

## Monthly Highlights on the Climate System (August 2014)

### Highlights in August 2014

- Monthly precipitation amounts were above normal all over Japan except Okinawa/Amami.
- Monthly mean temperatures were extremely high in western Alaska to Eastern Siberia, the western coast of the USA and Mexico.
- The subtropical jet stream flowed southward of its normal position over the area from Central Asia to Japan and North America.
- Convective activity was suppressed over the area from the South China Sea to the western part of the North Pacific.
- In the equatorial Pacific, remarkably positive SST anomalies were observed in the western part and positive SST anomalies were observed in the eastern part.

### Climate in Japan:

During the month, cloudy and rainy days were dominant all over Japan except Okinawa/Amami due to the weaker-than-normal Pacific High around the main islands of Japan. In the Pacific side of western Japan, monthly precipitation amounts were the highest on record and monthly sunshine durations were the lowest on record for August since 1946, respectively.

### World Climate:

The monthly anomaly of the global average surface temperature in August 2014 (i.e., the combined average of the near-surface air temperature over land and the SST) was  $+0.32^{\circ}\text{C}$  (the warmest since 1891) (preliminary value) (Fig. 2). On a longer time scale, global average surface temperatures have risen at a rate of about  $0.64^{\circ}\text{C}$  per century in August (preliminary value).

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

- Monthly mean temperatures were extremely high from western Alaska to Eastern Siberia.
- Monthly mean temperatures were extremely high in the western coast of the USA and Mexico.
- Monthly precipitation amounts were extremely heavy from Western Japan to southern China.

### Extratropics:

In the 500-hPa height field (Fig. 4), positive anomalies were seen over western and eastern Siberia and eastern Canada, and negative anomalies were observed over western Europe and south of Alaska. The subtropical jet stream flowed southward of its normal position over the area from Central Asia to Japan and North America (Fig. 5). The polar-front jet stream was clearly seen over the Northern Hemisphere. Zonal mean temperatures were above normal in the Northern Hemisphere. While the Pacific High was enhanced to the southeast of Japan, its westward expansion was weak.

### Tropics:

Convective activity was enhanced over the

Inter-tropical Convergence Zone (ITCZ) of the central and eastern parts of the North Pacific, the Arabian Sea and the eastern Indian Ocean, and was suppressed over the area from the South China Sea to the western part of the North Pacific (Fig. 6). Convective activity was suppressed over the western equatorial Pacific in association with relatively slow eastward propagation of the Madden-Julian Oscillation (Fig. 7). In the lower troposphere, anticyclonic circulation anomalies were seen over the area from the South China Sea to east of the Philippines. In the upper troposphere, the Tibetan High was weaker than normal (Fig. 8). The Southern Oscillation Index value was  $-0.9$  (Fig. 10).

### Oceanographic Conditions:

In the equatorial Pacific, remarkably positive SST anomalies were observed in the western part and positive SST anomalies were observed in the eastern part. The monthly mean SST anomaly in the NINO.3 region was  $+0.2^{\circ}\text{C}$  and the SST deviation from the latest sliding 30-year mean was  $+0.3^{\circ}\text{C}$ . In the North Pacific, remarkably negative SST anomalies were observed near  $35^{\circ}\text{N}$ ,  $175^{\circ}\text{E}$ , and as surrounding them, remarkably positive SST anomalies were observed from near northern Japan to south of Alaska and from the coast of North America to the western and eastern parts of tropical area. In the South Pacific, remarkably positive SST anomalies were observed from east of New Zealand to near  $45^{\circ}\text{S}$ ,  $120^{\circ}\text{W}$  and remarkably negative SST anomalies were observed from the coast of Chile to near  $20^{\circ}\text{S}$ ,  $100^{\circ}\text{W}$ . In the Indian Ocean, remarkably positive SST anomalies were observed in the eastern part of equatorial area and from near Madagascar to the western coast of Australia. In the Atlantic, remarkably positive SST anomalies were observed from near  $25^{\circ}\text{N}$ ,  $65^{\circ}\text{W}$  to near  $35^{\circ}\text{N}$ ,  $20^{\circ}\text{W}$ , in the Gulf of Mexico, and near the eastern coast of Canada, and remarkably negative SST anomalies were observed from near  $30^{\circ}\text{W}$  to near  $10^{\circ}\text{W}$  of the equatorial area.

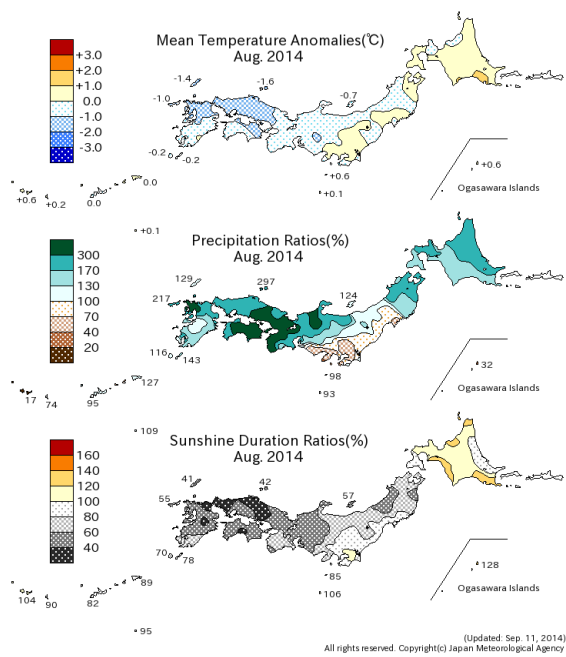


Fig. 1 Monthly climate anomaly / ratio over Japan (August 2014)  
 Top: temperature anomalies (degree C)  
 Middle: precipitation ratio (%)  
 Bottom: sunshine duration ratio (%)  
 Anomalies are defined as the deviations from the normal (1981-2010 average).

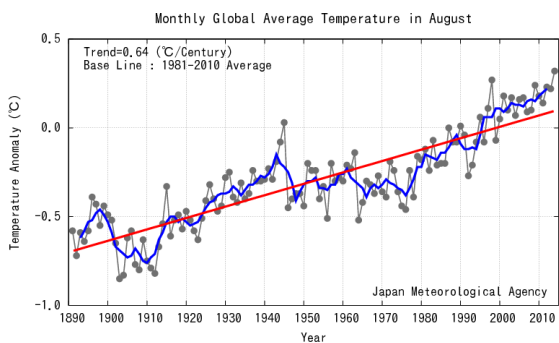


Fig. 2 Long-term change in monthly anomalies of global average surface temperature in August  
 The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations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

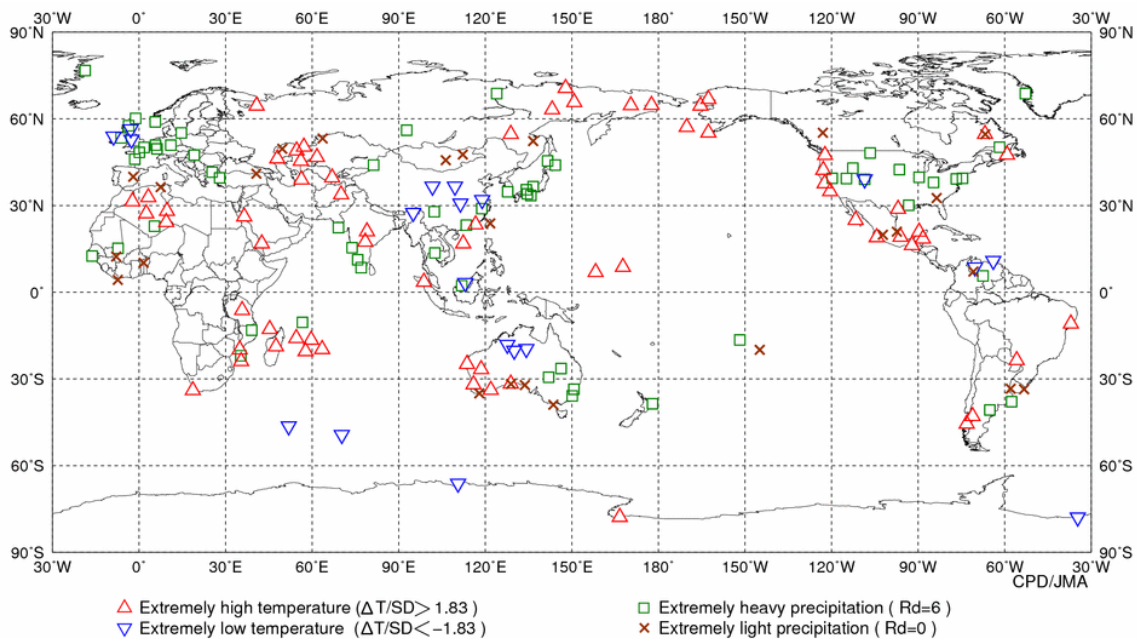


Fig. 3 Distribution of extreme climate events (August 2014)

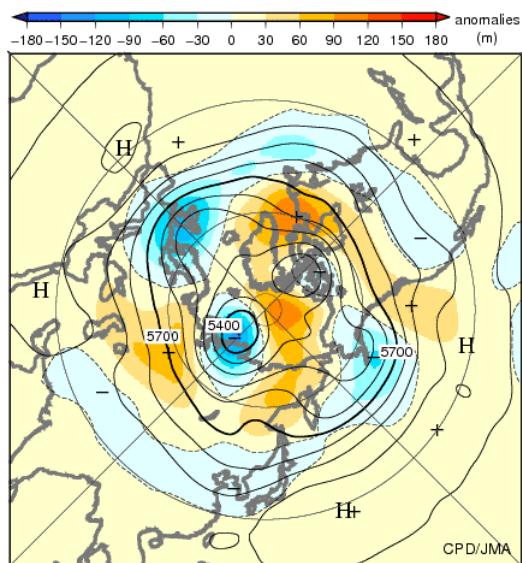


Fig. 4 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (August 2014)  
The contours show heights at intervals of 60 m. The shading indicates height anomalies. The base period for the normal is 1981-2010.

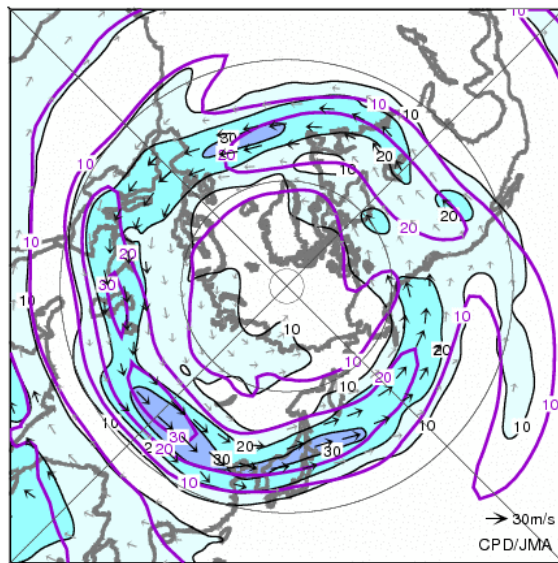


Fig. 5 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (August 2014)  
The black lines show wind speeds at intervals of 10 m/s. The dark blue shading shows values greater than 20 m/s. The purple lines show normal wind speeds at intervals of 20 m/s. The base period for the normal is 1981-2010.

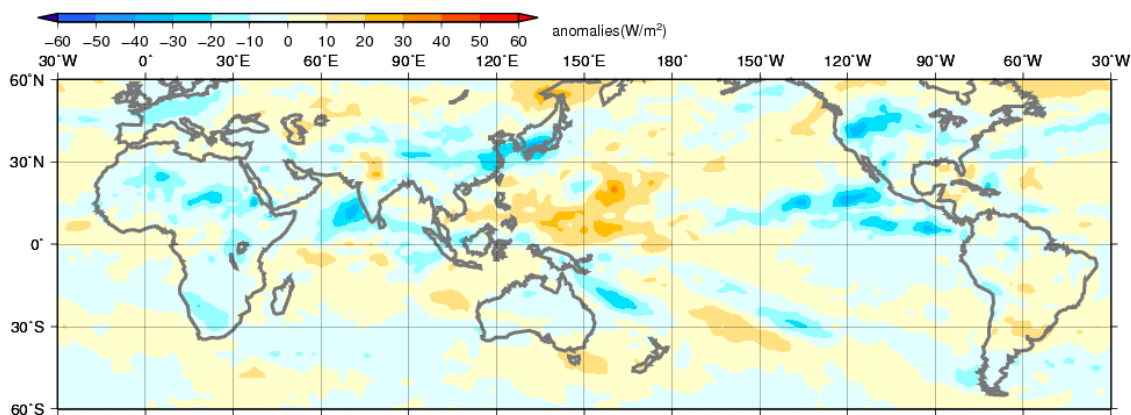


Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (August 2014)  
The contour interval is 10 W/m<sup>2</sup>. The base period for the normal is 1981-2010. Original data provided by NOAA.

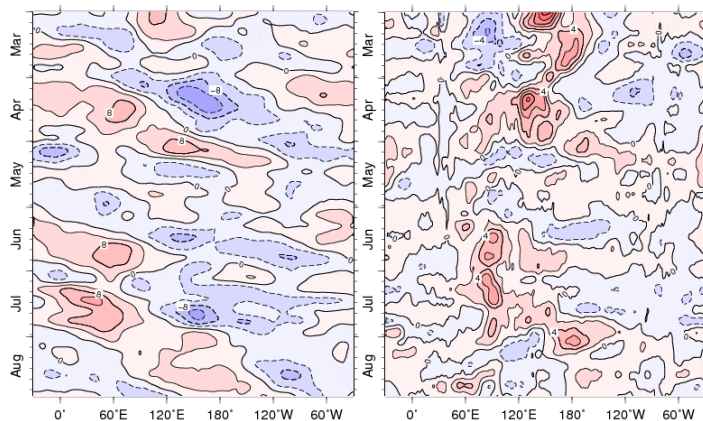


Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (March 2014 - August 2014)  
The contour intervals are  $4 \times 10^6$  m<sup>2</sup>/s (left) and 2 m/s (right). The base period for the normal is 1981-2010.

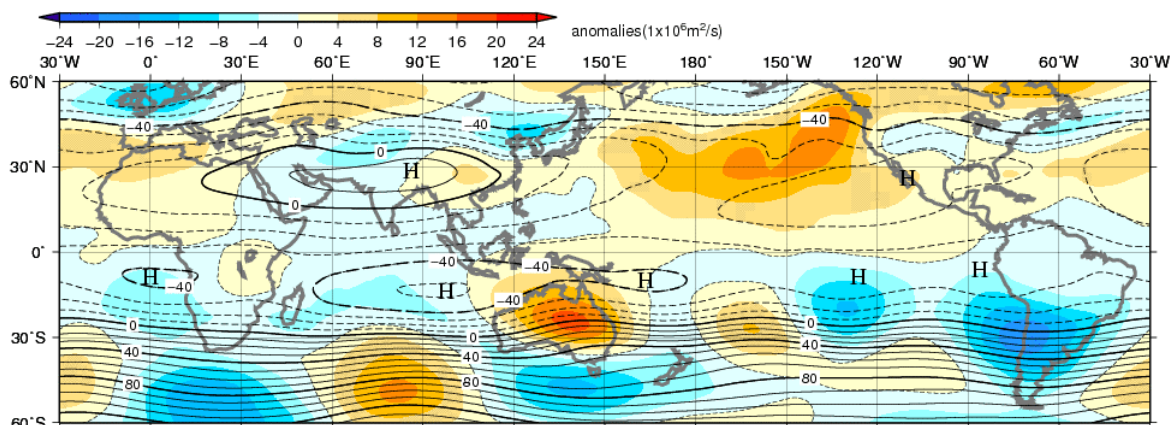


Fig. 8 Monthly mean 200-hPa stream function and anomaly (August 2014)  
 The contour interval is  $10 \times 10^6 \text{ m}^2/\text{s}$ . The base period for the normal is 1981-2010.

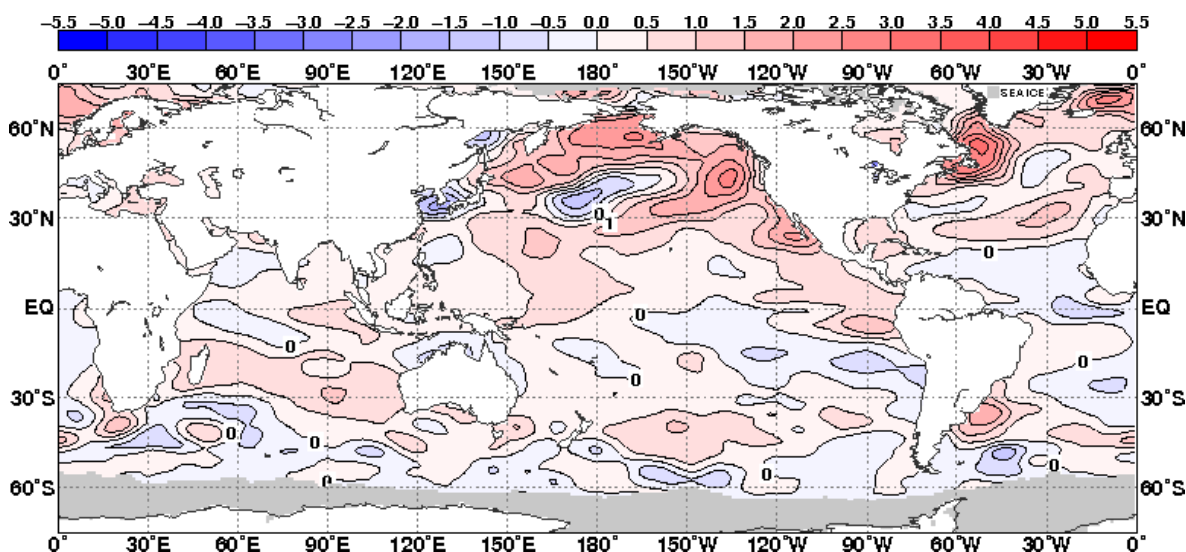


Fig. 9 Monthly mean sea surface temperature anomaly (August 2014)  
 The contour interval is 0.5 degree C. The base period for the normal is 1981-2010. Maximum coverage with sea ice is shaded in gray.

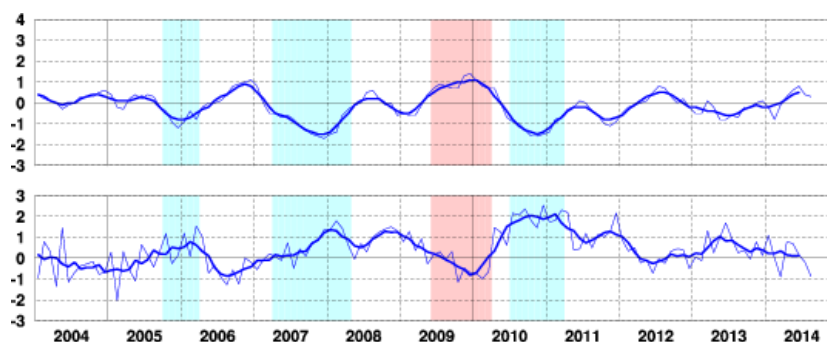


Fig. 10 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower).  
 Thin blue lines represent monthly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

Seasonal Highlights (June 2014 – August 2014)

- Seasonal mean temperatures were above normal in northern, eastern Japan and Okinawa/Amami, while below normal in western Japan. Seasonal precipitation amounts were significantly above normal in northern Japan and Pacific side of western Japan.
- Seasonal precipitation amounts were extremely heavy from France to western Turkey.
- The subtropical jet stream flowed southward of its normal position over the area from eastern China to Japan and North America.
- Convective activity was enhanced around the Maritime Continent and the ITCZ of the central and eastern parts of the North Pacific, and was suppressed over the western Indian Ocean.
- In the equatorial Pacific, remarkably positive SST anomalies were observed in the western part and positive SST anomalies were observed in the eastern part.

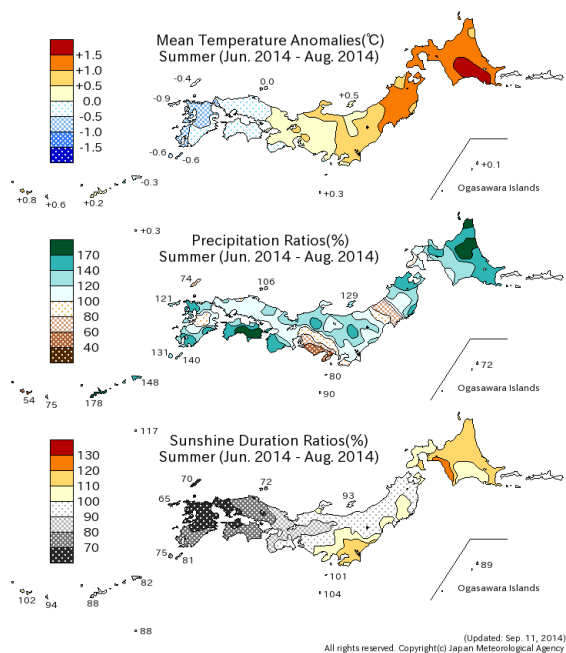


Fig. S1 Seasonal climate anomaly / ratio over Japan (June 2014 - August 2014)  
 Top: Temperature anomalies (degree C)  
 Middle: Precipitation ratio (%)  
 Bottom: Sunshine duration ratio (%)  
 Anomalies are defined as the deviations from the normal (1981-2010 average).

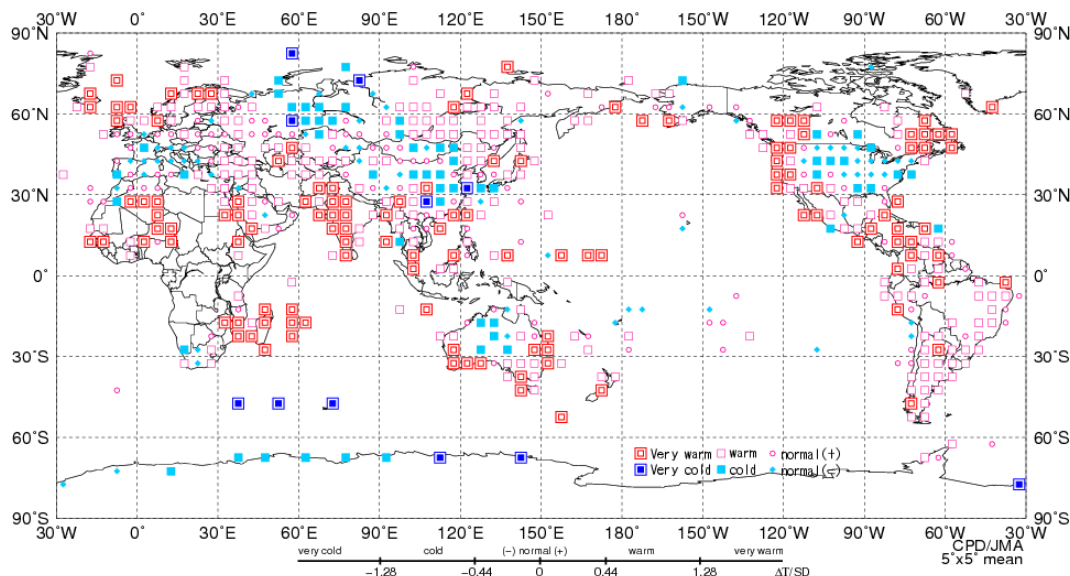


Fig. S2 Three-month mean temperature anomaly (normalized) category (June 2014 - August 2014)

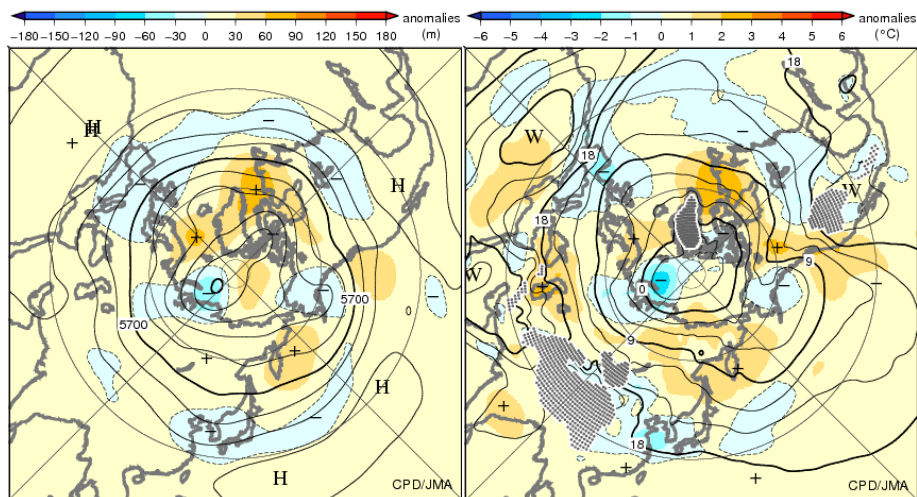


Fig. S3 Three-month mean 500-hPa height and anomaly (left) and 850-hPa temperature and anomaly (right) in the Northern Hemisphere (June 2014 - August 2014)  
 The contour intervals are 60 m (left) and 3 degree C (right). The shading shows anomalies. The base period for the normal is 1981-2010.

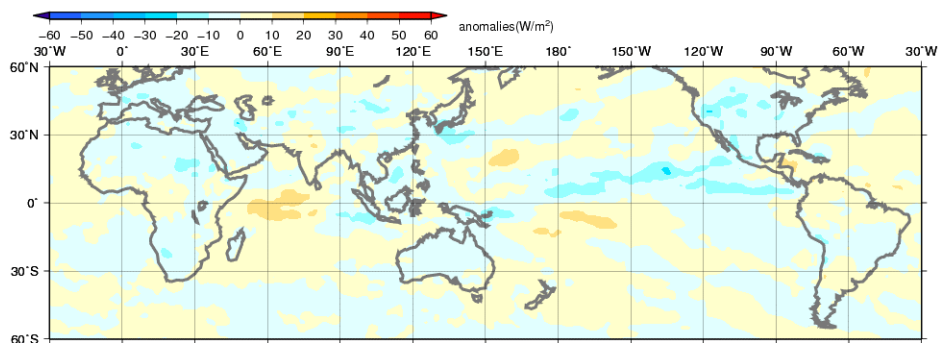


Fig. S4 Three-month mean Outgoing Longwave Radiation (OLR) anomaly (June 2014 - August 2014)  
 The contour interval is 10 W/m<sup>2</sup>. The base period for the normal is 1981-2010. Original data provided by NOAA.

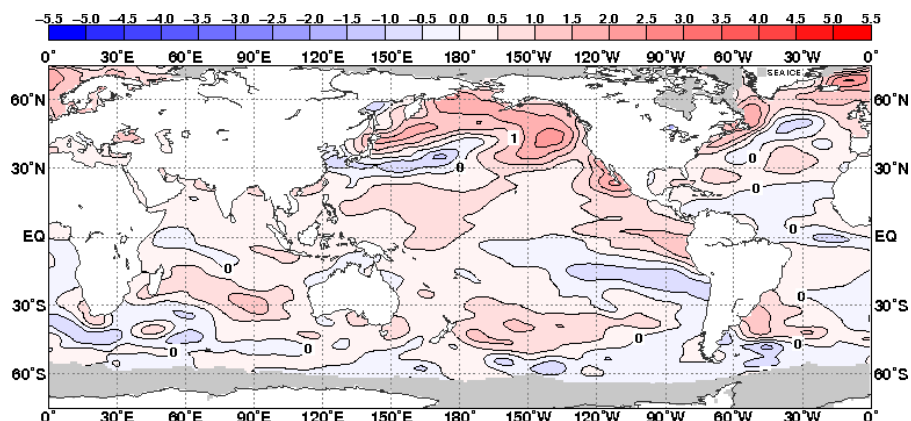


Fig. S5 Three-month mean sea surface temperature anomaly (June 2014 - August 2014)  
 The contour interval is 0.5 degree C. The base period for the normal is 1981-2010.

Detailed seasonal 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.