Monthly Highlights on the Climate System (January 2017)

Highlights in January 2017
- The monthly anomaly of the global average surface temperature was the second highest since 1891.
- ENSO neutral conditions are present (see *El Niño Outlook* updated on 10 February 2017).
- Convective activity was enhanced over Southeast Asia.
- Temperatures at 850-hPa were above normal from Central Siberia to East Asia.
- Monthly mean temperatures were significantly above normal in Okinawa/Amami.

Climate in Japan:

At the beginning and the end of the month, the winter monsoon was weaker than normal and there were some exceptionally warm days. However, in the middle of the month, the monsoon became stronger than normal and cold air from Siberia covered all over Japan. It snowed heavily on the Sea of Japan side and there were places which had heavy snow even on the Pacific side such as Hiroshima. In Okinawa/Amami, monthly mean temperatures were significantly above normal and the area average temperature for the first 10 days of the month was the highest on record. Monthly sunshine durations were significantly above normal in western Japan, because the winter monsoon was weaker than normal on average and low pressure systems were inactive for the month.

World Climate:

The monthly anomaly of the global average surface temperature in January 2017 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.39 °C (the second warmest since 1891) (preliminary value) (Fig. 2). On a longer time scale, global average surface temperatures have risen at a rate of about 0.76 °C per century in January (preliminary value).

Extreme climate events were as follows (Fig. 3).

- Monthly mean temperatures were extremely high from the southwestern part of Japan to southern China.
- Monthly precipitation amounts were extremely high from the southern Indochina Peninsula to the northern Sumatra Island.
- Monthly mean temperatures were extremely low in southeastern Europe.

Extratropics:

In the 500-hPa height field (Fig.4), positive anomalies were seen to the south of Alaska, eastern Canada and northern Europe. Positive anomalies were also seen over southeastern China and negative anomalies were seen to the east of Japan, in relation to wave trains dominant from the Mediterranean Sea through the southern part of Asia to the North Pacific. The westerly jet stream was displaced northward from its normal position from eastern China to Japan and southward to the east of Japan in association with the height anomalies (Fig.5). Temperatures at 850-hPa were above normal from Central Siberia to East Asia. The zonal mean sub-tropical jet stream was stronger than normal in the Northern Hemisphere. The tropospheric zonal mean temperatures were generally above normal.

Tropics:

Convective activity was enhanced over Southeast Asia. It was suppressed over the western to central Indian Ocean and the central to eastern part of the equatorial Pacific (Fig. 6). The active phase of the Madden-Julian Oscillation (MJO) propagated eastward from the Atlantic Ocean to the Maritime Continent in the second half of the month (Fig. 7). In the lower troposphere, cyclonic circulation anomalies straddling the equator were seen over the area from the eastern Indian Ocean to the Maritime Continent. In the upper troposphere, wave trains were dominant along the sub-tropical jet stream in the Northern Hemisphere, with anti-cyclonic circulation anomalies over southeastern China in particular (Fig. 8). These anti-cyclonic circulation anomalies were also associated with active convection over Southeast Asia. The Southern Oscillation Index value was +0.2 (Fig. 10).

Oceanographic Conditions:

In the equatorial Pacific, remarkably positive SST anomalies were observed in the western part, and negative SST anomalies were observed in the central part. The monthly mean SST anomaly and the SST deviation from the latest sliding 30-year mean in the NINO.3 region were both 0.0˚C. In the North Pacific, remarkably positive SST anomalies were observed from the South China Sea to near 35˚N, 155˚E, from near the Aleutian Islands to the western coast of Canada, from near 35˚N, 160˚E to near 35˚N, 130˚W and from the western coast of Central America to near 10˚N, 130˚W, and remarkably negative SST anomalies were observed along 45˚N. In the South Pacific, remarkably positive SST anomalies were observed from the eastern coast of Australia to the western coast of Peru and near 40˚S, 75˚W, and remarkably negative SST anomalies were observed from near 25˚S, 125˚W to near 40˚S, 110˚W. In the Indian Ocean, remarkably positive SST anomalies were observed in the northern part of the Arabian Sea and from around Madagascar to near 30˚S, 95˚E, and remarkably negative SST anomalies were observed from the southwestern coast of Australia to near 15˚S, 55˚E. In the North Atlantic, remarkably positive SST anomalies were widely observed mainly in the western part except from near 60˚N, 40˚W to near 60˚N, 20˚W where remarkably negative SST anomalies were observed.

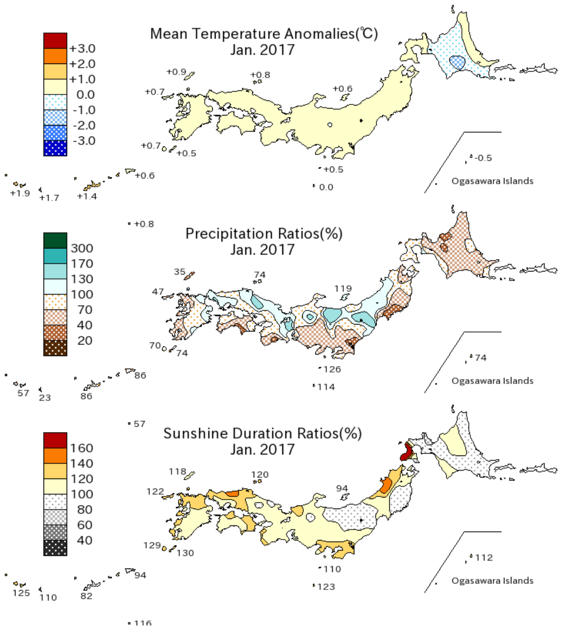

Fig. 1 Monthly climate anomaly / ratio over Japan (January 2017)

Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
Anomalies are defined as the deviations from the normal (1981-2010 average).

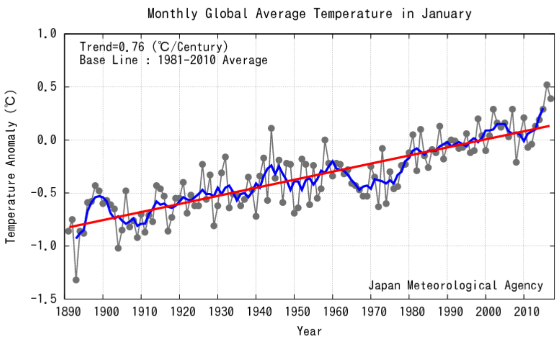

Fig. 2 Long-term change in monthly anomalies of global average surface temperature in January

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.

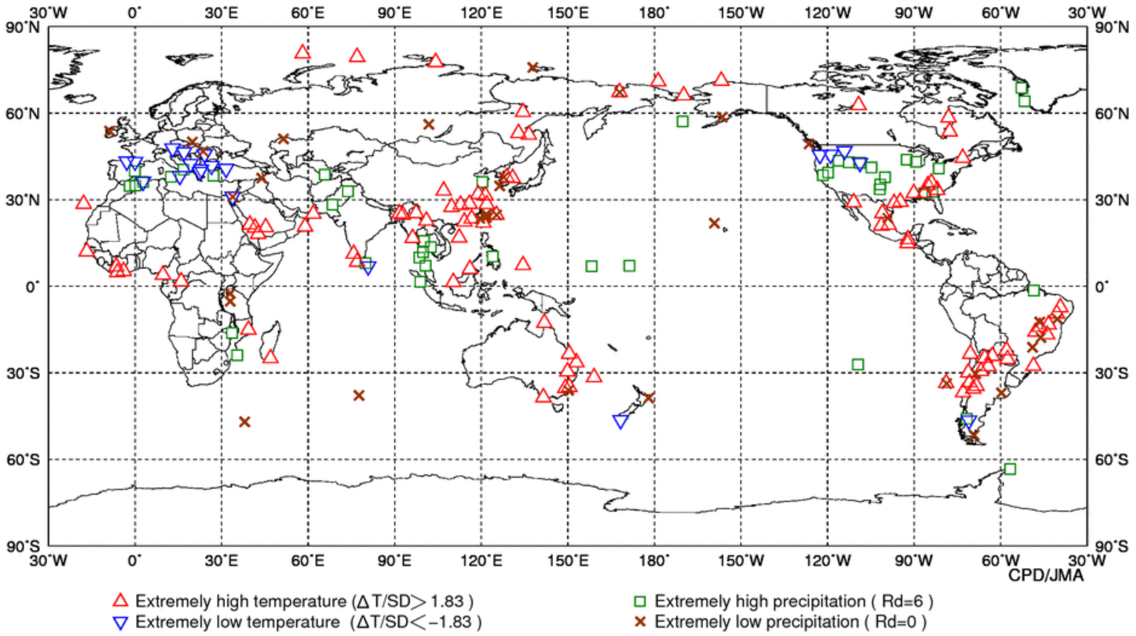

Fig. 3 Distribution of extreme climate events (January 2017)

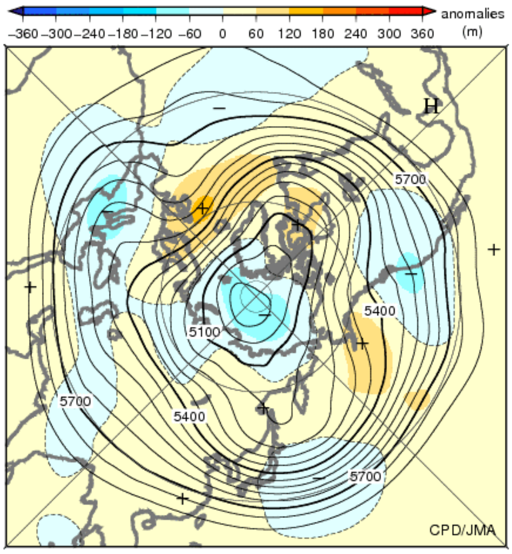

Fig. 4 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (January 2017)

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

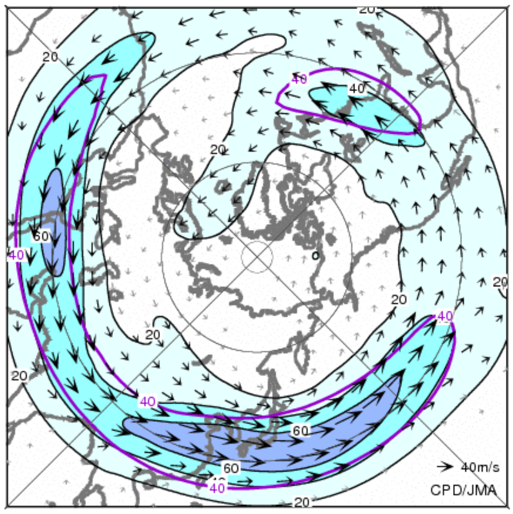

Fig. 5 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (January 2017)

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

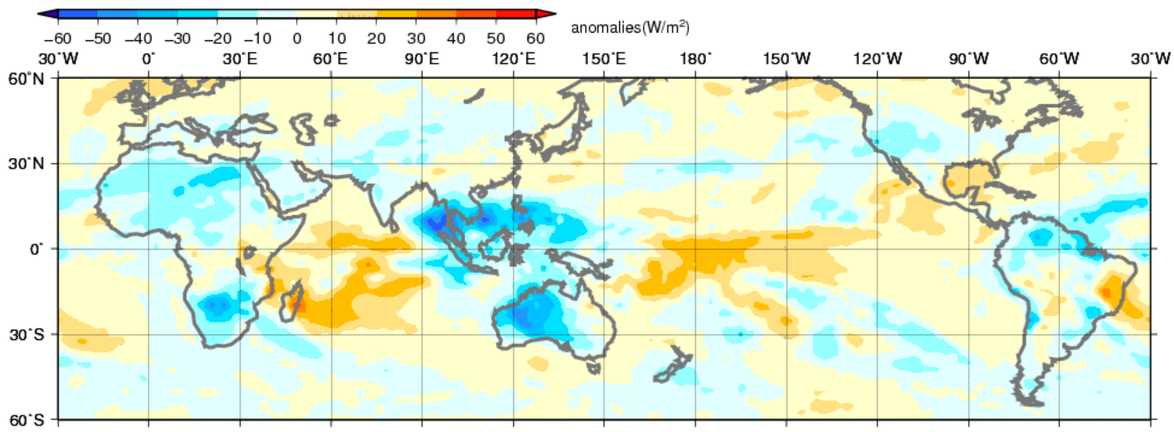

Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (January 2017)

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

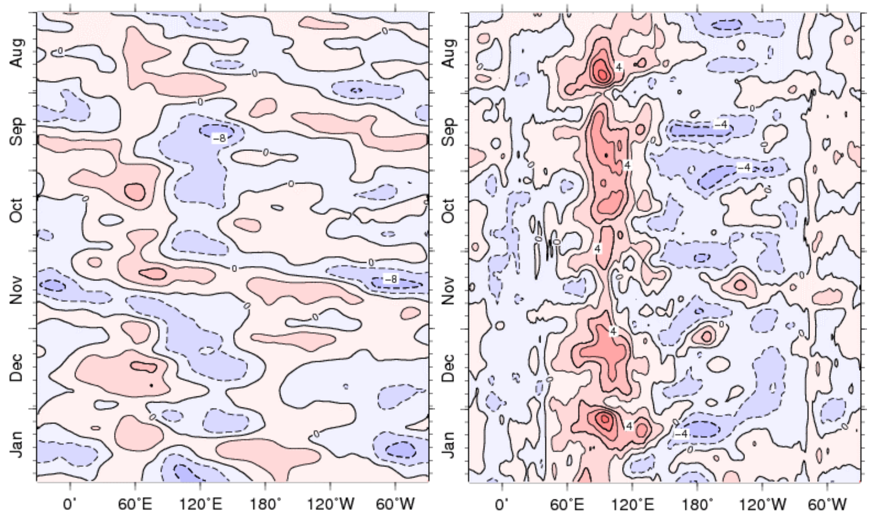

Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (August 2016 – January 2017)

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

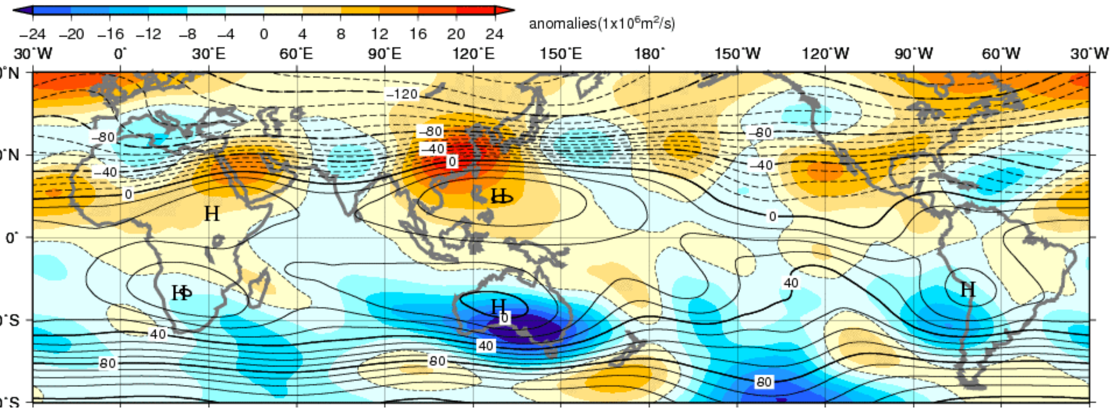

Fig. 8 Monthly mean 200-hPa stream function and anomaly (January 2017)
The contour interval is 10x10^6 m^2/s. The base period for the normal is 1981-2010.

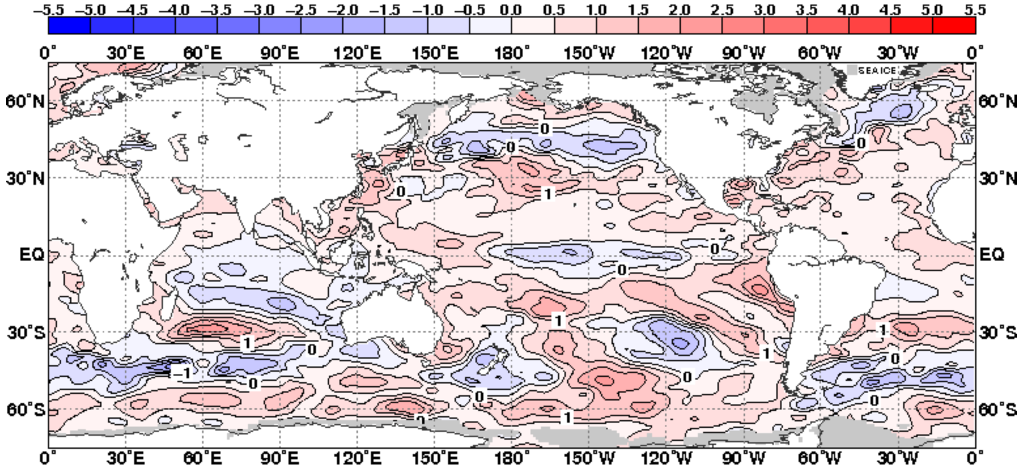

Fig. 9 Monthly mean sea surface temperature anomaly (January 2017)
The contour interval is 0.5 degree C. The base period for the normal is 1981-2010. Maximum coverage with sea ice is shaded in gray.

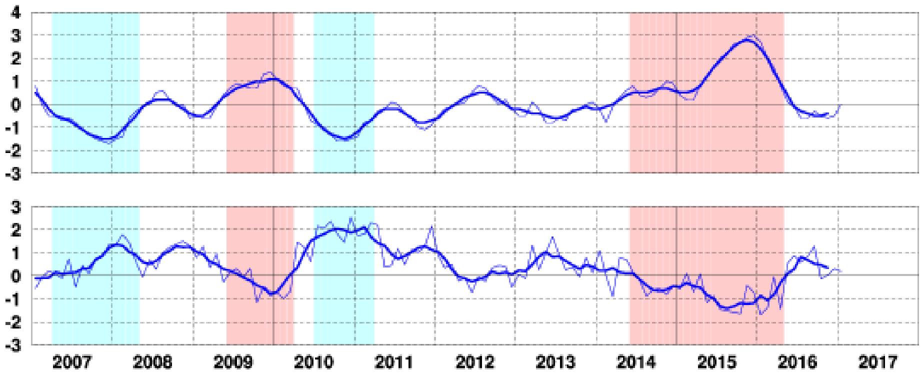

Fig. 10 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).
Thin blue lines represent monthly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