Monthly Highlights on the Climate System (February 2018)

Highlights in February 2018

- It is considered that La Niña conditions continue in the equatorial Pacific (see El Niño Outlook updated on 9 March 2018).
- Monthly mean temperatures were below normal all over Japan and there was a record-breaking heavy snowfall in some regions on the Sea of Japan side.
- Monthly mean temperatures were extremely low in and around the northwestern USA, and from the southern UK to western Germany.
- The active phase of equatorial intraseasonal oscillation propagated eastward from the central Pacific to the western Indian Ocean.
- In the 500-hPa height field, the polar vortex in the Northern Hemisphere split into the East Siberian part and the North American part associated with positive height anomalies in and around the North Pole.
- Temperatures at 850-hPa were widely above normal over the Arctic Ocean, and below normal over East Asia, the northern part of North America and Europe.

Climate in Japan (Fig. 1):

- Monthly mean temperatures were below normal all over country and there was a record-breaking heavy snowfall in some regions on the Sea of Japan side, since it was often covered with strong cold air.
- Monthly precipitation amounts were significantly below normal and monthly sunshine durations were above normal on the Pacific side of eastern Japan, because it was rarely affected by low pressure systems and fronts.

World Climate:

- The monthly anomaly of the global average surface temperature in February 2018 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.18 ℃ (7th 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 northwestern Alaska to the western part of Eastern Siberia, from the northern part of Western Russia to eastern Greenland, from the eastern USA to western Mexico, and in and around northern Australia.
  - Monthly mean temperatures were extremely low from the southern UK to western Germany, and in and around the northwestern USA.
  - Monthly precipitation amounts were extremely high in and around southern Europe, from the northeastern to southern USA, and in and around central Brazil.

Oceanographic Conditions (Fig. 4):

- In the equatorial Pacific, remarkably positive SST anomalies were observed in the western part and 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 -0.9˚C (Fig.5).
- In the North Pacific, remarkably positive SST anomalies were observed from the western tropical region to the Bering Sea, and from the area near 15˚N, 165˚W 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 35˚S, 130˚W to the area off the southwestern coast of Chile, and remarkably negative SST anomalies were observed in the eastern tropical region.

- In the Indian Ocean, remarkably positive SST anomalies were observed from the eastern coast of East Africa to the area near 25˚S, 75˚E, and remarkably negative SST anomalies were observed south of Madagascar.
- 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 the seas east of the Philippines to the central South Pacific and from the North Atlantic to Northern Africa, and was suppressed from the South Indian Ocean to the western South Pacific (Fig. 6).
- The active phase of equatorial intraseasonal oscillation propagated eastward from the central Pacific to the western Indian Ocean (Fig. 7).
- In the upper troposphere, wave trains were clearly seen from the central North Pacific to North America and from Europe to the Arabian Sea. Cyclonic circulation anomalies straddling the equator were seen over the western Indian Ocean (Fig. 8).
- In the lower troposphere, cyclonic circulation anomalies straddling the equator were seen from the eastern Maritime Continent to the east of the dateline.
- In the sea level pressure field, positive anomalies were seen over the Indian Ocean and the central to eastern Pacific, and negative anomalies were seen over the western Pacific and from the Atlantic to Africa. The Southern Oscillation Index value was -0.3 (Fig. 5).

Extratropics:

- In the 500-hPa height field (Fig. 9), the polar vortex in the Northern Hemisphere split into the East Siberian part and the North American part associated with positive height anomalies in and around the North Pole. While negative anomalies were observed over northeastern China, a wave train was clearly seen from the Pacific to North America with positive anomalies to the south of Alaska and over the Atlantic coast of North America, and negative anomalies over northern Canada. Another wave train was observed from Europe, where negative anomalies were observed, to the Middle East.
- The subtropical jet stream was displaced southward from its normal position over Eurasia (Fig. 10).
- In the sea level pressure field (Fig. 11), positive anomalies were observed from northern Europe to Western Siberia and to the south of Alaska. The Aleutian Low shifted northwestward and was stronger than normal on and around the Kamchatka Peninsula.
- Temperatures at 850-hPa were widely above normal over the Arctic Ocean as well as over the southern to eastern USA, and below normal over East Asia, the northern part of North America and Europe (Fig. 12).
- Zonal mean temperatures in the troposphere were extremely above-normal over the high latitudes in the Northern Hemisphere. In addition, above-normal anomalies were observed over the latitudinal bands of 40°N and 50°S and below-normal anomalies over the latitudinal band of 50°N
- In the 30-hPa height field, the stratospheric polar vortex shifted over northern Canada in association with positive height anomalies clearly observed over northern Eurasia. A major sudden stratospheric warming event occurred in the middle of the month.

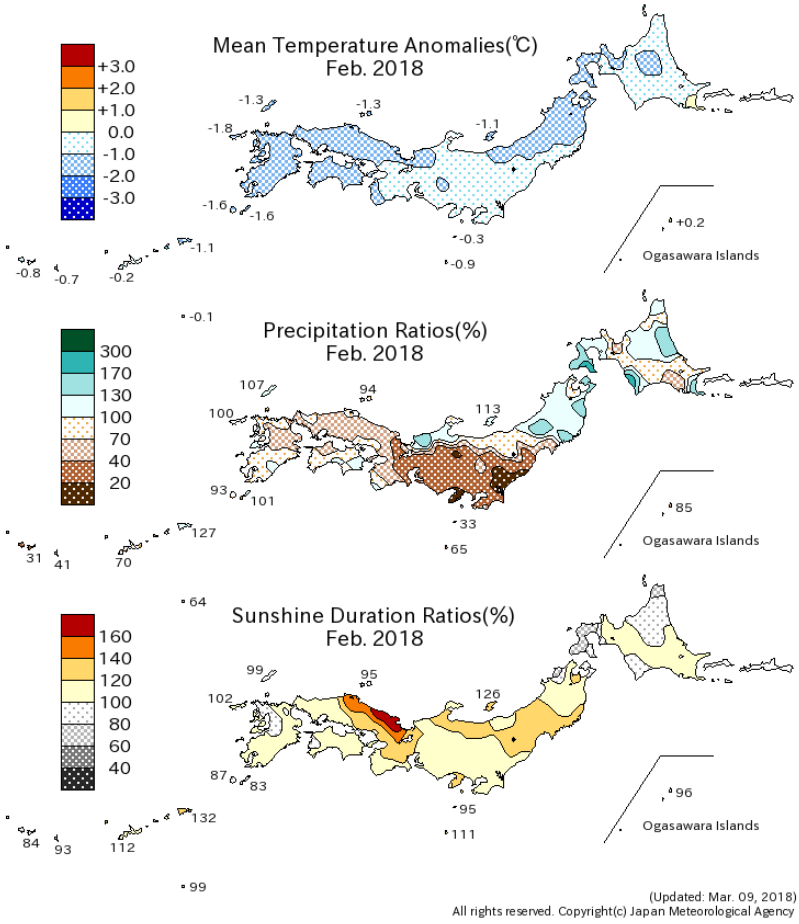

Fig. 1 Monthly climate anomaly/ratio over Japan (February 2018)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
The base period for the normal is 1981-2010.

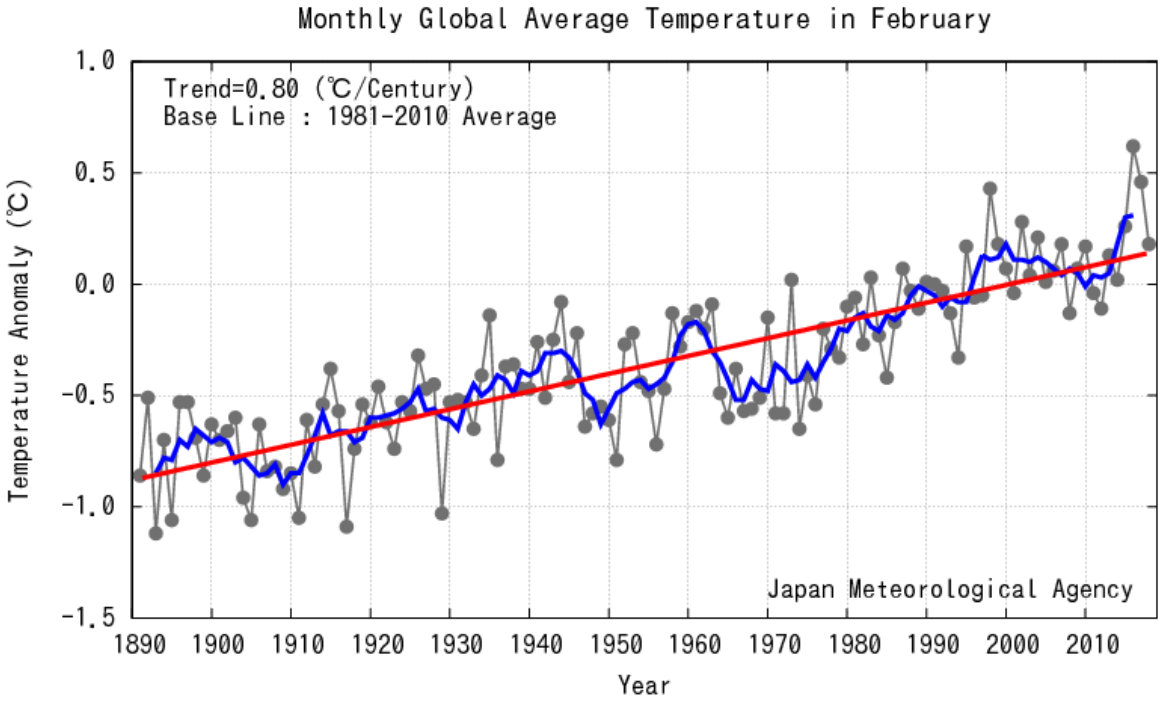

Fig. 2 Long-term change in monthly anomalies of global average surface temperature in February
The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations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

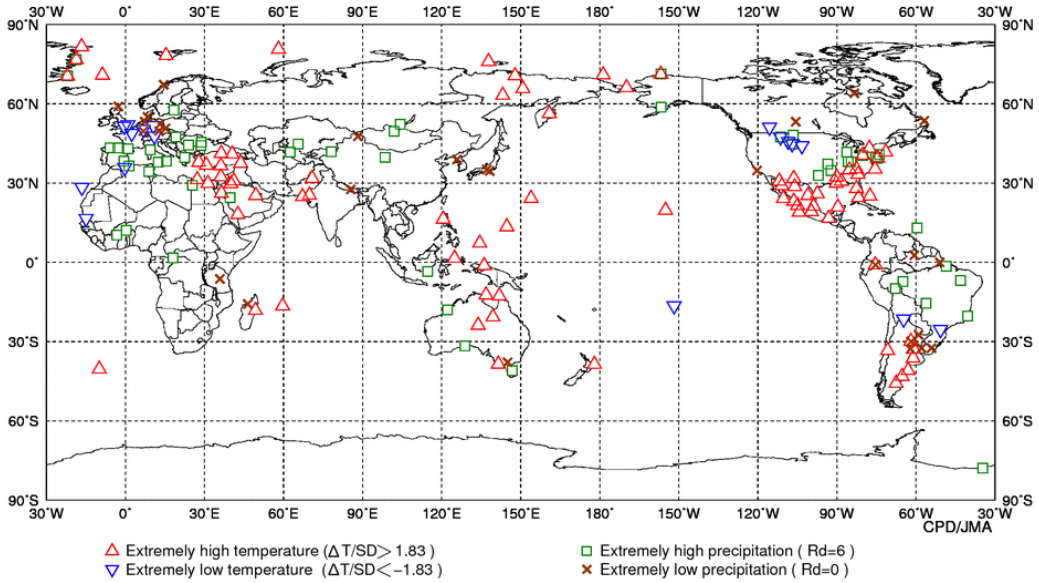

Fig. 3 Distribution of extreme climate events (February 2018)

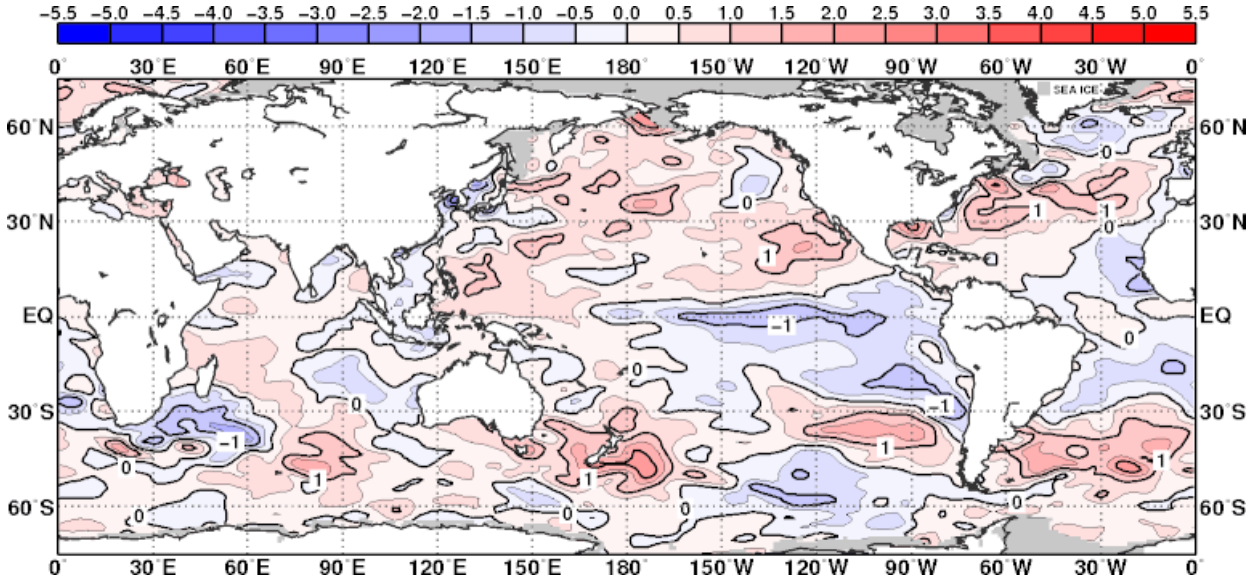

Fig. 4 Monthly mean sea surface temperature anomaly (February 2018)
The contour interval is 0.5 degree C. The base period for the normal is 1981-2010. Maximum coverage with sea ice is shaded in gray.

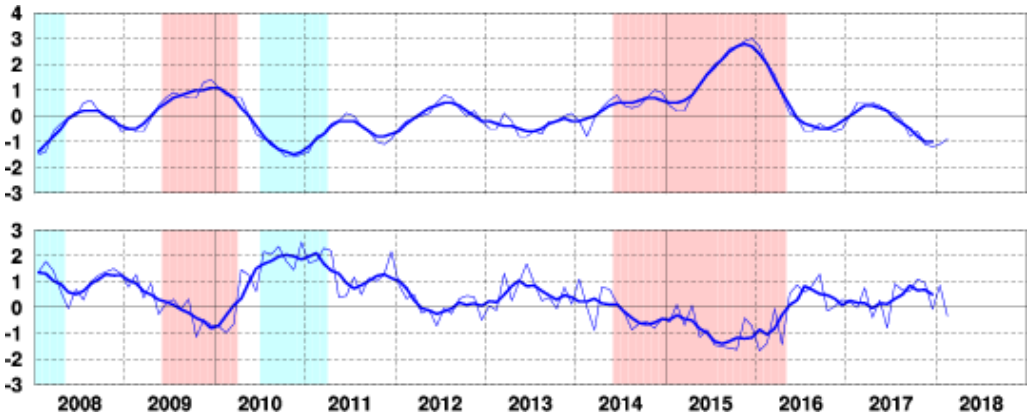

Fig. 5 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).
Thin blue lines represent monthly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

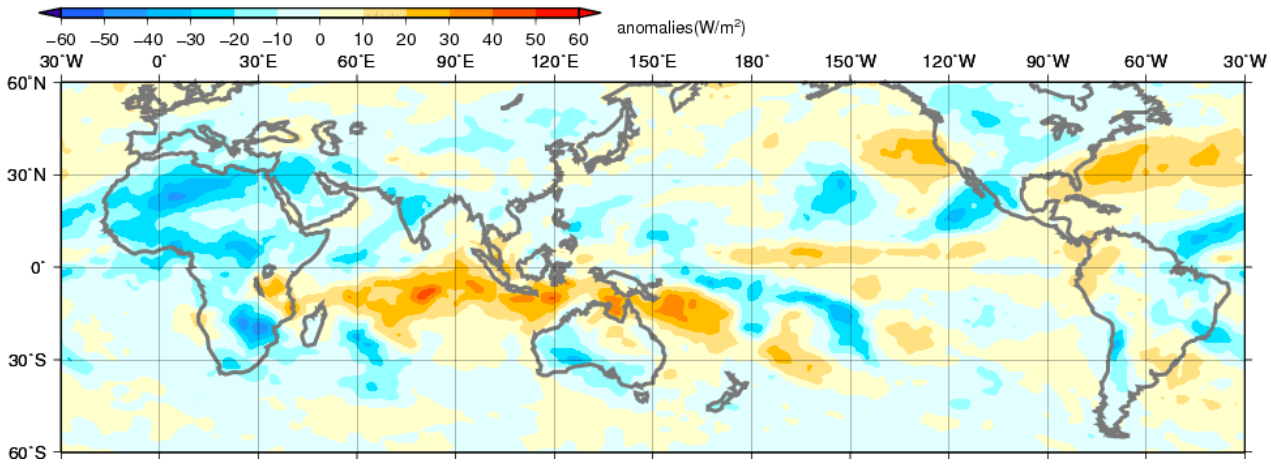

Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (February 2018)
The contour interval is 10 W/m^2. The base period for the normal is 1981-2010. Original data provided by NOAA.

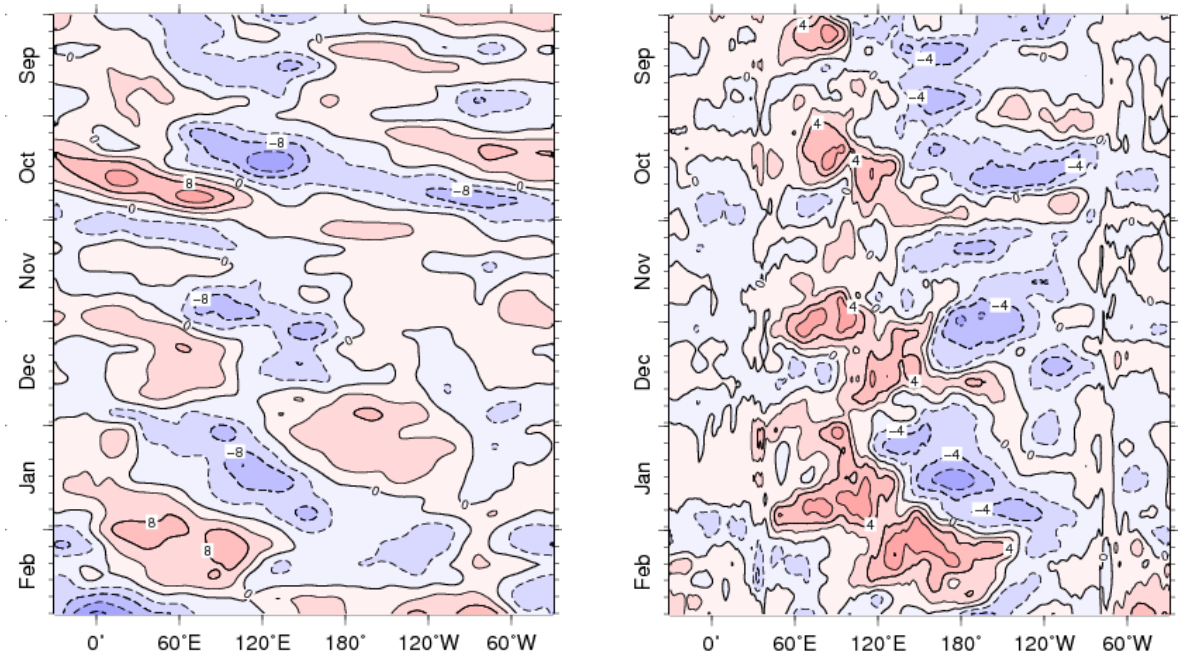

Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (September 2017 – February 2018)
The contour intervals are 4x10^6 m^2/s (left) and 2 m/s (right). The base period for the normal is 1981-2010.

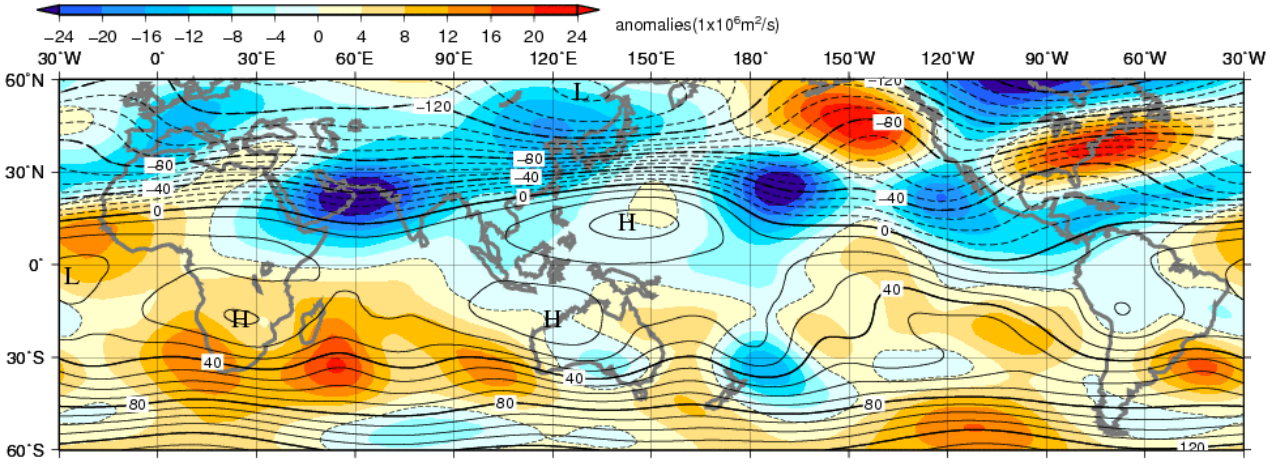

Fig. 8 Monthly mean 200-hPa stream function and anomaly (February 2018)
The contour interval is 10x10^6 m^2/s. The base period for the normal is 1981-2010.

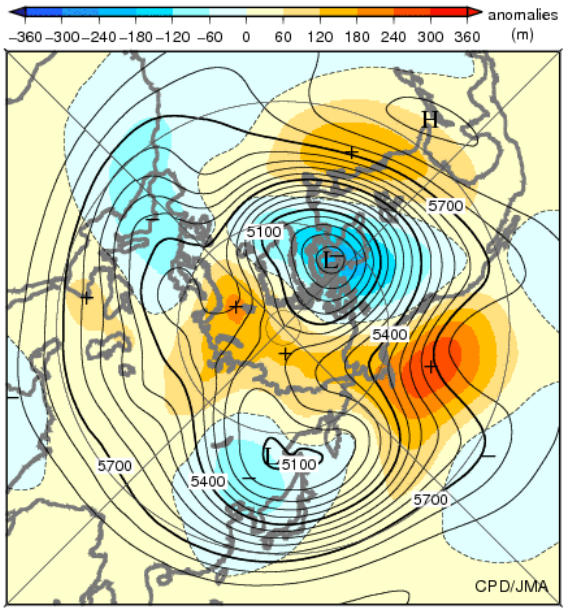

Fig. 9 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (February 2018)

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.

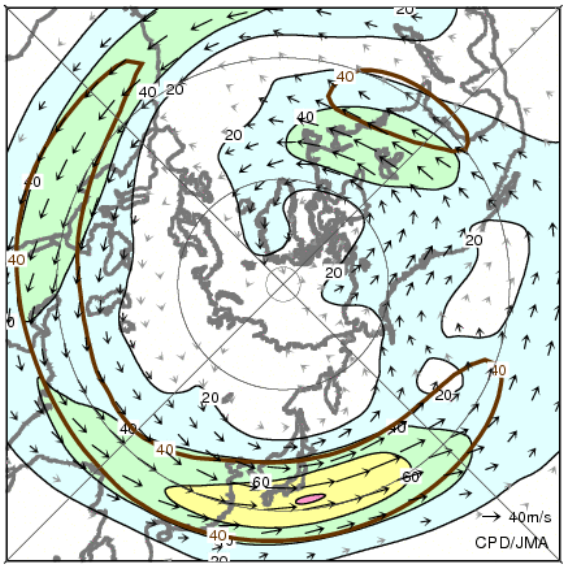

Fig. 10 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (February 2018)

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.

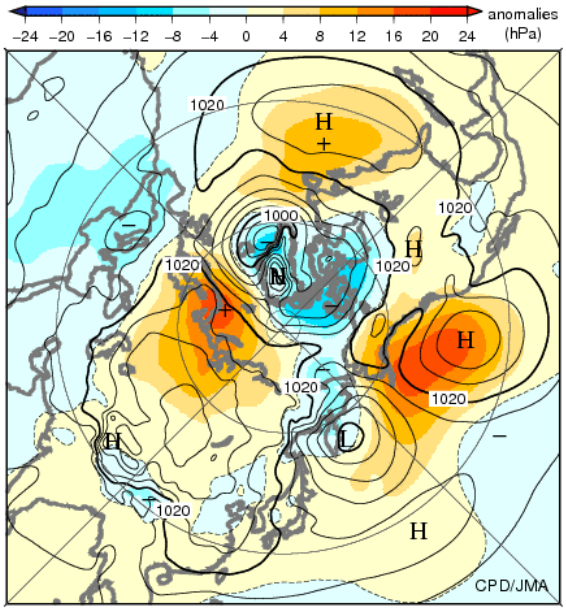

Fig. 11 Monthly mean sea level pressure and anomaly in the Northern Hemisphere (February 2018)

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.

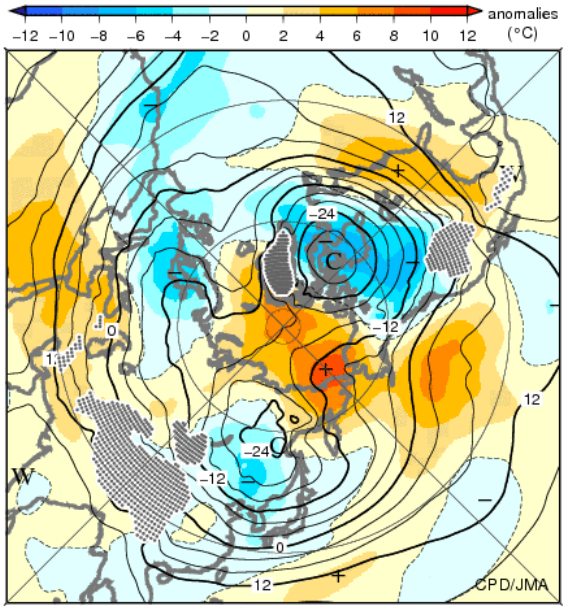

Fig. 12 Monthly mean 850-hPa temperature and anomaly in the Northern Hemisphere (February 2018)

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.
http://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.