Monthly Highlights on the Climate System (October 2015)

Highlights in October 2015

-The monthly anomaly of the global average surface temperature was the warmest since 1891.
- El Niño conditions continue in the equatorial Pacific (see *El Niño Outlook* updated on 10 November 2015).
-The characteristics of the convective activity and circulation in tropics were similar to those observed in the past El Niño events.
- The jet stream largely shifted southward of its normal position from southern Eurasia to the seas east of Japan.
- Monthly mean temperatures were extremely high in various places in the low latitudes.
- Monthly sunshine durations were significantly above normal in eastern and western Japan and the Pacific side of northern Japan, due to frequent pass of migratory high pressure systems.

Climate in Japan:

Monthly temperatures were below normal in northern Japan, since cyclones frequently developed in the seas around the Kuril Islands and caused cold air advection into northern Japan. In other regions, monthly temperatures were near normal with a cold spell in the first half and a warm spell in the second half. Meanwhile, monthly sunshine durations were significantly above normal in eastern and western Japan and the Pacific side of northern Japan, due to frequent pass of migratory high pressure systems. In particular, monthly sunshine durations were the highest on record for October since 1946 in western Japan. Additionally, monthly precipitation amounts were significantly below normal in eastern Japan and the Pacific side of western Japan.

World Climate:

The monthly anomaly of the global average surface temperature in October 2015 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.53°C (the warmest since 1891) (preliminary value) (Fig. 2). On a longer time scale, global average surface temperatures have risen at a rate of about 0.64°C per century in October (preliminary value).

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

- Monthly mean temperatures were extremely high in various places in the low latitudes.
- Monthly precipitation amounts were extremely light in and around northern Europe.
- Monthly mean temperatures were extremely low in and around Argentina.

Extratropics:

In the 500-hPa height field (Fig.4), positive anomalies were observed over the area from Alaska to western Canada and northern Europe, and negative anomalies were observed to the south of Alaska, over northern Canada, western Siberia and Japan. The jet stream largely shifted southward of its normal position from southern Eurasia to the seas east of Japan (Fig. 5). Zonal mean temperatures in the troposphere were above normal in all latitudes except near 60˚S.

Tropics:

Convective activity was enhanced over the seas west of the equatorial dateline to the latitude band of 5˚N in the central to eastern Pacific, and was suppressed over the eastern Indian Ocean to the Maritime Continent (Fig. 6). The active phase of the Madden-Julian Oscillation (MJO) was seen over the western Indian Ocean in late October (Fig. 7). In the lower troposphere, cyclonic and anticyclonic circulation anomalies straddling the equator were seen over the Pacific and over the Indian Ocean, respectively (Fig. 7). In the upper troposphere, anticyclonic circulation anomalies straddling the equator were seen over the Pacific (Fig. 8). The Southern Oscillation Index value was -1.6 (Fig. 10).

Oceanographic Conditions:

Remarkably positive SST anomalies were observed from near the date line to the eastern part of the equatorial Pacific, and remarkably negative SST anomalies were observed near Indonesia. The monthly mean SST anomaly in the NINO.3 region was +2.6˚C and the SST deviation from the latest sliding 30-year mean was +2.7˚C.

In the North Pacific, remarkably positive SST anomalies were observed from east of Kamchatka to south of Alaska and from the western coast of North America to central and eastern parts of the tropical region, and remarkably negative SST anomalies were observed near 160˚E in the tropical region and east of Japan. In the South Pacific, remarkably positive SST anomalies were observed near the western coast of South America, and remarkably negative SST anomalies were observed from near the northeastern coast of Australia to near 25˚S, 125˚W.

In the Indian Ocean, remarkably positive SST anomalies were observed in almost the entire region except near the coast of Indonesia.

In the North Atlantic, remarkably positive SST anomalies were observed near the eastern coast of North America and from the Gulf of Mexico to the western coast of North Africa, and remarkably negative SST anomalies were observed south of Greenland.

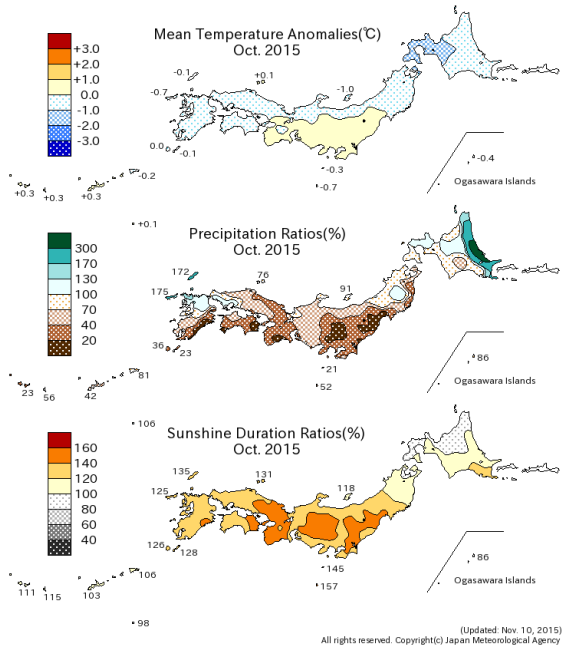

Fig. 1 Monthly climate anomaly / ratio over Japan (October 2015)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
Anomalies are defined as the deviations from the normal (1981-2010 average).

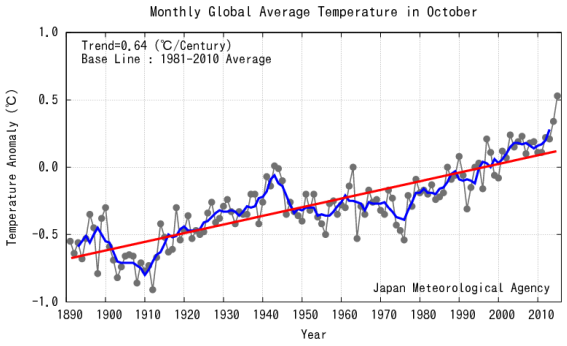

Fig. 2 Long-term change in monthly anomalies of global average surface temperature in October
The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations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

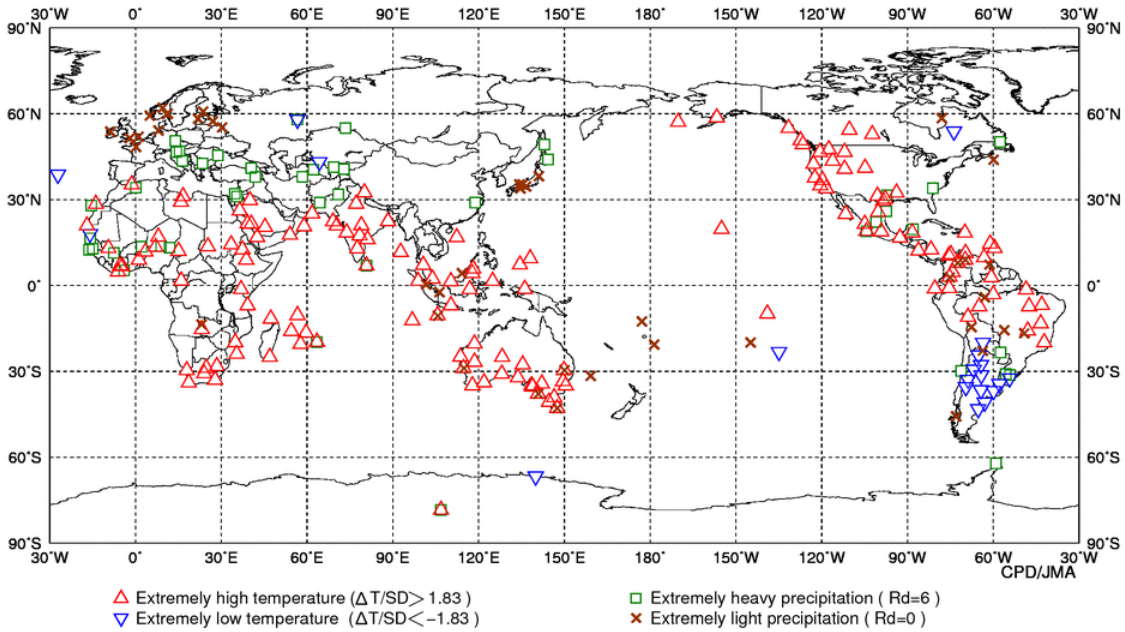

Fig. 3 Distribution of extreme climate events (October 2015)

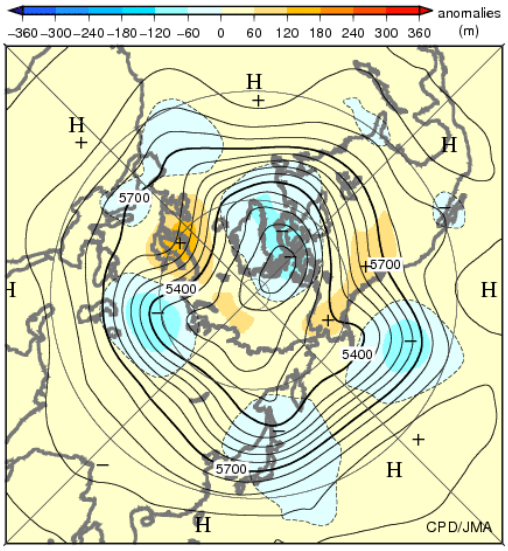

Fig. 4 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (October 2015)
The contours show heights at intervals of 60 m. The shading indicates height anomalies. The base period for the normal is 1981-2010.

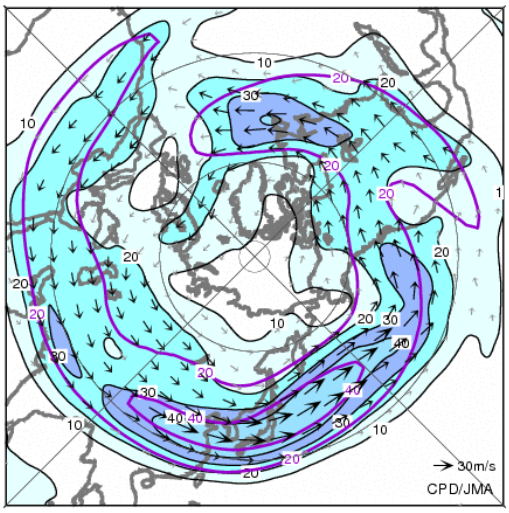

Fig. 5 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (October 2015)
The black lines show wind speeds at intervals of 10 m/s. The purple lines show normal wind speeds at intervals of 20 m/s. The base period for the normal is 1981-2010.

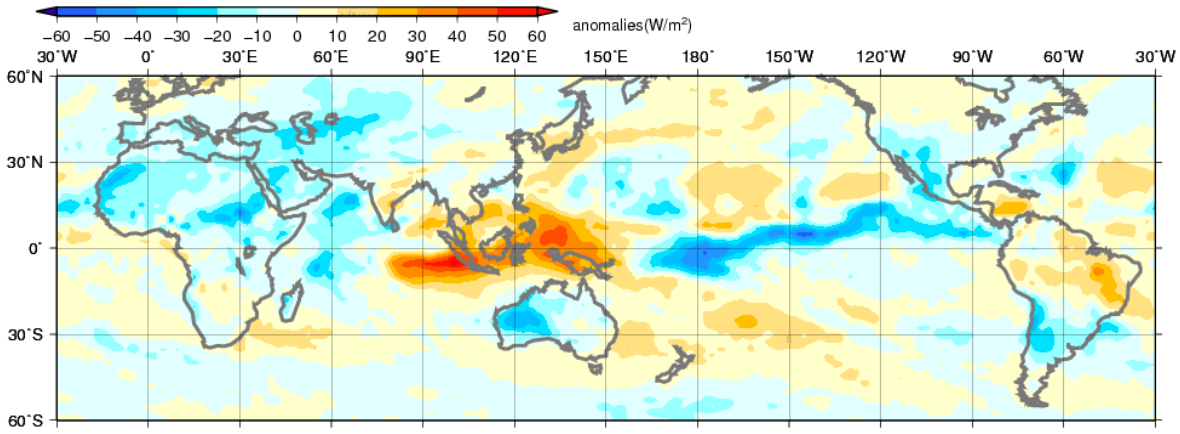

Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (October 2015)
The contour interval is 10 W/m^2. The base period for the normal is 1981-2010. Original data provided by NOAA.

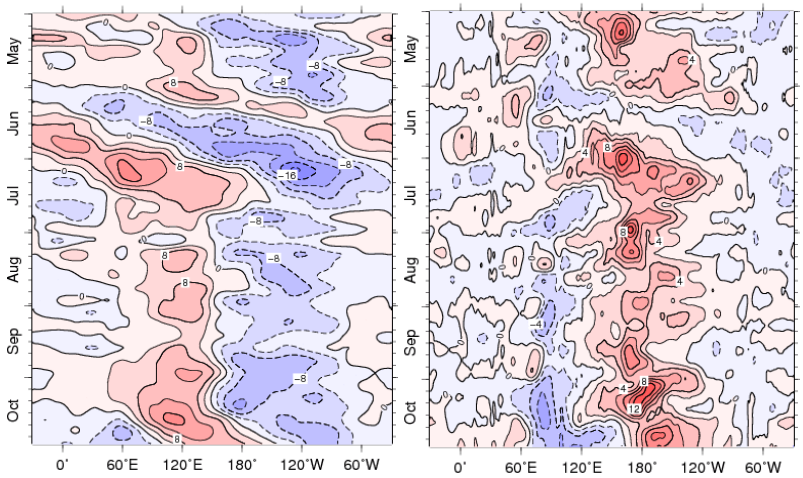

Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (May 2015 - October 2015)
The contour intervals are 4x10^6 m^2/s (left) and 2 m/s (right). The base period for the normal is 1981-2010.

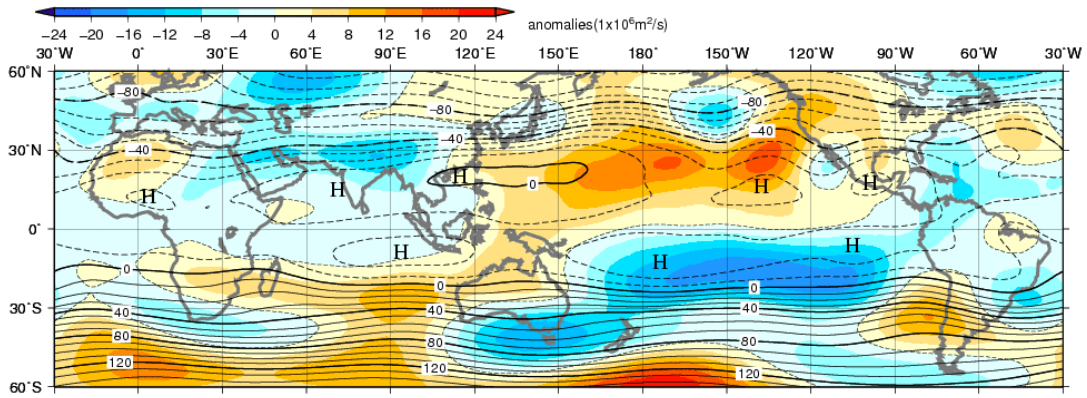

Fig. 8 Monthly mean 200-hPa stream function and anomaly (October 2015)

The contour interval is $10x10^6$ m^2/s. The base period for the normal is 1981-2010.

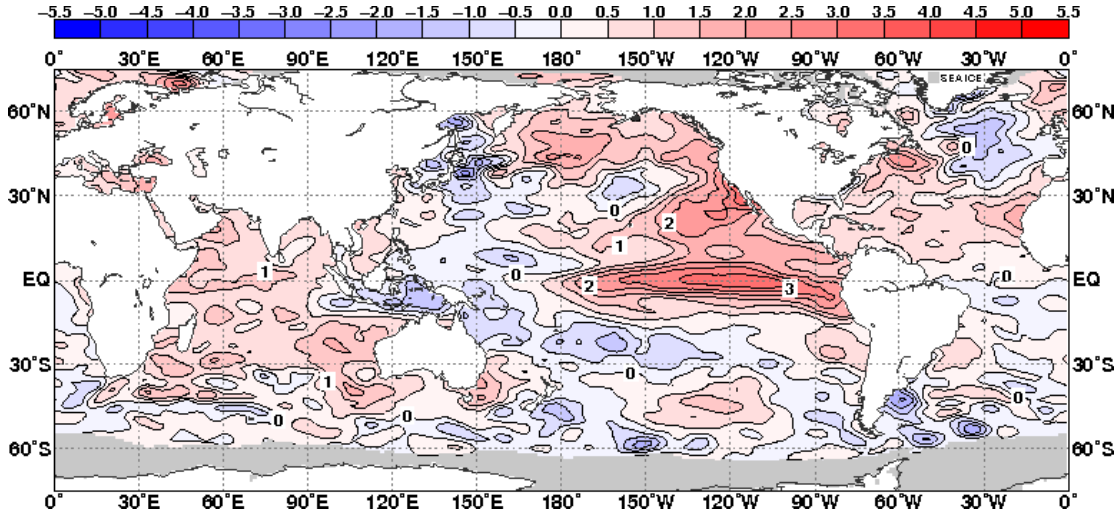

Fig. 9 Monthly mean sea surface temperature anomaly (October 2015)

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.

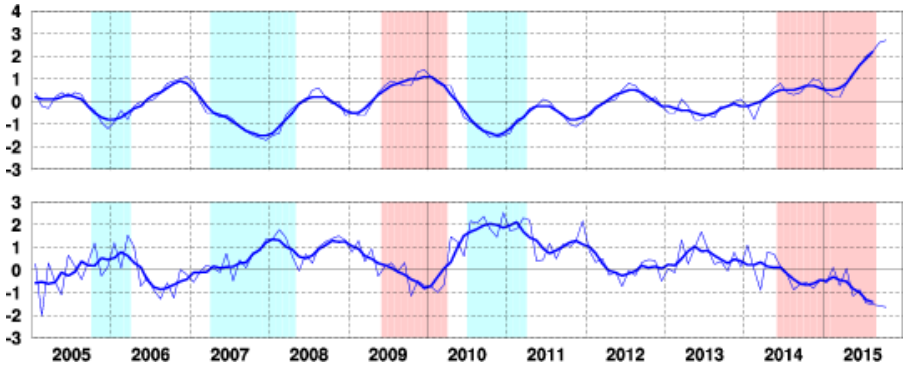

Fig. 10 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).

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.