Monthly Highlights on the Climate System (February 2019)

Highlights in February 2019

- El Niño conditions are considered to have persisted in the equatorial Pacific (see El Niño Outlook updated on 11 March 2019).
- Monthly mean temperatures were significantly above normal in Okinawa/Amami, and were above normal in northern to western Japan.
- Monthly mean temperatures were extremely high from eastern to northern Australia, and were extremely low from southwestern Canada to the southwestern USA.
- Convective activity was enhanced around the date line, and was suppressed from the eastern Indian Ocean to the Maritime Continent and around the Philippines.
- In the 500-hPa height field, a wave train was clearly seen from the central North Pacific to Europe with positive anomalies to the seas south of Alaska, and negative anomalies over the western USA. Zonally elongated positive anomalies were seen from Japan to its east.

Climate in Japan (Fig. 1):

- In eastern and western Japan and Okinawa/Amami, monthly mean temperatures were above normal with the highest on record for February since 1946 in Okinawa/Amami, since warm air covered over the regions in the most of the month. In northern Japan, monthly mean temperatures were above normal due to significantly warm air in late February, although temperatures were remarkably low in the first half of the month.
- Monthly snowfall amounts for the Sea of Japan side were significantly below normal due to small effect of cold air and developed low pressures.

World Climate:

- The monthly anomaly of the global average surface temperature in February 2019 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.32 °C (4th warmest since 1891) (preliminary value) (Fig. 2). On a longer time scale, global average surface temperatures have risen at a rate of about 0.80°C per century in February (preliminary value).
- Extreme climate events were as follows (Fig. 3).
  - Monthly mean temperatures were extremely high from the Ogasawara Islands of Japan to southern China, from the central part of Southeast Asia to the southern part of South Asia, from the northern UK to southeastern Germany, from the southern USA to the northwestern part of South America, and from eastern to northern Australia.
  - Monthly mean temperatures were extremely low from southwestern Canada to the southwestern USA.
  - Monthly precipitation amounts were extremely high in and around northwestern Russia, from southern Greece to northwestern Libya, and from the southeastern to western part of North America.
  - Monthly precipitation amounts were extremely low from southern Belarus to southwestern Ukraine, from northern Spain to northwestern Algeria, and in and around northeastern Argentina.

Oceanographic Conditions (Fig. 4):

- In the equatorial Pacific, positive SST anomalies were observed in almost the entire region except the area near Indonesia. In the NINO.3 region, the monthly mean SST anomaly was +0.6˚C and the SST deviation from the latest sliding 30-year mean was +0.7˚C (Fig.5).
- In the North Pacific, remarkably positive SST anomalies were observed from the South China Sea to south of Japan, in the central part, in the area around the Gulf of Alaska, and off the western coast of Mexico.
- In the South Pacific, remarkably positive SST anomalies were observed from the area near the date line of the tropics to the area near 40˚S, 90˚W and from the area near the southeastern coast of Australia to the area

near 50˚S, 150˚W, and remarkably negative SST anomalies were observed in the area near the northeastern coast of Australia and off the western coast of Chile.
- In the Indian Ocean, remarkably positive SST anomalies were observed over the southern part of tropics.
- In the North Atlantic, remarkably positive SST anomalies were observed in the equatorial area, from the Gulf of Mexico to the area off the eastern coast of the Florida Peninsula, and off the western coast of the Iberian Peninsula, and remarkably negative SST anomalies were observed south of Greenland.

Tropics:
- Convective activity was enhanced around the date line, and was suppressed from the eastern Indian Ocean to the Maritime Continent and around the Philippines (Fig. 6).
- The active phase of equatorial intraseasonal oscillation propagated eastward from the Atlantic to the Indian Ocean in mid- to late February (Fig. 7).
- In the upper troposphere, cyclonic circulation anomalies straddling the equator were seen over the Maritime Continent, and a wave train was seen from the Philippines to Japan. A wave train was seen from the Kamchatka Peninsula to the eastern Pacific (Fig. 8).
- In the lower troposphere, cyclonic circulation anomalies straddling the equator were seen from the west of the date line to the central Pacific, and anticyclonic circulation anomalies straddling the equator were seen from the eastern Indian Ocean to the Maritime Continent.
- In the sea level pressure field, in the equatorial area, positive anomalies were seen from the Indian Ocean to the Maritime Continent. The Southern Oscillation Index value was -0.9 (Fig. 5).

Extratropics:
- In the 500-hPa height field (Fig. 9), the polar vortex in the Northern Hemisphere were centered to the north of Siberia and over the Kamchatka Peninsula. A wave train was clearly seen from the central North Pacific to Europe with positive anomalies to the seas south of Alaska, over the eastern USA, and Europe, and negative anomalies over the western USA and mid-latitudes of the North Atlantic. Zonally elongated positive anomalies were seen from Japan to its east.
- The subtropical jet stream shifted southward from its normal position from North Africa to Eurasia. The westerly jet stream shifted northward from its normal position from Japan to the western North Pacific and from eastern North America to the western North Atlantic (Fig. 10).
- In the sea level pressure field (Fig. 11), developed cyclones were seen over the western Bering Sea, the seas south of Greenland, and to the north of Siberia. Positive anomalies were seen over the seas south of Alaska, western Canada, Europe, and from Japan to its east.
- Temperatures at 850-hPa were above normal from Alaska to its south, over the eastern USA, Europe, and from southern China to the mainland Japan, and below normal over the western USA and the Kamchatka Peninsula (Fig. 12).
- Zonal mean temperatures in the troposphere were above normal over a wide area except near the North Pole. In the high-latitudes of the Northern Hemisphere, above-normal temperatures were seen in the lower-stratosphere, and below-normal temperatures were seen above the 30-hPa level.

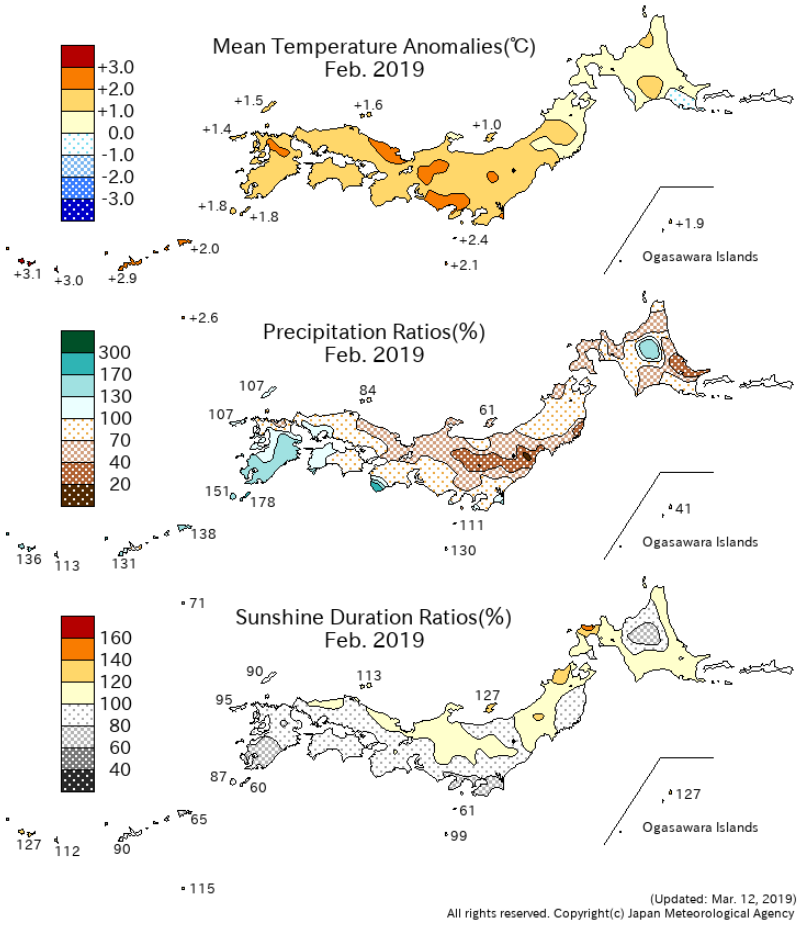

Fig. 1 Monthly climate anomaly/ratio over Japan (February 2019)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
The base period for the normal is 1981-2010.

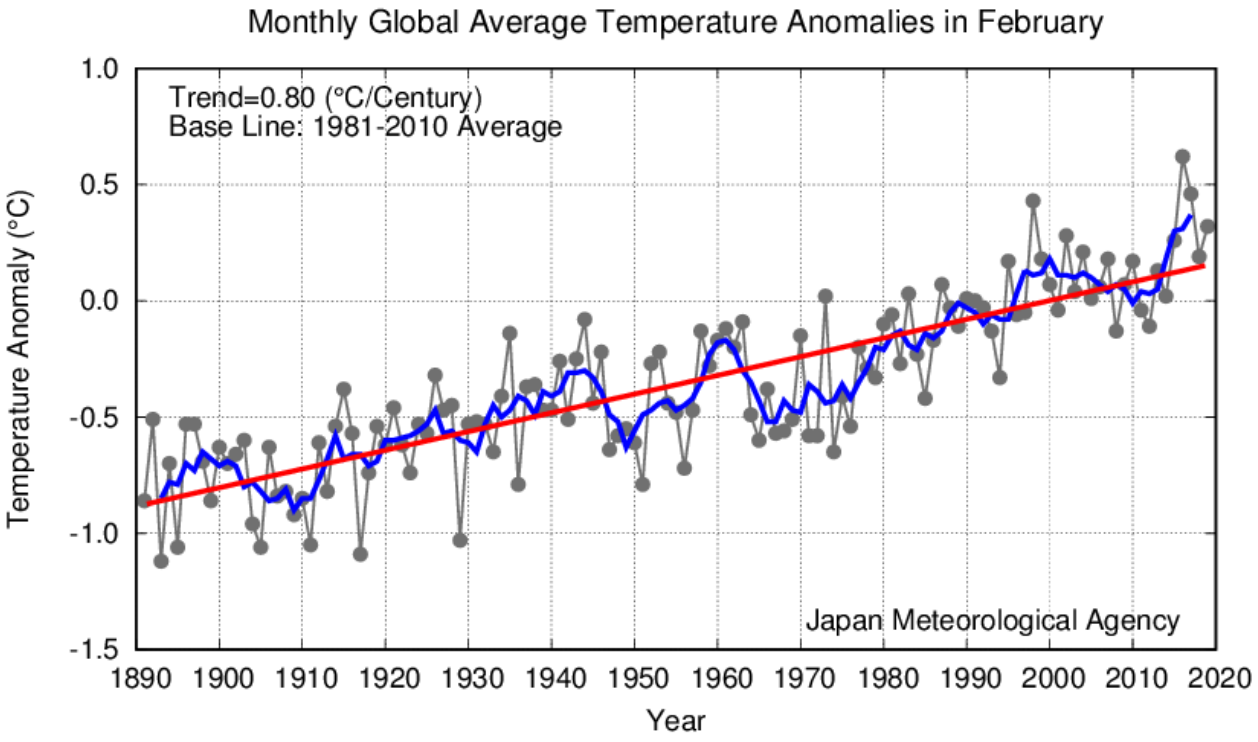

Fig. 2 Long-term change in monthly anomalies of global average surface temperature in February
The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations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

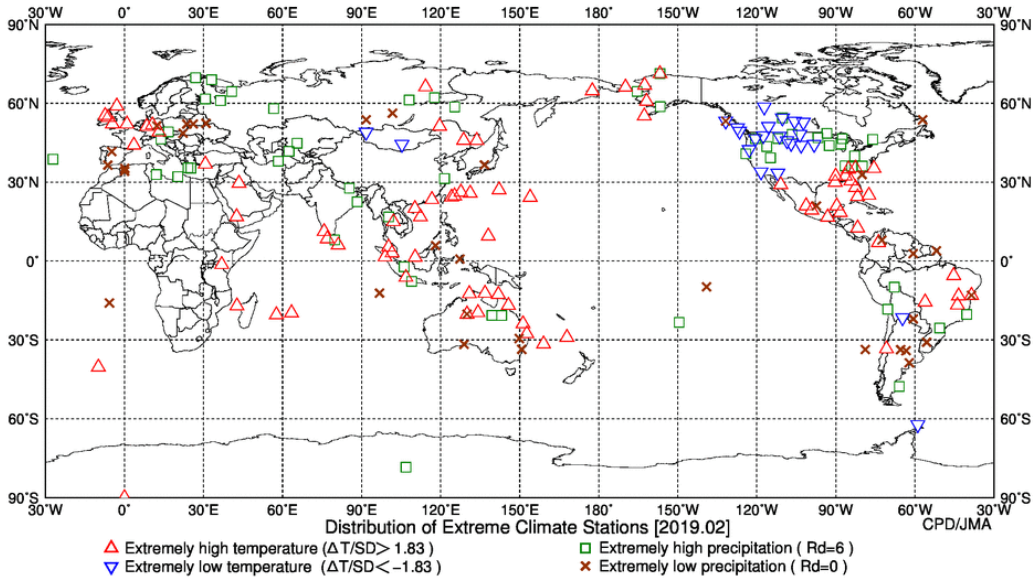

Fig. 3 Distribution of extreme climate stations (February 2019)

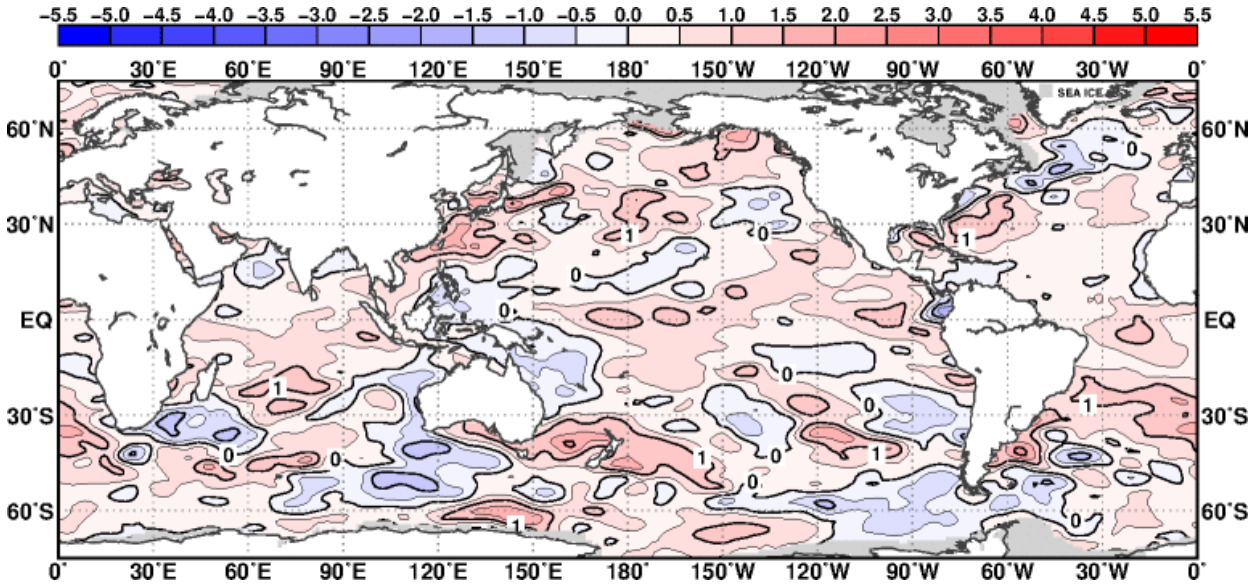

Fig. 4 Monthly mean sea surface temperature anomaly (February 2019)
The contour interval is 0.5 degree C. The base period for the normal is 1981-2010. Maximum coverage with sea ice is shaded in gray.

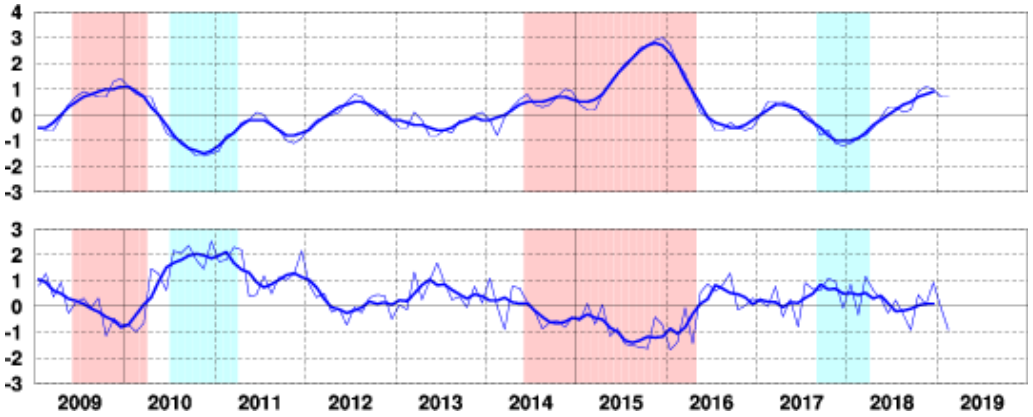

Fig. 5 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).
Thin blue lines represent monthly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

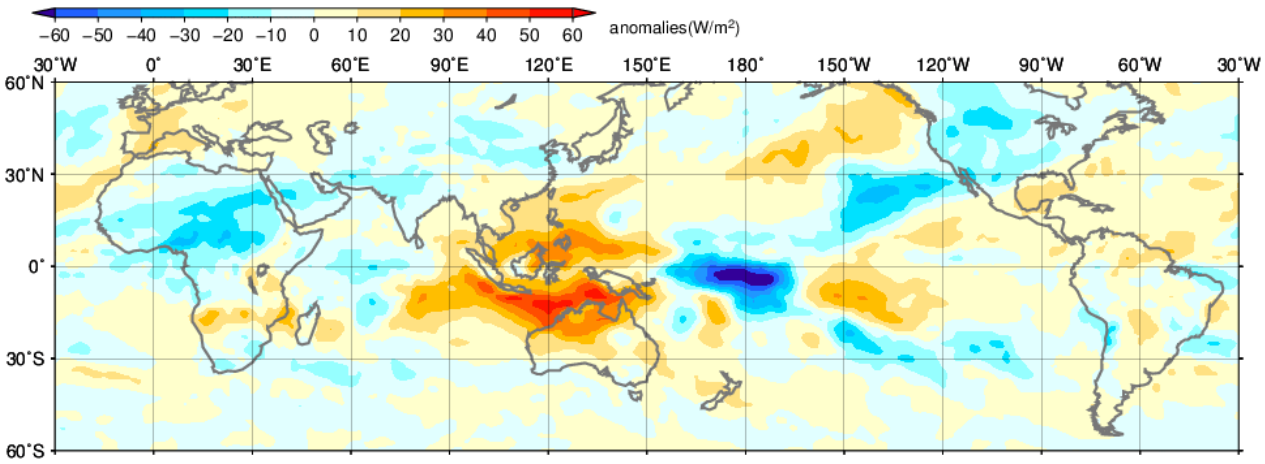

Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (February 2019)
The contour interval is 10 W/m^2. The base period for the normal is 1981-2010. Original data provided by NOAA.

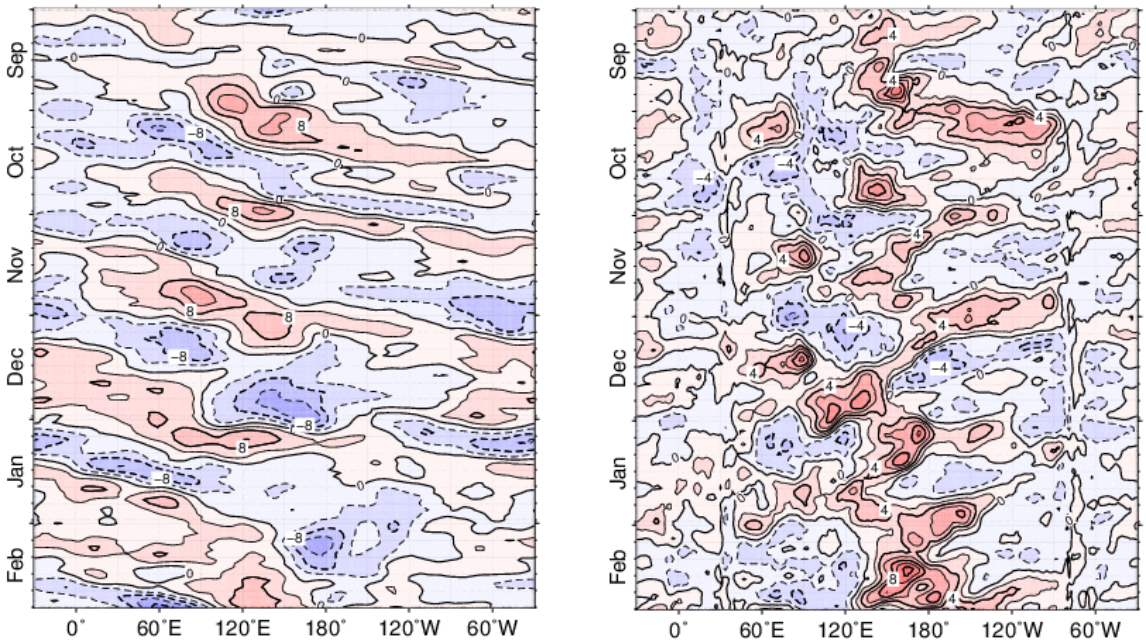

Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (September 2018 – February 2019)
The contour intervals are 4x10^6 m^2/s (left) and 2 m/s (right). The base period for the normal is 1981-2010.

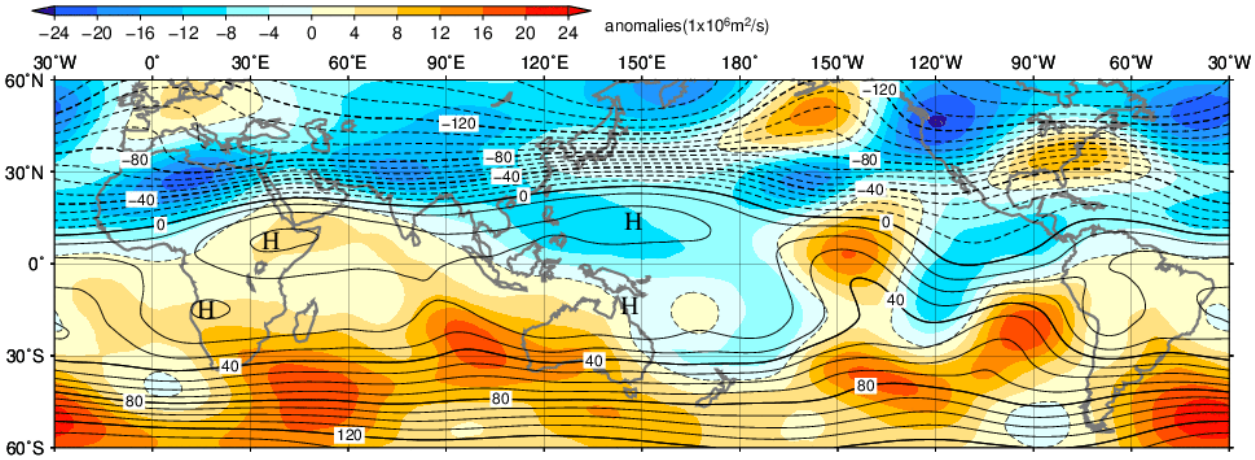

Fig. 8 Monthly mean 200-hPa stream function and anomaly (February 2019)
The contour interval is 10x10^6 m^2/s. The base period for the normal is 1981-2010.

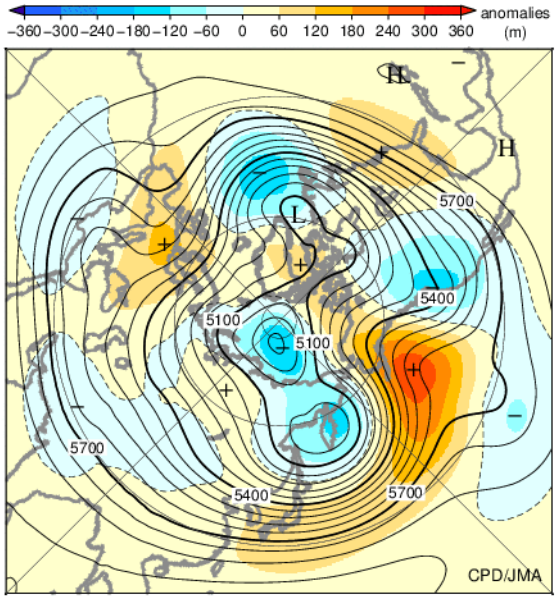

Fig. 9 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (February 2019)

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.

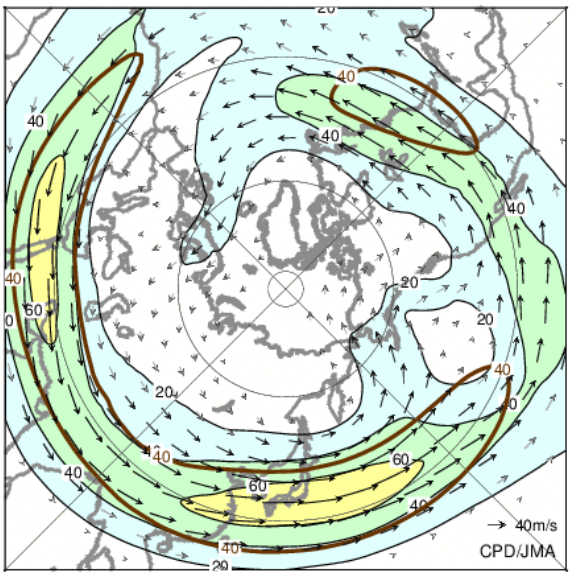

Fig. 10 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (February 2019)

The black lines show wind speed at intervals of 20 m/s. The brown lines show its normal at intervals of 40 m/s. The base period for the normal is 1981-2010.

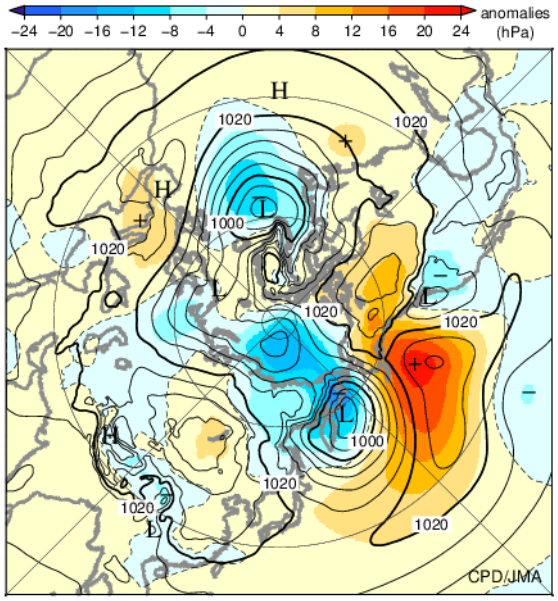

Fig. 11 Monthly mean sea level pressure and anomaly in the Northern Hemisphere (February 2019)

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.

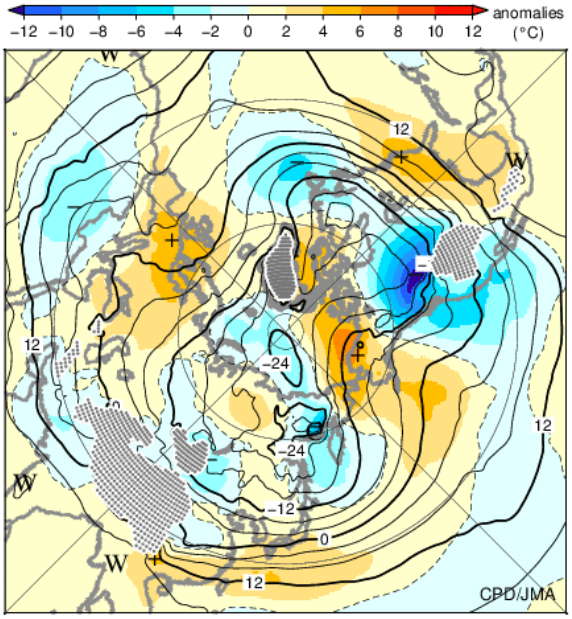

Fig. 12 Monthly mean 850-hPa temperature and anomaly in the Northern Hemisphere (February 2019)

The contours show 850-hPa temperature at intervals of 4 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.