Monthly Highlights on the Climate System (April 2018)

Highlights in April 2018

- It is considered that La Niña conditions continue in the equatorial Pacific (see El Niño Outlook updated on 11 May 2018).
- Monthly mean temperatures were significantly above normal in eastern and western Japan.
- Monthly precipitation amounts were significantly above normal on the Sea of Japan side of eastern Japan.
- Monthly sunshine durations were significantly above normal on the Pacific side of western Japan and in Okinawa/Amami.
- Monthly mean temperatures were extremely high from eastern Japan to central China, and in and around Europe.
- The active phase of equatorial intraseasonal oscillation propagated eastward from South America to the Indian Ocean during early to mid-April, but after that its amplitude became small.
- In the 500-hPa height field, a wave train was dominant from North America through Europe to the seas east of Japan, with positive anomaly from the northern part of East Asia to the seas east of Japan and negative anomaly from eastern Canada to the seas west of the UK, respectively. Associated with a blocking high over the East Siberian Sea, negative anomaly was seen in and around the Kamchatka Peninsula.
- Temperatures at 850-hPa were above normal over the East Siberian Sea, Europe and East Asia, and below normal over the central and eastern parts of North America.

Climate in Japan (Fig. 1):

- Monthly mean temperatures were significantly above normal in eastern and western Japan and above normal in northern Japan.
- Monthly precipitation amounts were significantly above normal on the Sea of Japan side of eastern Japan due to moist air flow.
- Monthly sunshine durations were significantly above normal on the Pacific side of western Japan and in Okinawa/Amami since the high pressure systems often covered around Japan.

World Climate:

- The monthly anomaly of the global average surface temperature in April 2018 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.31°C (3rd warmest since 1891) (preliminary value) (Fig. 2). On a longer time scale, global average surface temperatures have risen at a rate of about 0.77°C per century in April (preliminary value).
- Extreme climate events were as follows (Fig. 3).
  - Monthly mean temperatures were extremely high from eastern Japan to central China.
  - Monthly mean temperatures were extremely high in and around Europe, and monthly precipitation amounts were extremely low from Turkey to southern Europe.
  - Monthly mean temperatures were extremely low in and around the Midwest of the USA.

Oceanographic Conditions (Fig. 4):

- In the equatorial Pacific, remarkably positive SST anomalies were observed in the western part and remarkably negative SST anomalies were observed from the central part to the eastern part. In the NINO.3 region, the monthly mean SST anomaly and the SST deviation from the latest sliding 30-year mean were both -0.5°C (Fig.5).
- In the North Pacific, remarkably positive SST anomalies were observed from the East China Sea to south of Alaska and from the area near 5°N, 150°E to the western coast of Central America.
- In the South Pacific, remarkably positive SST anomalies were observed around New Zealand and from the

area near 25°S, 150°W to the area near 35°S, 95°W, and remarkably negative SST anomalies were observed in the eastern part of the tropical region.
- In the Indian Ocean, remarkably positive SST anomalies were observed in the Arabian Sea.
- In the North Atlantic, remarkably positive SST anomalies were observed from the Gulf of Mexico to the area off the western coast of Europe.

Tropics:
- Convective activity was enhanced from Eastern Africa to the equatorial Indian Ocean, over the latitudinal bands between 10°N and 30°N in the central part of North Pacific and over 20°S in the central part of South Pacific, and was suppressed over the central to eastern equatorial Pacific and the eastern Atlantic (Fig. 6).
- The active phase of equatorial intraseasonal oscillation propagated eastward from South America to the Indian Ocean during early to mid-April, but after that its amplitude became small (Fig. 7).
- In the upper troposphere, a wave train was seen from Europe through the Middle East to South Asia. Cyclonic circulation anomalies were observed around the Philippines and cyclonic circulation anomalies straddling the equator were observed over the eastern Pacific (Fig. 8).
- In the lower troposphere, anti-cyclonic circulation anomalies straddling the equator were seen over the Indian Ocean. In the tropical North Pacific, cyclonic circulation anomalies were observed in the western part and anti-cyclonic circulation anomalies were observed in the eastern part.
- In the sea level pressure field, negative anomalies were seen in the western Pacific and positive anomalies were seen in the eastern Pacific. The Southern Oscillation Index value was +0.6 (Fig. 5).

Extratropics:
- In the 500-hPa height field (Fig. 9), a wave train was dominant from North America through Europe to the seas east of Japan, with positive anomalies to the east of the USA, over Europe, from the northern part of East Asia to the seas east of Japan and negative anomalies from eastern Canada to the seas west of the UK and over Western Siberia. Associated with a blocking high over the East Siberian Sea, negative anomaly was seen in and around the Kamchatka Peninsula.
- The westerly jet stream split into two branches over Eurasia, and was displaced northward from its normal position in and around Japan (Fig. 10).
- In the sea level pressure field (Fig. 11), negative anomaly was seen over a wide area in the high-latitudes. The subtropical high over the North Atlantic was stronger than normal. The westward extension of the subtropical high over the North Pacific was stronger than normal.
- Temperatures at 850-hPa were above normal over the East Siberian Sea, Europe and East Asia, and below normal over the central and eastern parts of North America (Fig. 12).
- Zonal mean temperatures in the troposphere were above normal over the latitudinal bands from 30°N to 40°N and the high-latitudes in the Northern and Southern Hemispheres.

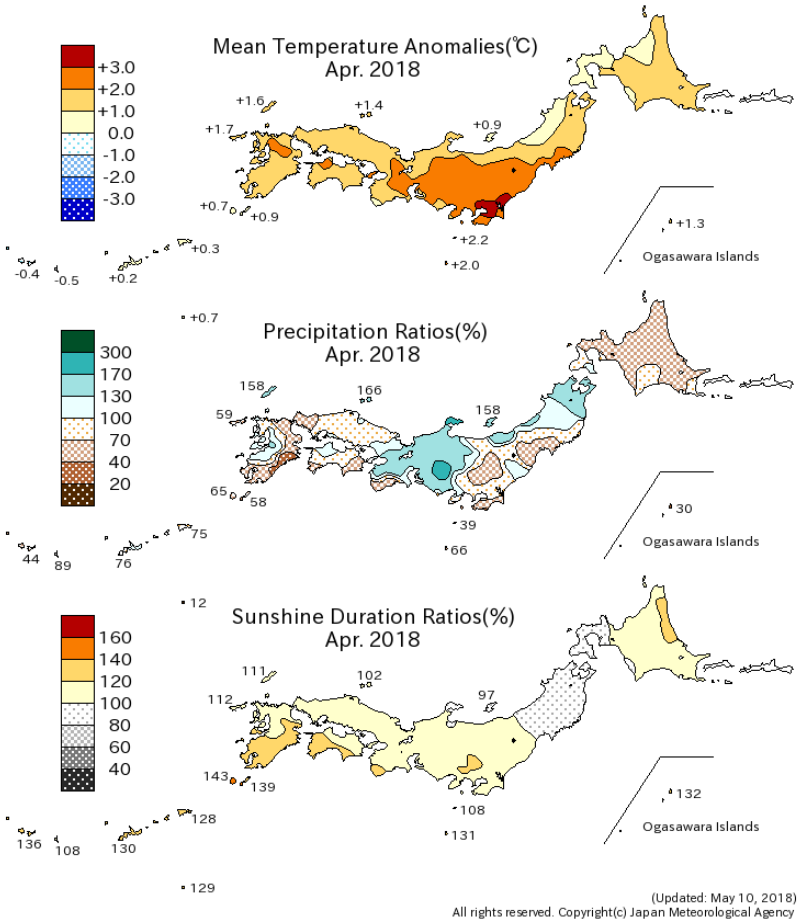

Fig. 1 Monthly climate anomaly/ratio over Japan (April 2018)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
The base period for the normal is 1981-2010.

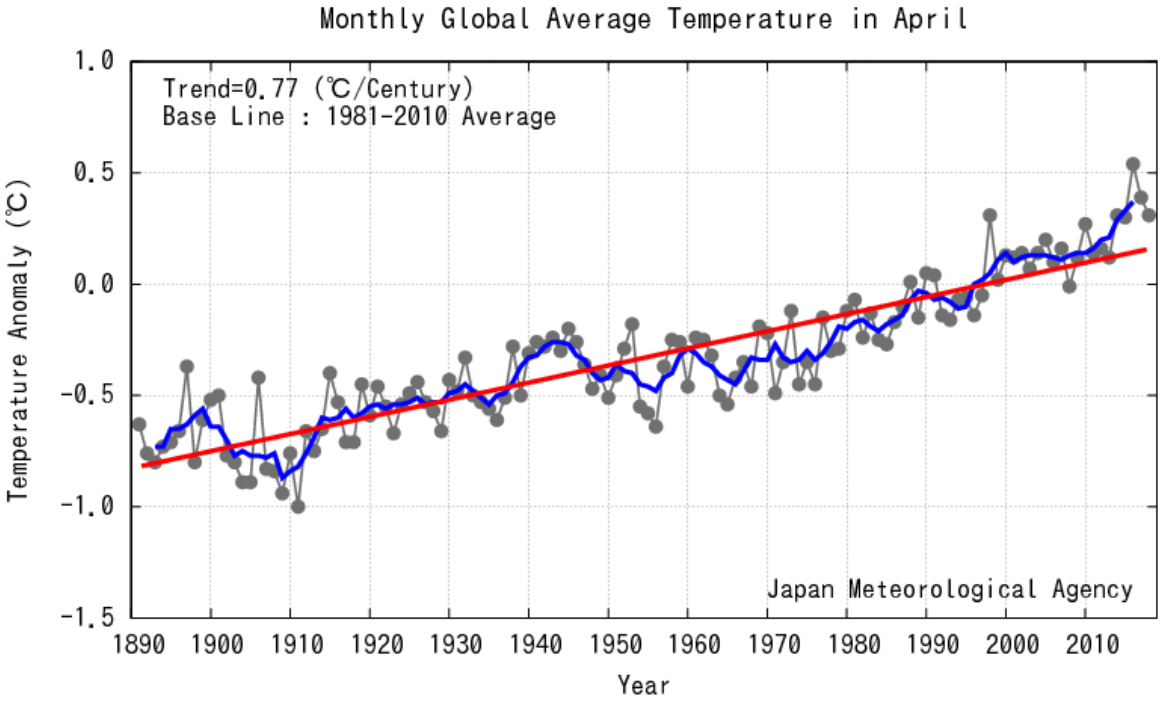

Fig. 2 Long-term change in monthly anomalies of global average surface temperature in April
The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations from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

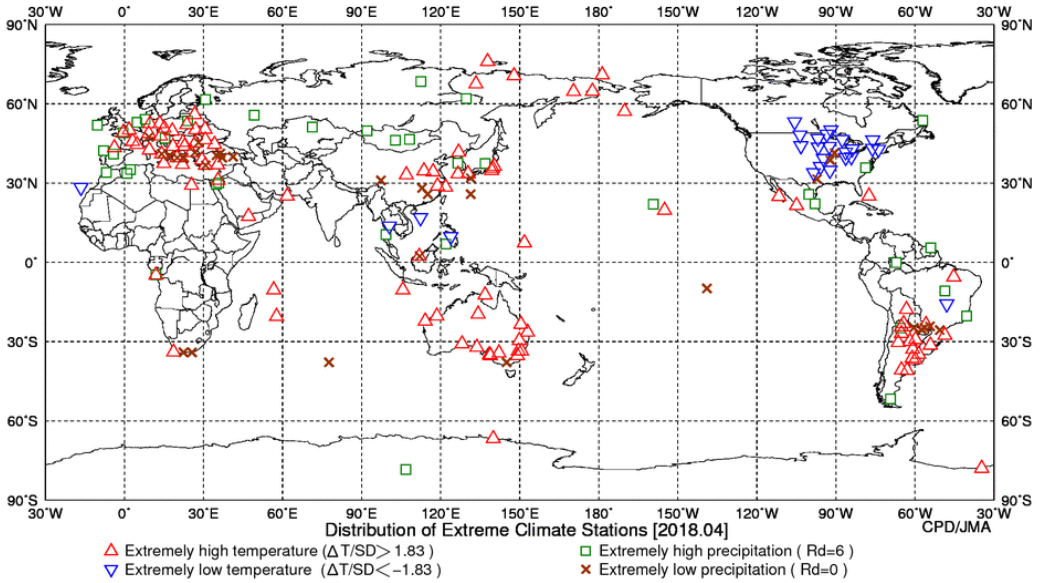

Fig. 3 Distribution of extreme climate stations (April 2018)

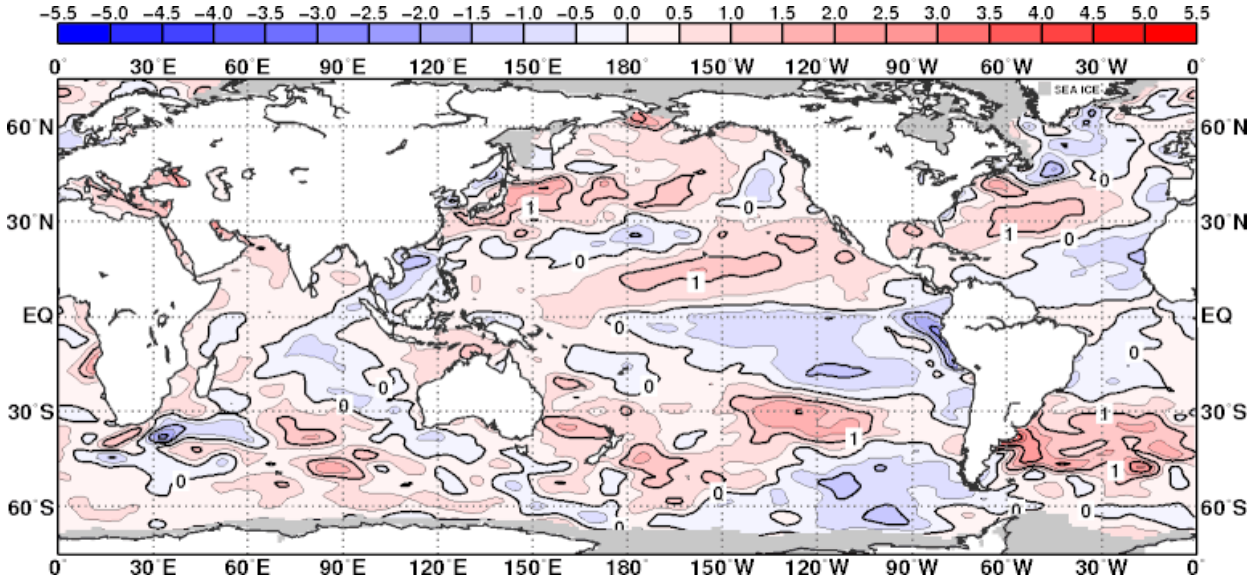

Fig. 4 Monthly mean sea surface temperature anomaly (April 2018)
The contour interval is 0.5 degree C. The base period for the normal is 1981-2010. Maximum coverage with sea ice is shaded in gray.

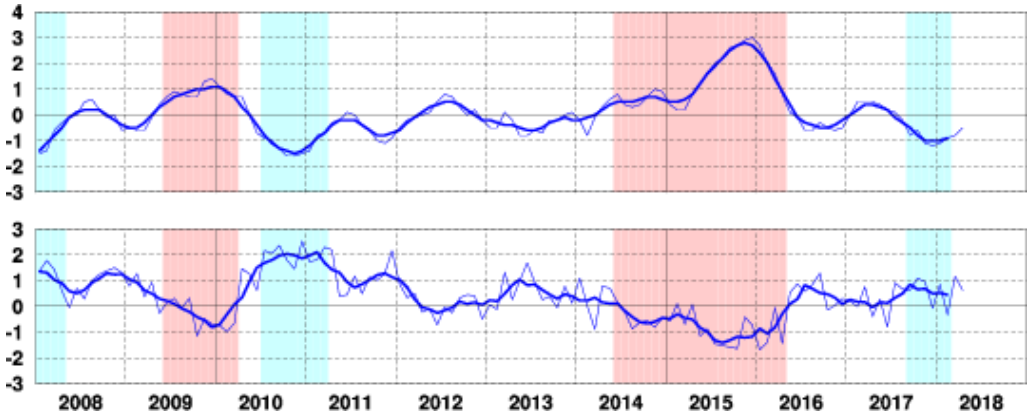

Fig. 5 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).
Thin blue lines represent monthly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

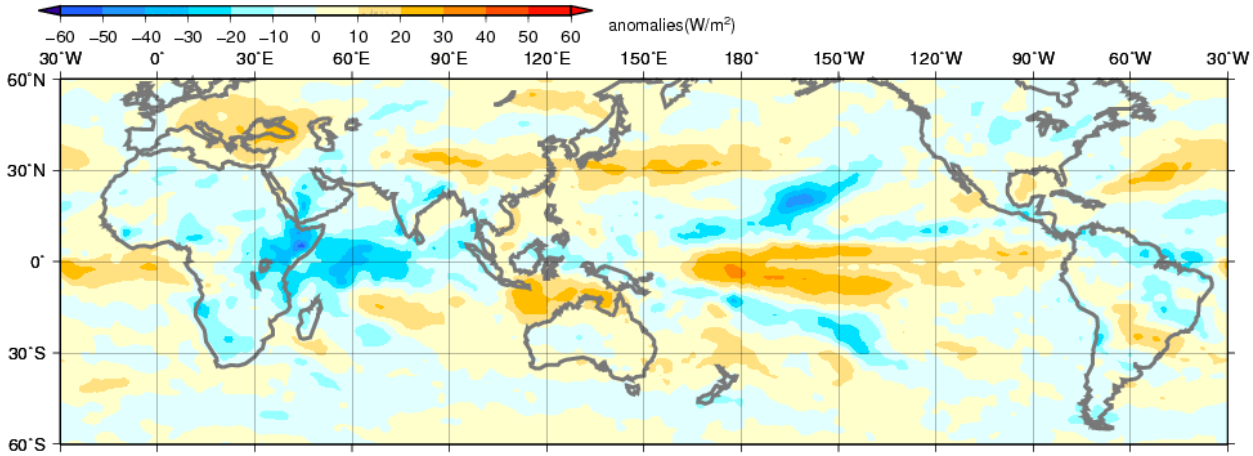

Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (April 2018)
The contour interval is 10 W/m^2. The base period for the normal is 1981-2010. Original data provided by NOAA.

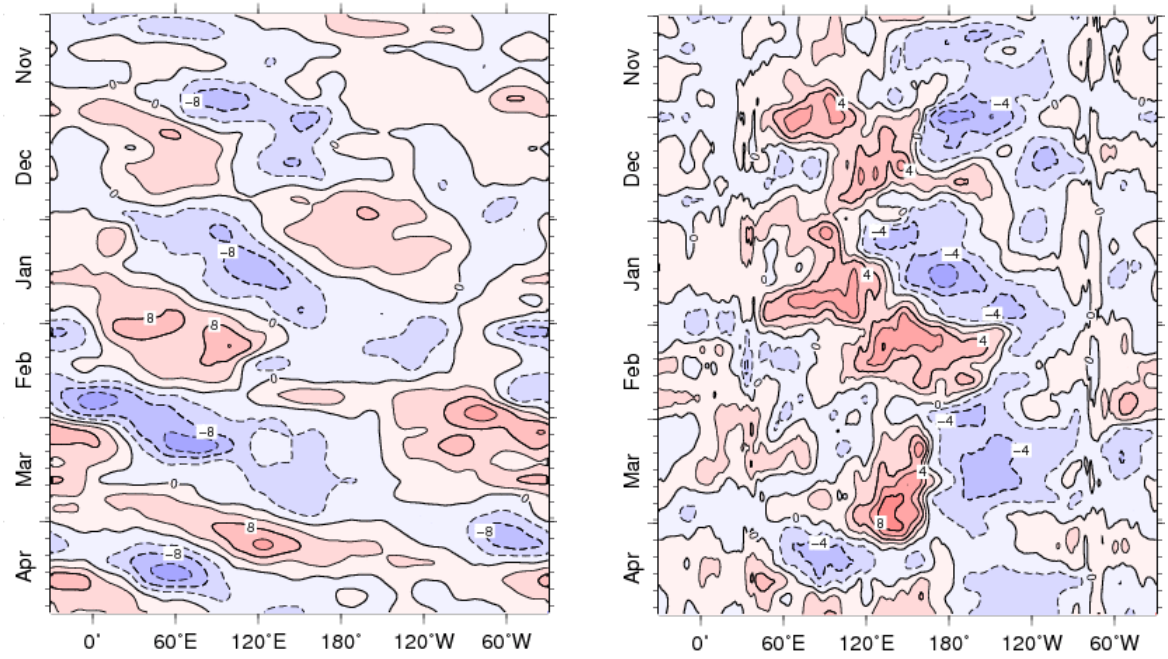

Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (November 2017 – April 2018)
The contour intervals are 4x10^6 m^2/s (left) and 2 m/s (right). The base period for the normal is 1981-2010.

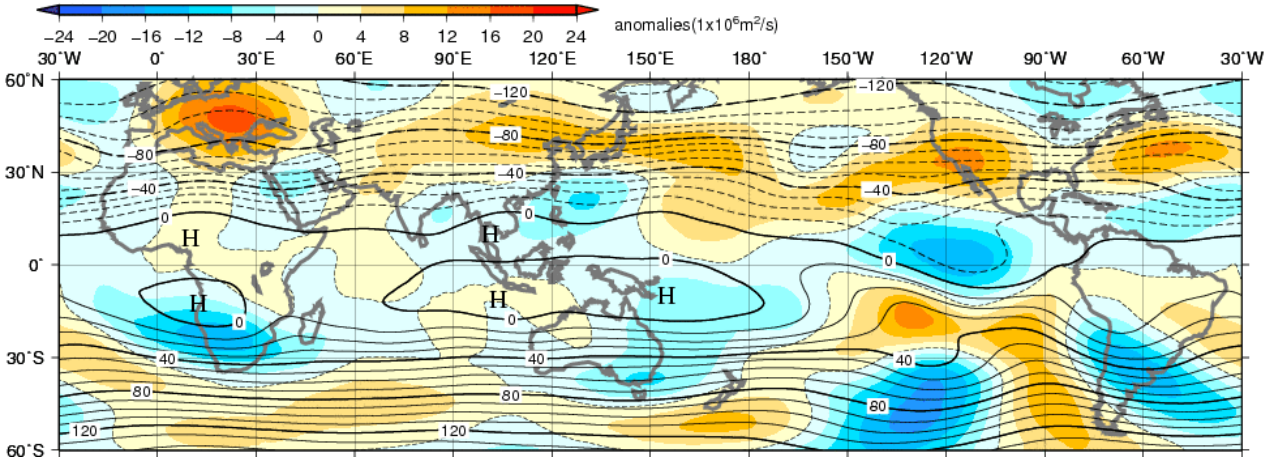

Fig. 8 Monthly mean 200-hPa stream function and anomaly (April 2018)
The contour interval is 10x10^6 m^2/s. The base period for the normal is 1981-2010.

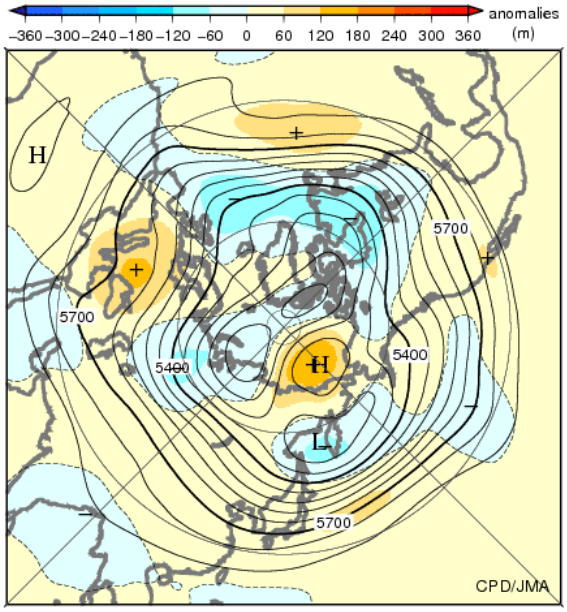

Fig. 9 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (April 2018)

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.

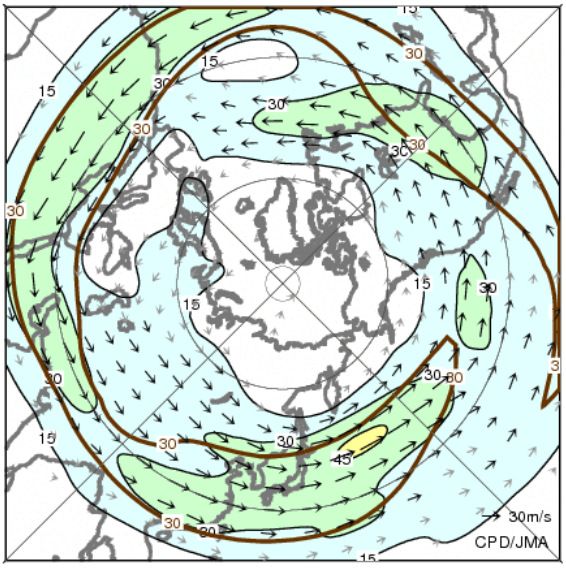

Fig. 10 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (April 2018)

The black lines show wind speed at intervals of 15 m/s. The brown lines show its normal at intervals of 30 m/s. The base period for the normal is 1981-2010.

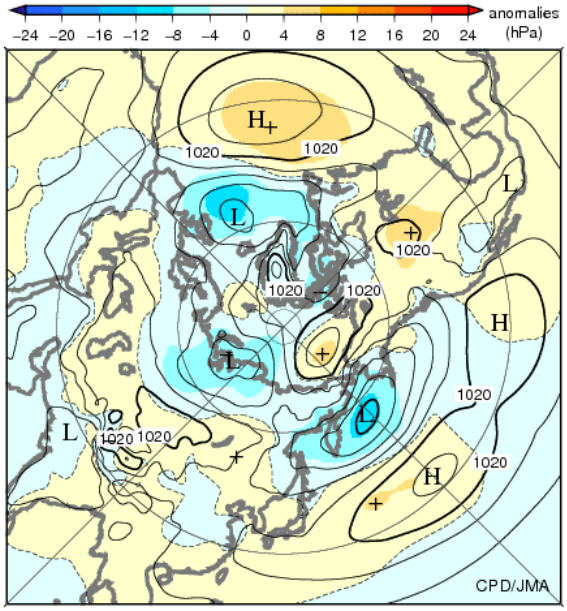

Fig. 11 Monthly mean sea level pressure and anomaly in the Northern Hemisphere (April 2018)

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.

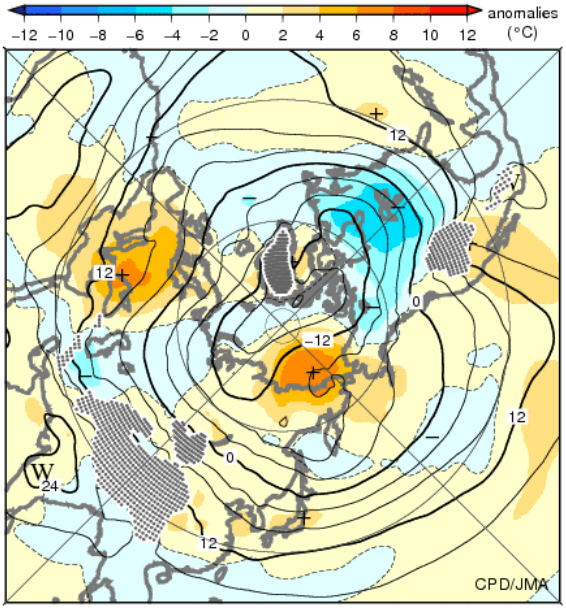

Fig. 12 Monthly mean 850-hPa temperature and anomaly in the Northern Hemisphere (April 2018)

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.