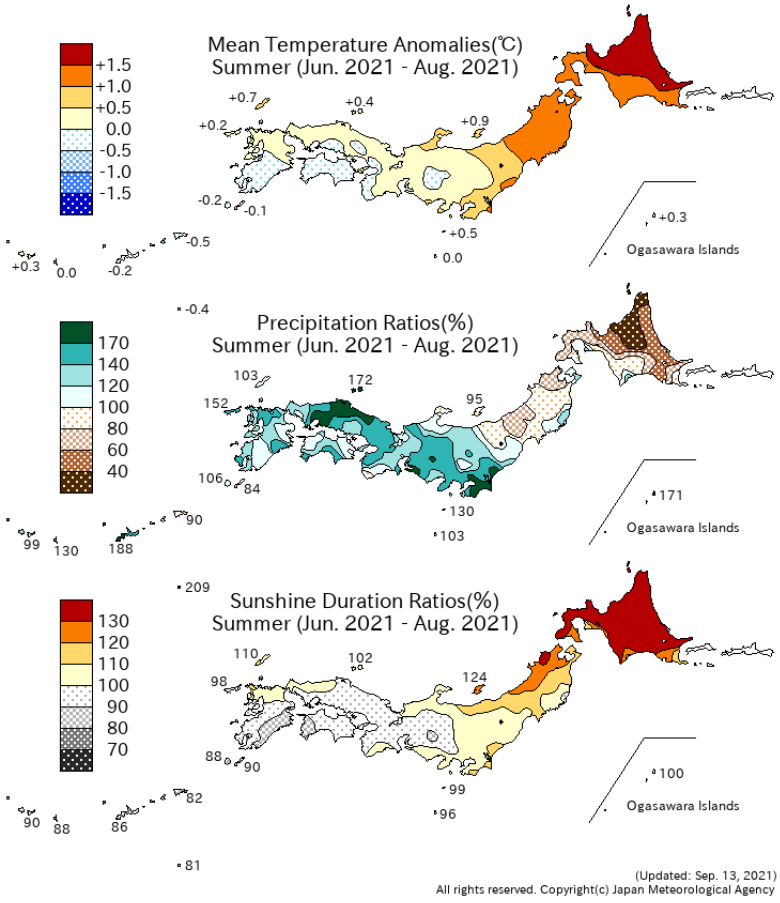

Fig. S1 Seasonal climate anomaly/ratio over Japan (June – August 2021)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
The base period for the normal is 1991-2020.

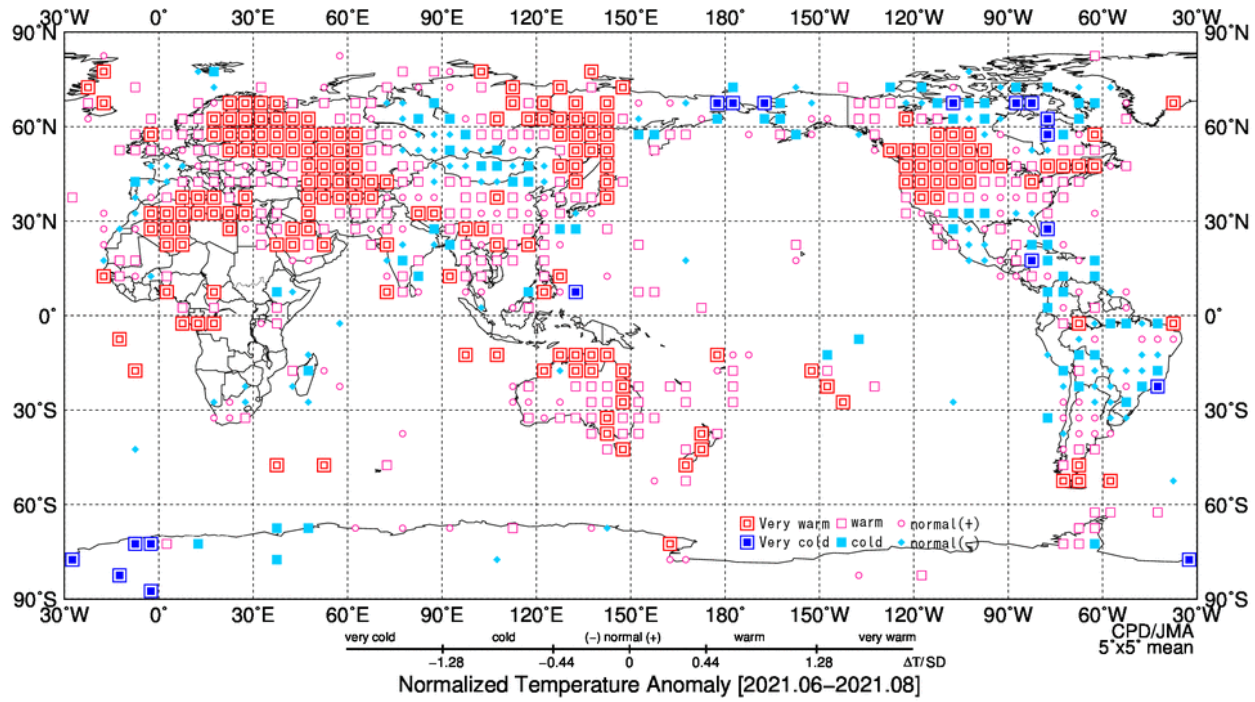

Fig. S2 Three-month mean temperature anomaly (normalized) category (June – August 2021)

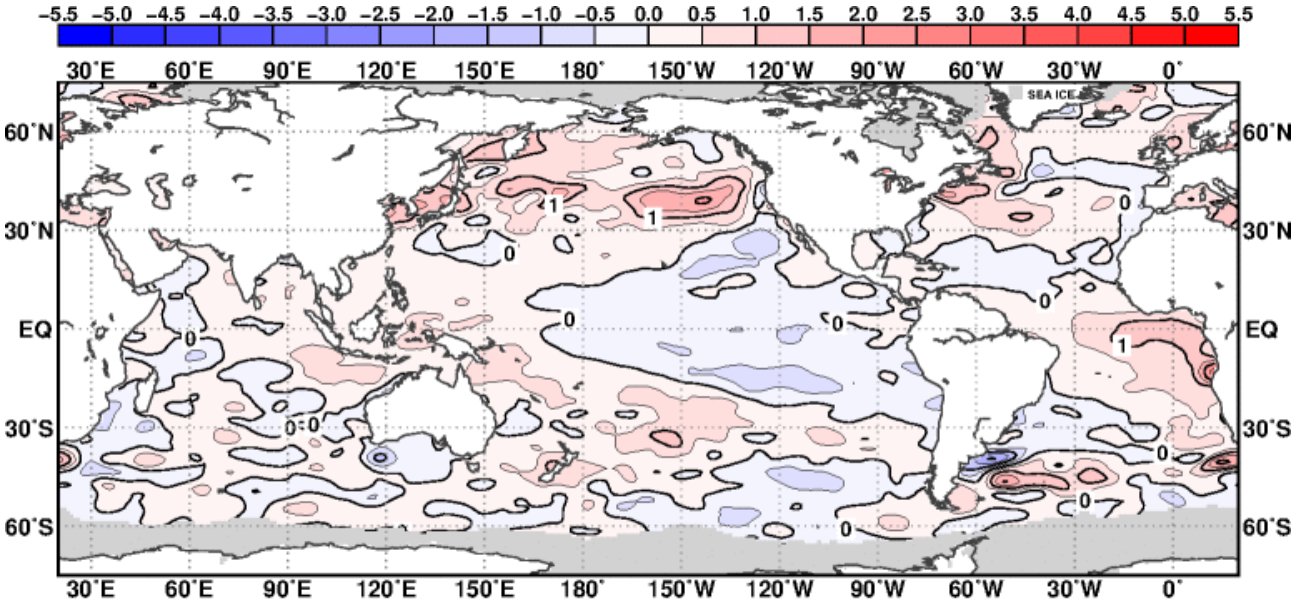

Fig. S3 Three-month mean sea surface temperature anomaly (June – August 2021)
The contour interval is 0.5 degree C. The base period for the normal is 1991-2020. Maximum coverage with sea ice is shaded in gray.

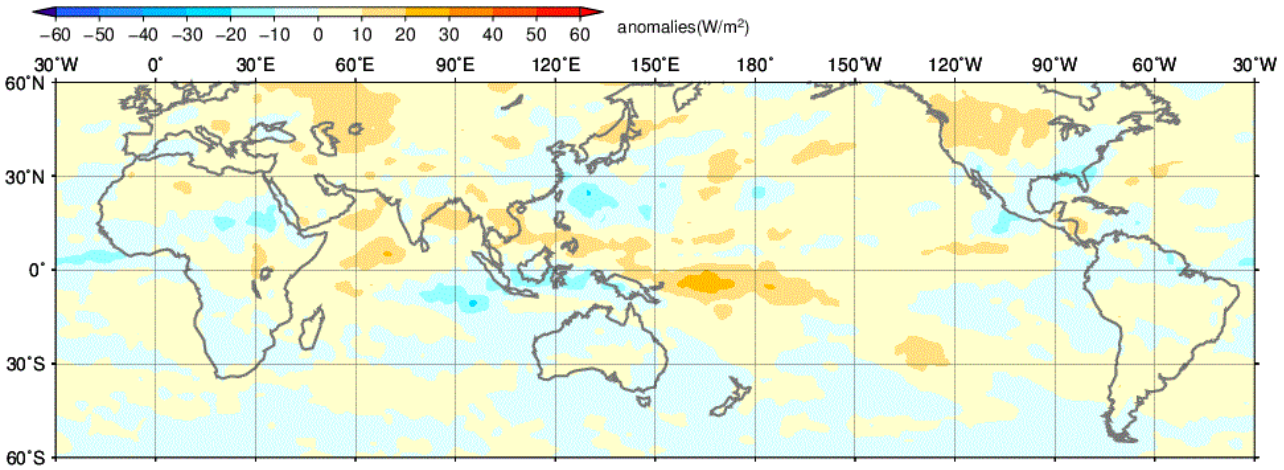

Fig. S4 Three-month mean Outgoing Longwave Radiation (OLR) anomaly (June – August 2021)
The contour interval is 10 W/m^2. The base period for the normal is 1991-2020. Original data provided by NOAA.

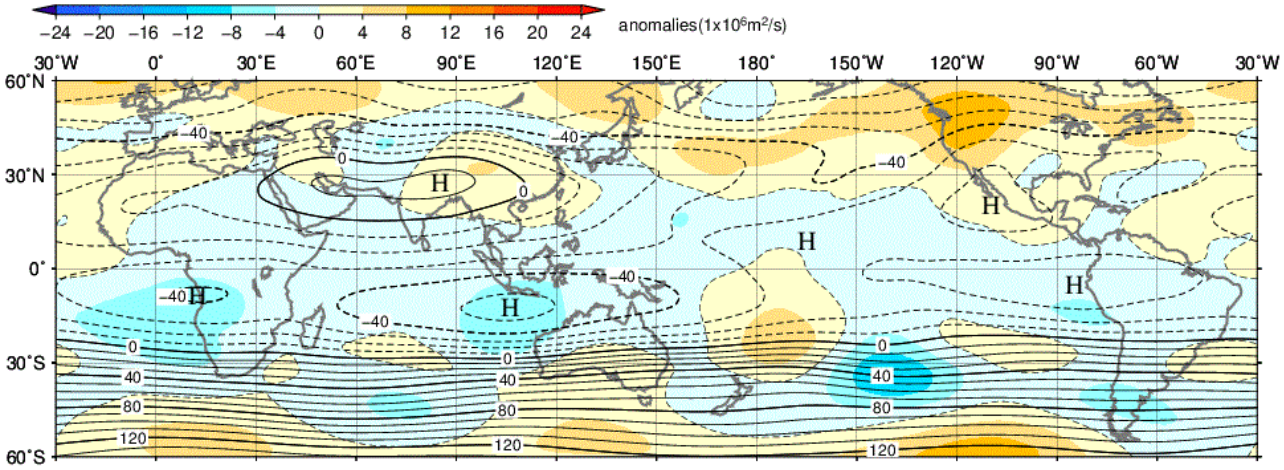

Fig. S5 Three-month mean 200-hPa stream function and anomaly (June – August 2021)
The contour interval is 10x10^6 m^2/s. The base period for the normal is 1991-2020.

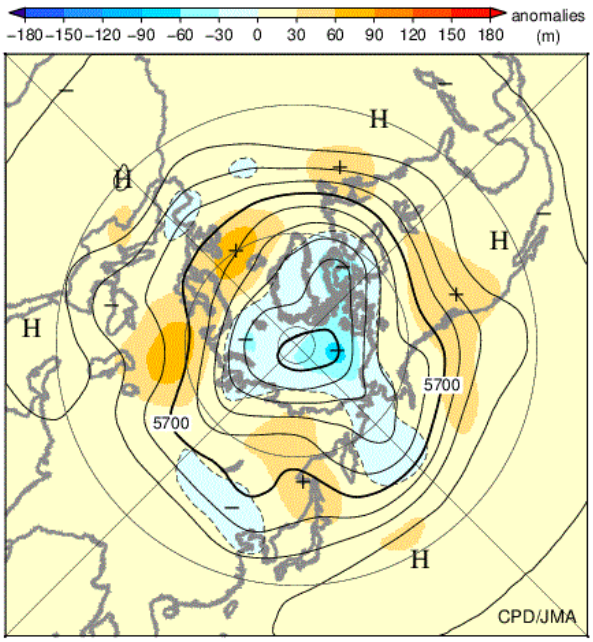

Fig. S6 Three-month mean 500-hPa height and anomaly in the Northern Hemisphere (June – August 2021)

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.

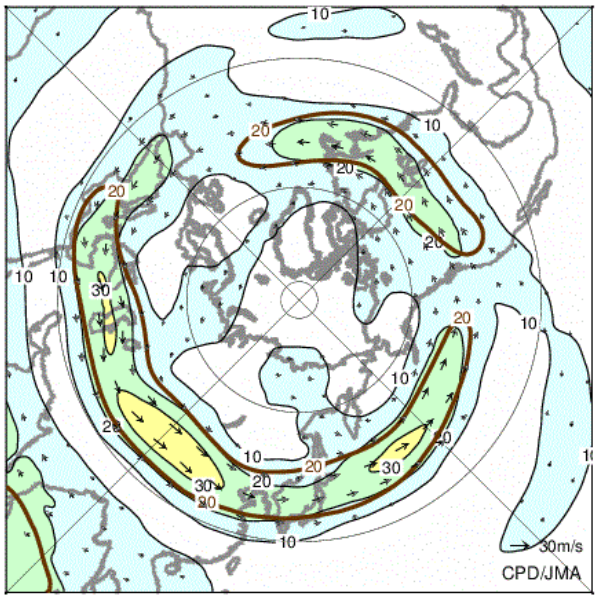

Fig. S7 Three-month mean 200-hPa wind speed and vectors in the Northern Hemisphere (June – August 2021)

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.

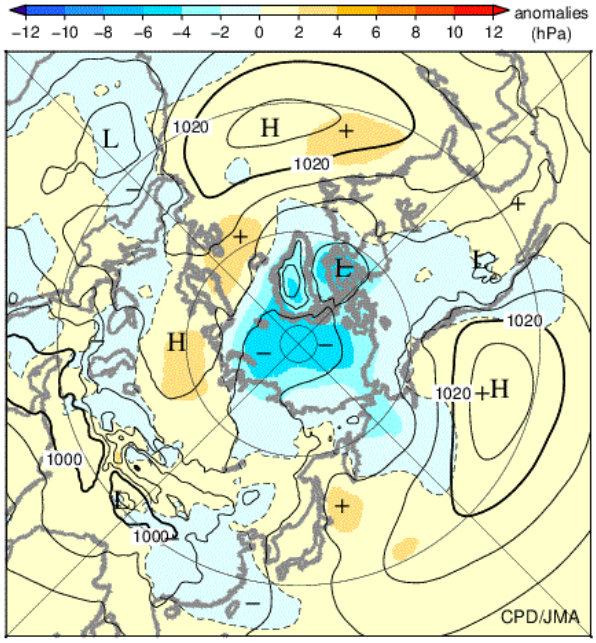

Fig. S8 Three-month mean sea level pressure and anomaly in the Northern Hemisphere (June – August 2021)

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.

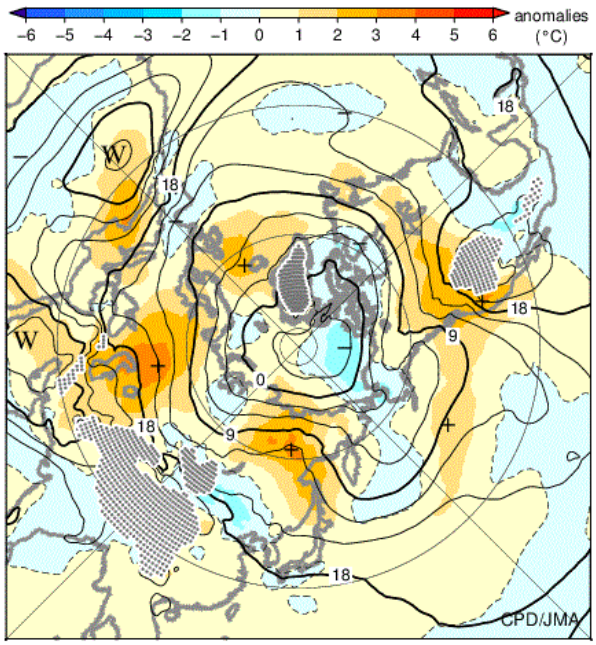

Fig. S9 Three-month mean 850-hPa temperature and anomaly in the Northern Hemisphere (June – August 2021)

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.