Monthly Highlights on the Climate System (March 2014)

Highlights in March 2014
- Monthly precipitation amounts were above normal all over Japan except Okinawa/Amami.
- Monthly mean temperatures were extremely low from southeastern Canada to the eastern USA.
- The polar vortex shifted toward Canada compared to its normal position.
- Convective activity was enhanced around the dateline region, and was suppressed around Indonesia.
- Positive SST anomalies were observed in the equatorial western Pacific.

Climate in Japan:

Temperatures were below normal all over Japan in the first half of March due to cold air outbreaks and above normal in the end of the month in northern, eastern and western parts of the country. Since developing cyclones occasionally passed near Japan, monthly precipitation amounts were above normal all over Japan except Okinawa/Amami, and that of the Sea of Japan side of eastern Japan was the highest on record for March since 1946.

World Climate:

The monthly anomaly of the global average surface temperature in March 2014 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.21°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 0.82°C per century in March (preliminary value).

Extreme climate events were as follows (Fig. 3).
- Monthly mean temperatures were extremely high around eastern China.
- Monthly mean temperatures were extremely high from eastern to northwestern Europe.
- Monthly mean temperatures were extremely low from southeastern Canada to the eastern USA.

Extratropics:

In the 500-hPa height field (Fig. 4), the polar vortex shifted toward Canada compared to its normal position. Ridges were observed around Alaska, Europe and Mongolia, and a distinct trough was observed over eastern Canada. The subtropical jet stream shifted southward of its normal position from southern Eurasia to the vicinity of Japan (Fig. 5). The polar-front jet stream was clearly seen over northern Eurasia. The Aleutian Low was stronger than normal. The Siberian High was enhanced and extended to Japan in comparison with the normal conditions in the first half of March. Migratory cyclones were more frequent and intense than normal around Japan.

Tropics:

Convective activity was enhanced around the dateline region and over the area from central Africa to the central Indian Ocean, and was suppressed around Indonesia (Fig. 6). The active phase of the Madden-Julian Oscillation propagated eastward from Africa to the Indian Ocean in early March and across the Pacific in the mid-March (Fig. 7). In the equatorial lower troposphere, easterly and westerly wind anomalies were seen over the Indian Ocean and the western Pacific, respectively (Fig. 7). In the upper troposphere, cyclonic circulation anomalies were seen over southern Asia (Fig. 8). The Southern Oscillation Index value was -0.9 (Fig. 10).

Oceanographic Conditions:

In the equatorial Pacific, positive SST anomalies were observed in the western part. The monthly mean SST anomaly in the NINO.3 region and the SST deviation from the latest sliding 30-year mean were both -0.1˚C.

In the North Pacific, remarkably positive SST anomalies were observed from south of Alaska to near the coast of Mexico and from the central to the western parts of tropical area. In the South Pacific, remarkably positive SST anomalies were observed in the zonal area around 45˚S and remarkably negative SST anomalies were observed from around 30˚S along the coast of Chile to around 15˚S, 125˚W.

In the Indian Ocean, remarkably positive SST anomalies were observed from near the northwestern coast of Australia to the central part of tropical area in the Southern Hemisphere and from near Madagascar to around 35˚S, 80˚E. Remarkably negative SST anomalies were observed in some parts of the Arabian Sea and the Bay of Bengal.

In the North Atlantic, remarkably positive SST anomalies were observed from the Caribbean Sea to around 35˚S, 35˚W and remarkably negative SST anomalies were observed near the western coast of North Africa and around 50˚N, 30˚W. These SST anomalies showed a tripole pattern.

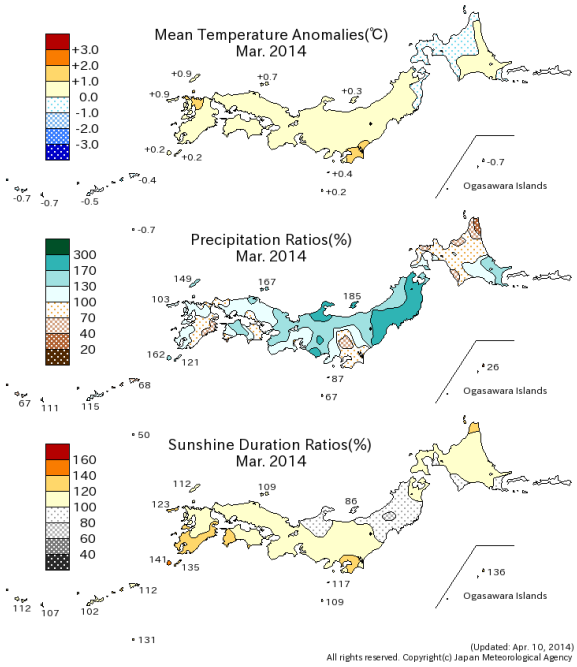

Fig. 1 Monthly climate anomaly / ratio over Japan (March 2014)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
Anomalies are defined as the deviations from the normal (1981-2010 average).

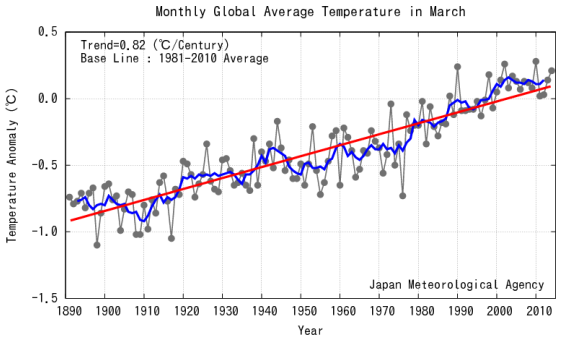

Fig. 2 Long-term change in monthly anomalies of global average surface temperature in March
The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations from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

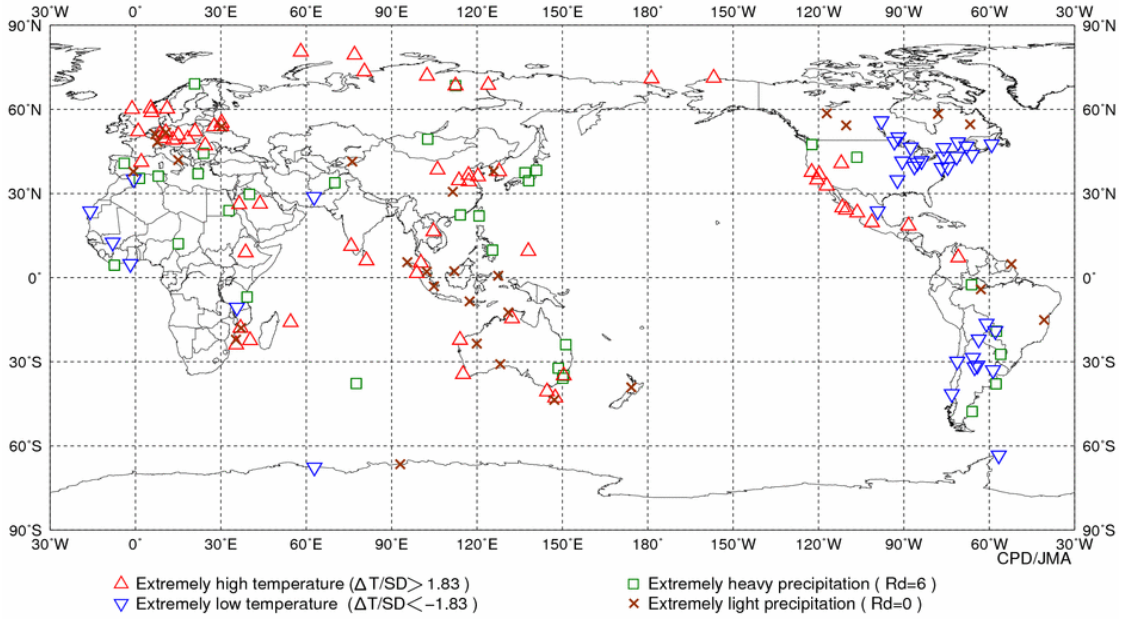

Fig. 3 Distribution of extreme climate events (March 2014)

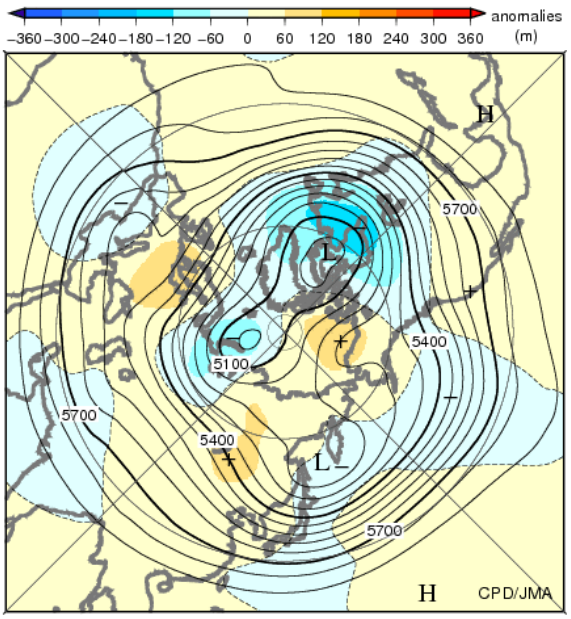

Fig. 4 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (March 2014)

The contours show heights at intervals of 60 m. The shading indicates height anomalies. The base period for the normal is 1981-2010.

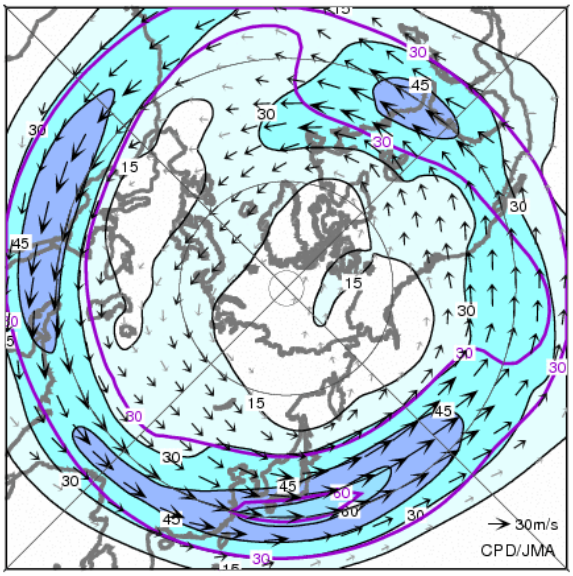

Fig. 5 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (March 2014)

The black lines show wind speeds at intervals of 15 m/s. The dark blue shading shows values greater than 30 m/s. The purple lines show normal wind speeds at intervals of 30 m/s. The base period for the normal is 1981-2010.

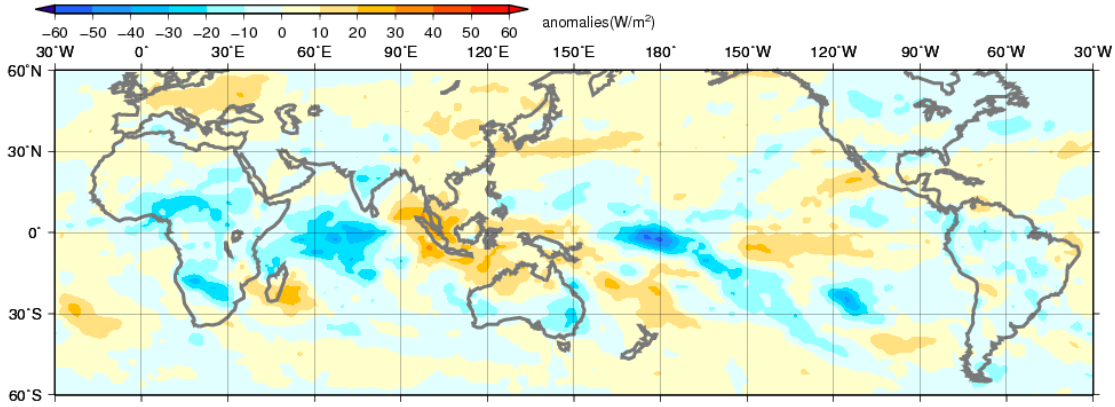

Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (March 2014)

The contour interval is 10 W/m^2. The base period for the normal is 1981-2010. Original data provided by NOAA.

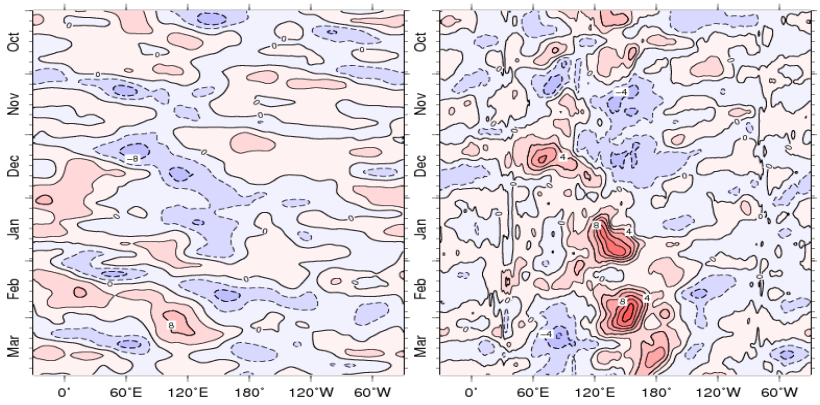

Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (October 2013 - March 2014)

The contour intervals are 4x10^6 m^2/s (left) and 2 m/s (right). The base period for the normal is 1981-2010.

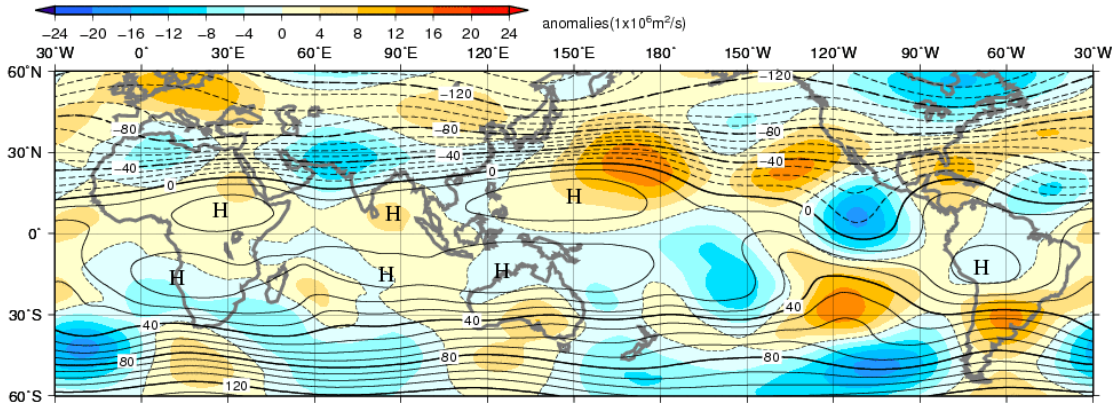

Fig. 8 Monthly mean 200-hPa stream function and anomaly (March 2014)

The contour interval is 10×10^6 m^2/s. The base period for the normal is 1981-2010.

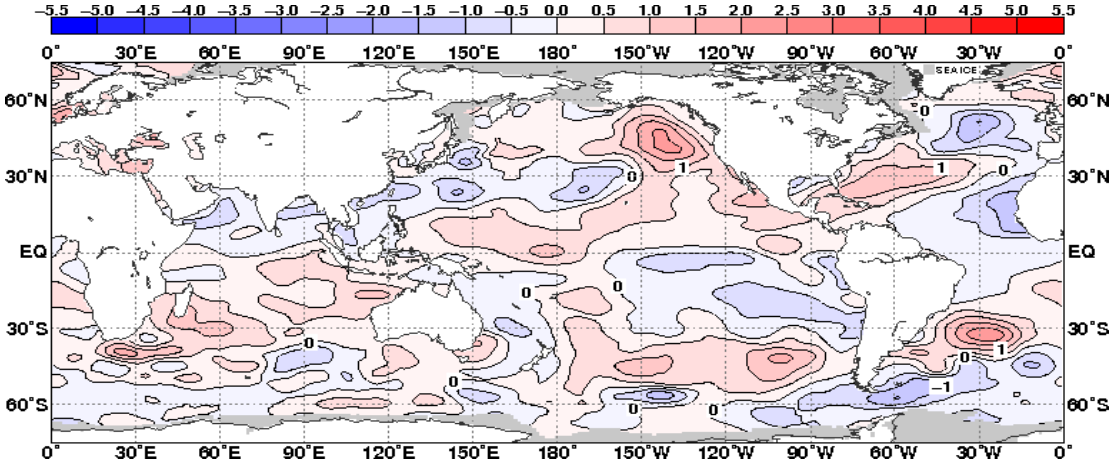

Fig. 9 Monthly mean sea surface temperature anomaly (March 2014)

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.

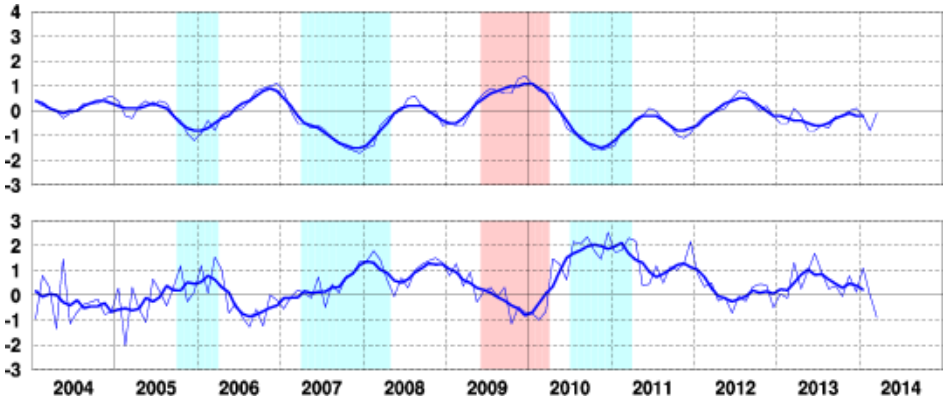

Fig. 10 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).

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.

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 Climate Prediction Division, Global Environment and Marine Department, Japan Meteorological Agency.