Monthly Highlights on the Climate System (September 2015)

Highlights in September 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 9 October 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.
- A record-breaking heavy precipitation event hit parts of Kanto and Tohoku, resulting in significantly above normal monthly precipitation amount in the Pacific side of eastern Japan.

Climate in Japan:

Days with low temperature continued along with many cloudy or rainy days in the main island of Japan in early September, since low pressures frequently passed through around Japan. After that, high and low pressures alternately passed through around Japan. Cold high pressures often covered western Japan in mid-September and temperature there was significantly below normal. High pressures covered Okinawa through the month and brought many sunny days.

World Climate:

The monthly anomaly of the global average surface temperature in September 2015 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.50 °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 0.63°C per century in September (preliminary value).

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

- Monthly mean temperatures were extremely high in various places in the low latitudes.
- Monthly mean temperatures were extremely high in western Russia to southeastern Europe and wide areas of the USA.
- Monthly mean temperatures were extremely high and monthly precipitation amounts were extremely light around the eastern Caribbean Sea and in the northern part of South America.

Extratropics:

In the 500-hPa height field (Fig.4), wave trains were seen over the area from Europe to Central Asia and from the Pacific to North America. Positive anomalies were observed over eastern Canada, Western Russia and the Bering Sea, and negative anomalies were observed over western Canada, western Europe, western China, in and around 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 generally above normal except over the Arctic region and the area south of 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 Maritime Continent (Fig. 6). The active phase of the Madden-Julian Oscillation (MJO) remained obscure throughout the month (Fig. 7). In the lower troposphere, cyclonic circulation anomalies straddling the equator were seen and westerly wind anomalies were dominant from the western to central equatorial Pacific (Fig. 7). The monsoon circulation over the Indian Ocean was weaker than normal. In the upper troposphere, anticyclonic circulation anomalies straddling the equator were seen from the western to central 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. The monthly mean SST anomaly and the SST deviation from the latest sliding 30-year mean in the NINO.3 region were both +2.6 ˚C. In the North Pacific, remarkably positive SST anomalies were observed in almost the entire region except from east of Japan to far east of Japan where remarkably negative SST anomalies were observed. 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 15˚S, 175˚W to near 25˚S, 130˚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 coast of North America and from the Gulf of Mexico to the western coast of North Africa, and remarkably negative SST anomalies were observed from south of Greenland to west of the UK.

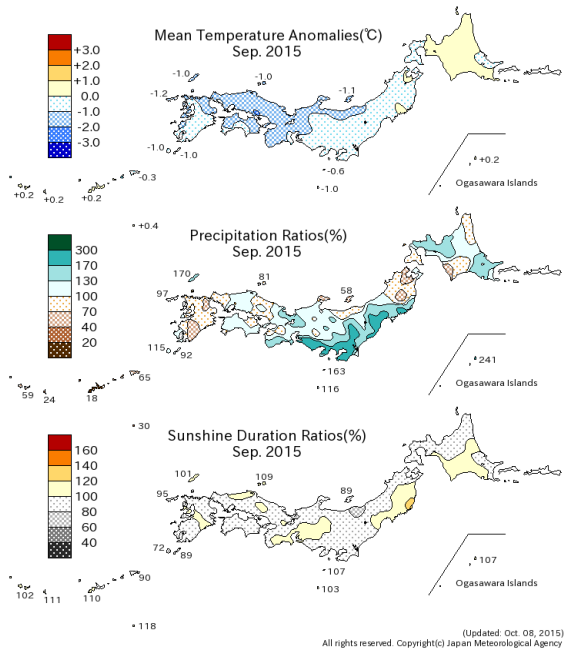

Fig. 1 Monthly climate anomaly / ratio over Japan (September 2015)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
Anomalies are defined as the deviations from the normal (1981-2010 average).

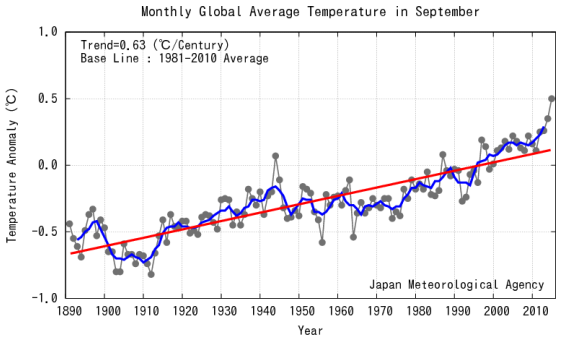

Fig. 2 Long-term change in monthly anomalies of global average surface temperature in September
The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations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

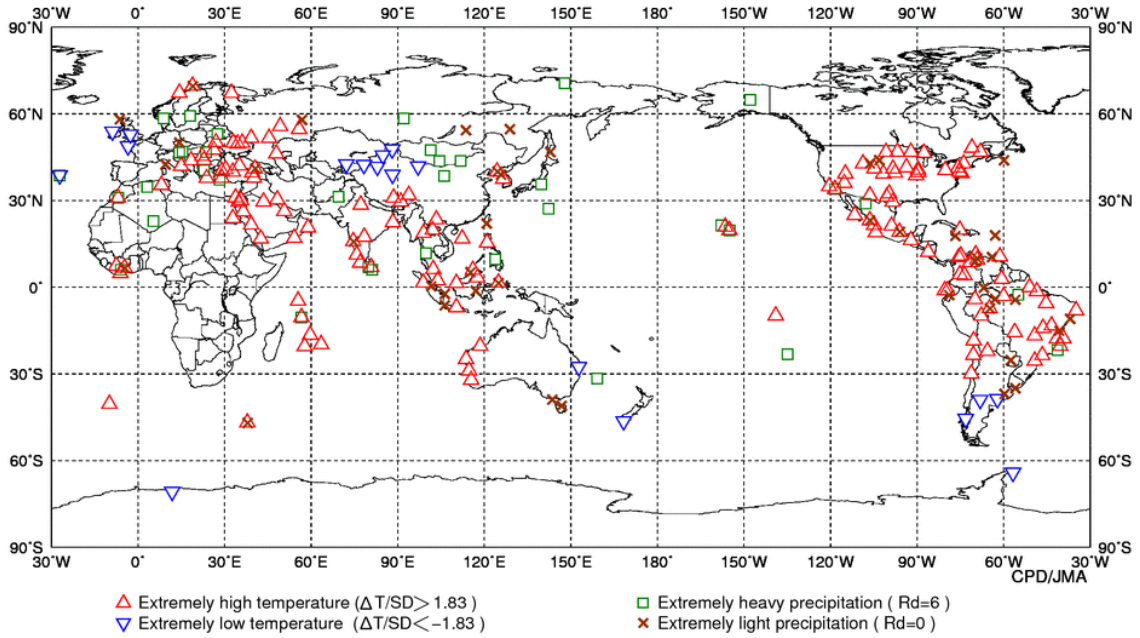

Fig. 3 Distribution of extreme climate events (September 2015)

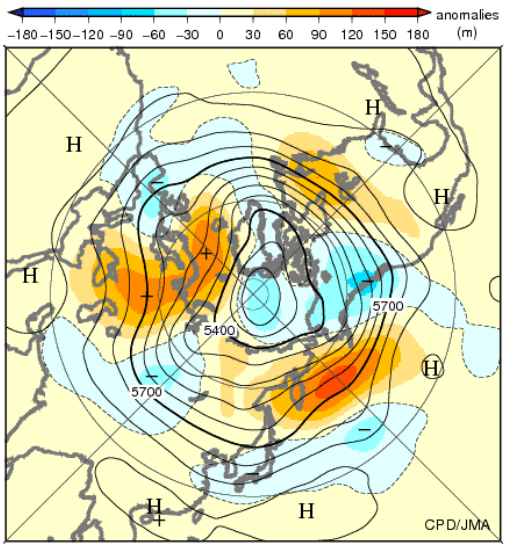

Fig. 4 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (September 2015)
The contours show heights at intervals of 60 m. The shading indicates height anomalies. The base period for the normal is 1981-2010.

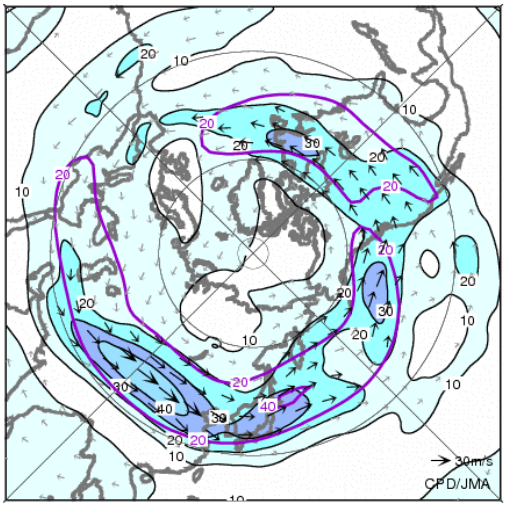

Fig. 5 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (September 2015)
The black lines show wind speeds at intervals of 10 m/s. The purple lines show normal wind speeds at intervals of 20 m/s. The base period for the normal is 1981-2010.

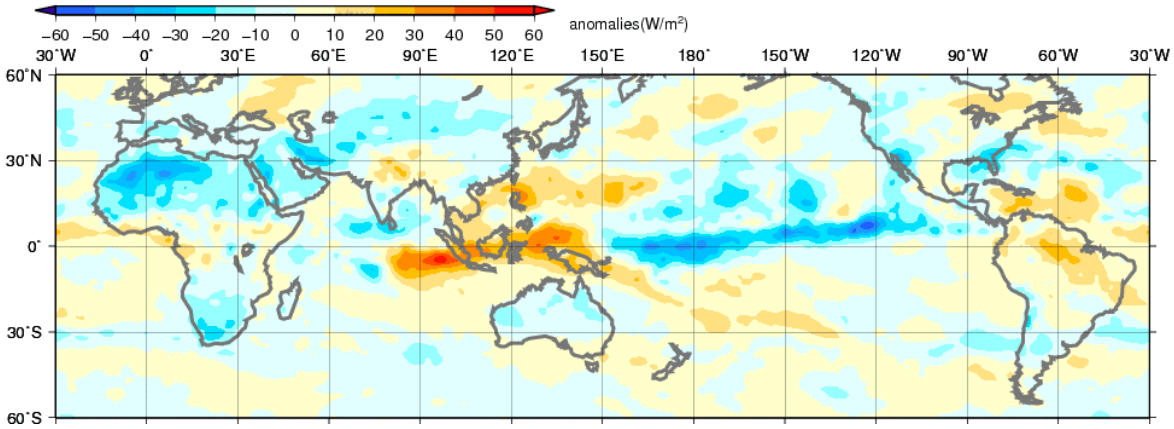

Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (September 2015)
The contour interval is 10 W/m^2. The base period for the normal is 1981-2010. Original data provided by NOAA.

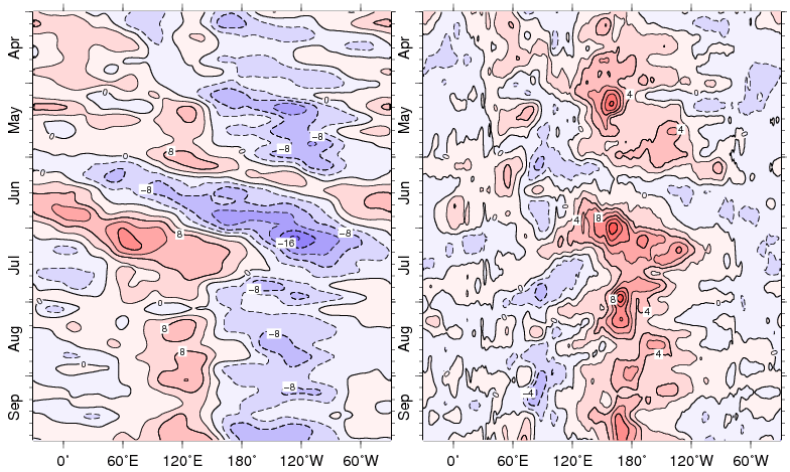

Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (April 2015 - September 2015)
The contour intervals are 4x10^6 m^2/s (left) and 2 m/s (right). The base period for the normal is 1981-2010.

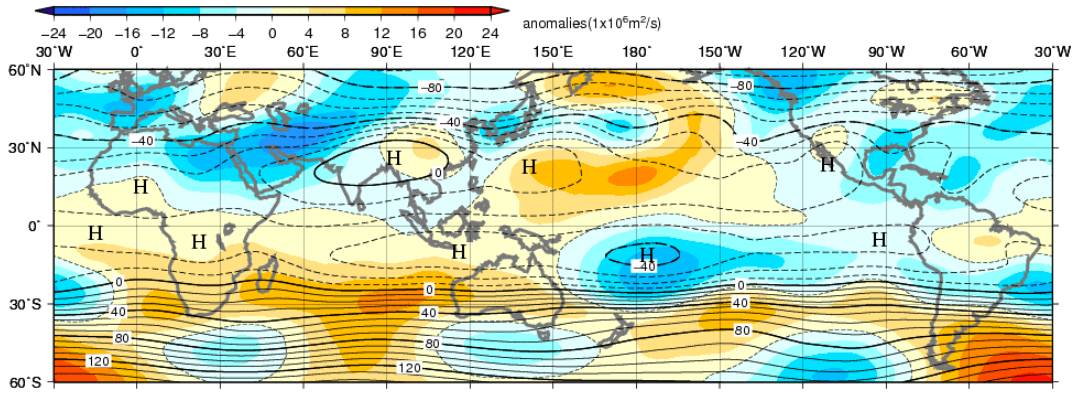

Fig. 8 Monthly mean 200-hPa stream function and anomaly (September 2015)

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

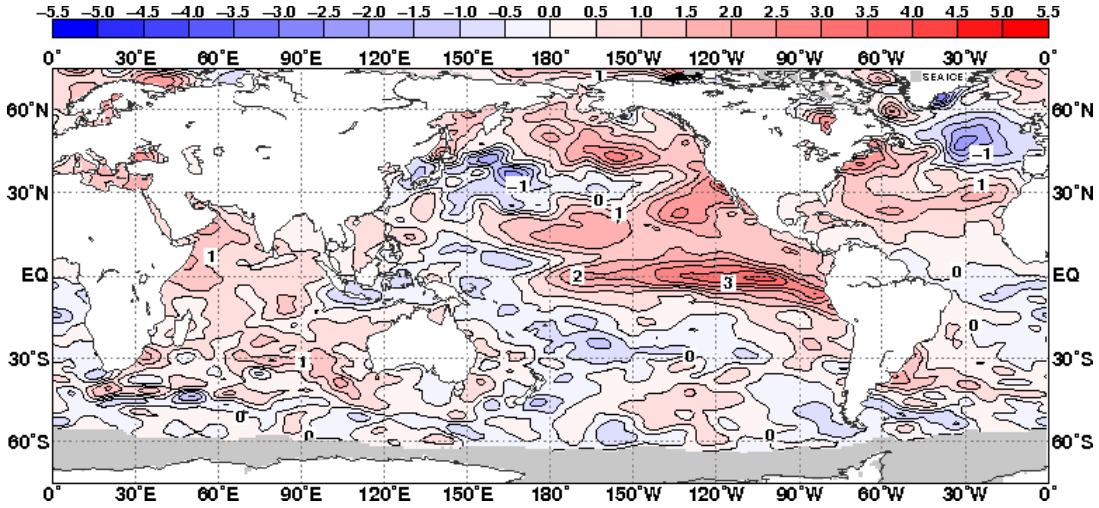

Fig. 9 Monthly mean sea surface temperature anomaly (September 2015)

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.

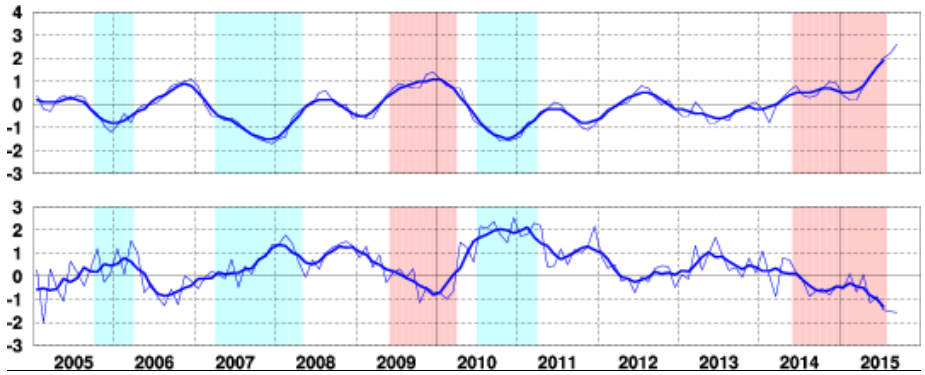

Fig. 10 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).

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.