

Monthly Highlights on the Climate System (April 2017)

Highlights in April 2017

- Monthly mean temperatures were above normal in northern and western Japan and monthly precipitation amounts were above normal in western Japan.
- The monthly anomaly of the global average surface temperature was the second warmest since 1891.
- In the equatorial Pacific, positive SST anomalies were widely observed except around the date line.
- Convective activity was enhanced over the Maritime Continent and the South Pacific.
- A blocking high was seen to the northwest of Alaska and negative anomalies extended zonally over the mid-latitude of the North Pacific in the 500-hPa height field.

Climate in Japan:

- Monthly mean temperatures were above normal in northern and western Japan. Temperatures significantly fluctuated and there were some periods of low temperatures in most of Japan.
- Monthly precipitation amounts were above normal in western Japan due to moist southerly flow.
- Monthly sunshine durations were above normal almost all over Japan, since high pressure systems frequently covered Japan.

World Climate:

- The monthly anomaly of the global average surface temperature in April 2017 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.38 °C (2nd 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 April (preliminary value).
- Extreme climate events were as follows (Fig. 3).
 - Monthly mean temperatures were extremely high in Eastern Siberia.
 - Monthly mean temperatures were extremely high from the Iberian Peninsula to northwestern Africa.
 - Monthly mean temperatures were extremely high in the eastern USA and monthly precipitation amounts were extremely high from the eastern to southern USA.

Oceanographic Conditions:

- In the equatorial Pacific, positive SST anomalies were widely observed except around the date line. The monthly mean SST anomaly and the SST deviation from the latest sliding 30-year mean in the NINO.3 region were both +0.6°C.
- In the North Pacific, remarkably positive SST anomalies were observed from east of the Philippines to the western coast of the USA. In the South Pacific, remarkably positive SST anomalies were observed in almost the entire region west of 150°W and from the western coast of South America to near 10°S, 160°W and near 30°S, 130°W.
- In the Indian Ocean, remarkably positive SST anomalies were observed from south of Madagascar to near 40°S, 90°E, and remarkably negative SST anomalies were observed from near 10°S, 70°E to the southwestern coast of Australia.
- In the North Atlantic, remarkably positive SST anomalies were observed off the western coast of North Africa.

Tropics:

- Convective activity was enhanced over the Maritime Continent and the South Pacific, and suppressed over the central – eastern North Pacific and the Indian Ocean (Fig. 6).
- The active phase of equatorial intraseasonal oscillations propagated eastward from the Maritime Continent

to the Atlantic in mid-April (Fig. 7). Another active phase propagated from the Maritime Continent to the Pacific in late April.

- In the upper troposphere, anti-cyclonic circulations straddling the equator from the eastern Indian Ocean to the western Pacific were stronger than normal (Fig. 8).
- In the lower troposphere, cyclonic circulation anomalies were seen in the South Indian Ocean. The subtropical high over the North Pacific was stronger than normal to the east of the Ogasawara Islands.
- In the sea level pressures field, positive anomalies were observed from the Indian Ocean to the western Pacific and negative anomalies were seen over the central – eastern Pacific. The Southern Oscillation Index value was -0.4 (Fig. 5).

Extratropics:

- In the 500-hPa height field (Fig. 9), the center of the polar vortex was seen from northern Canada to Western – Central Siberia. A blocking high was seen to the northwest of Alaska and negative anomalies extended zonally over the mid-latitude of the North Pacific. Wave train was seen from the eastern part of North America to Japan through northern Eurasia with positive anomalies over the eastern part of North America, western Europe and Mongolia and negative ones from northern Europe to Western Russia and over Japan.
- The subpolar jet stream was clearly seen from northern Europe to Central Siberia. The westerly jet stream was stronger than normal from Japan to the seas east of Japan and shifted southward from its normal position over the central – eastern North Pacific (Fig. 10).
- In the sea level pressure field (Fig. 11), high-pressure system was seen over and around the United Kingdom. Negative anomalies were seen from northern to eastern Eurasia and over the mid-latitude of the North Pacific.
- Temperatures at 850-hPa were above normal over eastern Eurasia, the eastern part of North America and below normal from northern Europe to Western Russia (Fig. 12).
- In the zonal mean zonal wind, the westerly jet stream was stronger than normal over the latitude bands of 60°N. The zonal mean sub-tropical jet stream extended northward from its normal position.
- Zonal mean temperatures in the troposphere were above normal over the tropics and the mid-latitudes.

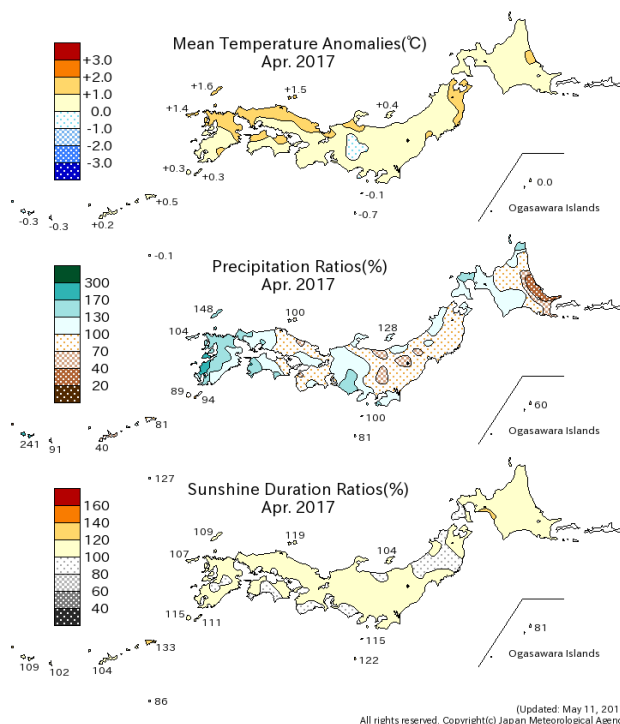


Fig. 1 Monthly climate anomaly/ratio over Japan (April 2017)
 Top: temperature anomalies (degree C)
 Middle: precipitation ratio (%)
 Bottom: sunshine duration ratio (%)
 Anomalies are defined as the deviations from the normal (1981-2010 average).

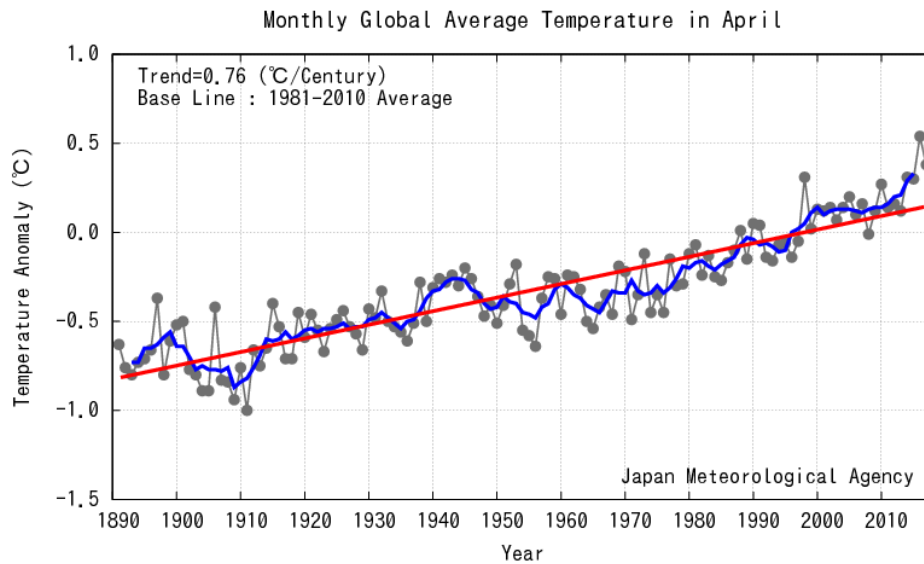


Fig. 2 Long-term change in monthly anomalies of global average surface temperature in April
 The thin black line indicates anomalies of the surface temperature in each year. The blue line indicates five-year running mean, and the red line indicates a long-term linear trend. Anomalies are deviations from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

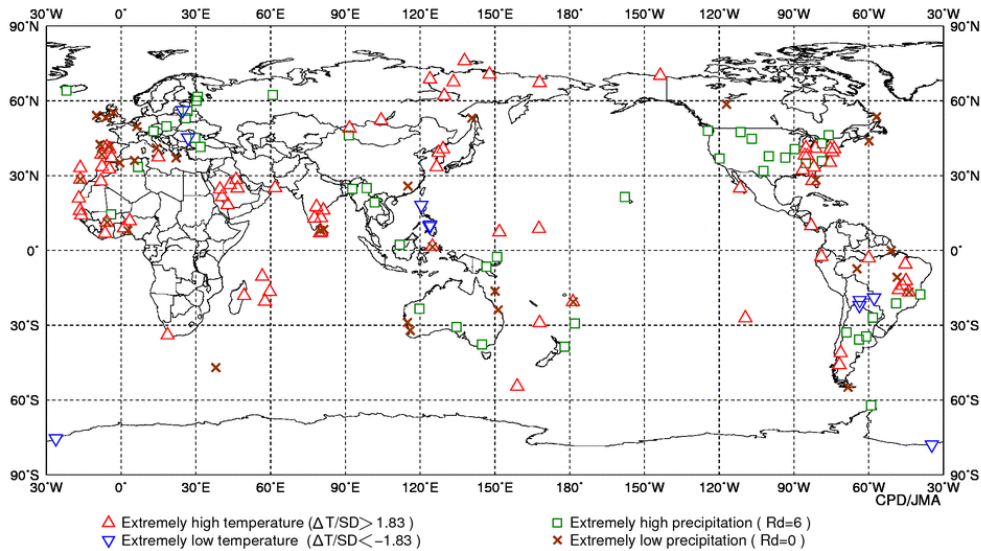


Fig. 3 Distribution of extreme climate events (April 2017)

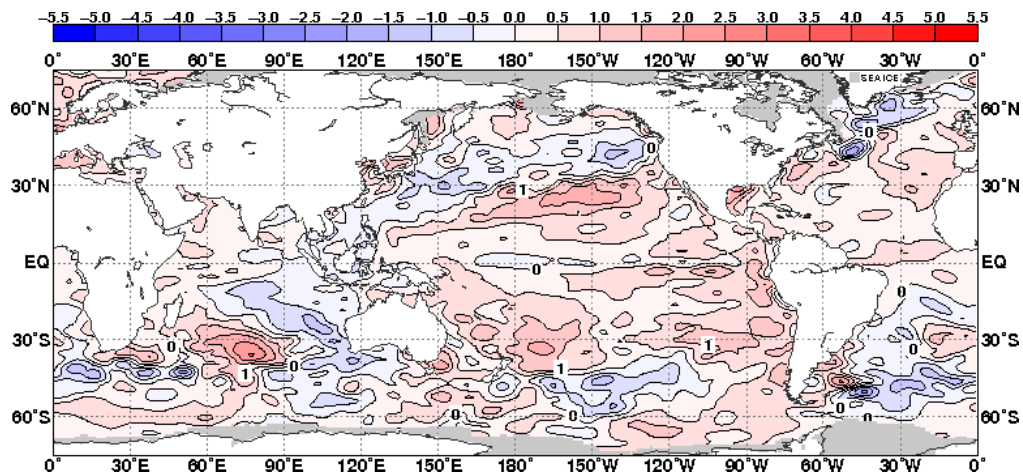


Fig. 4 Monthly mean sea surface temperature anomaly (April 2017)
 The contour interval is 0.5 degree C. The base period for the normal is 1981-2010. Maximum coverage with sea ice is shaded in gray.

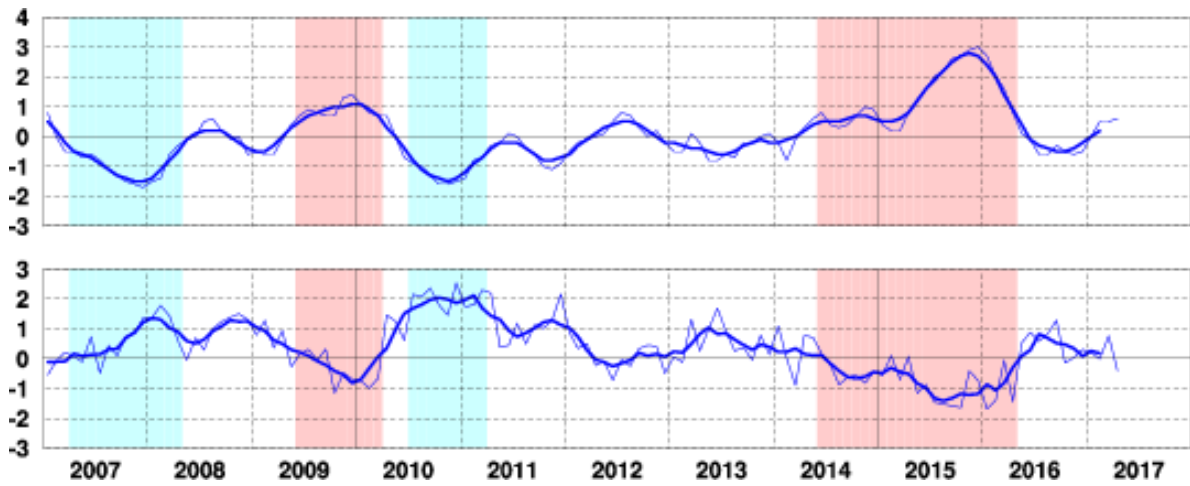


Fig. 5 Time series of monthly mean SST departure (degree C) from the reference value defined as the immediate past 30-year mean SST averaged over the NINO.3 region (upper). Time series of the Southern Oscillation Index with respect to the 1981-2010 base period (lower). Thin blue lines represent monthly 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.

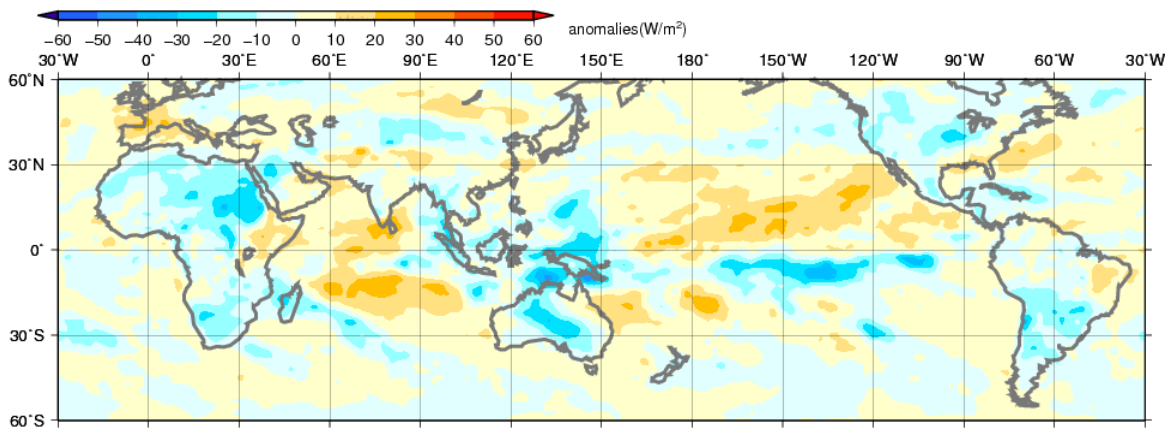


Fig. 6 Monthly mean Outgoing Longwave Radiation (OLR) anomaly (April 2017). The contour interval is 10 W/m². The base period for the normal is 1981-2010. Original data provided by NOAA.

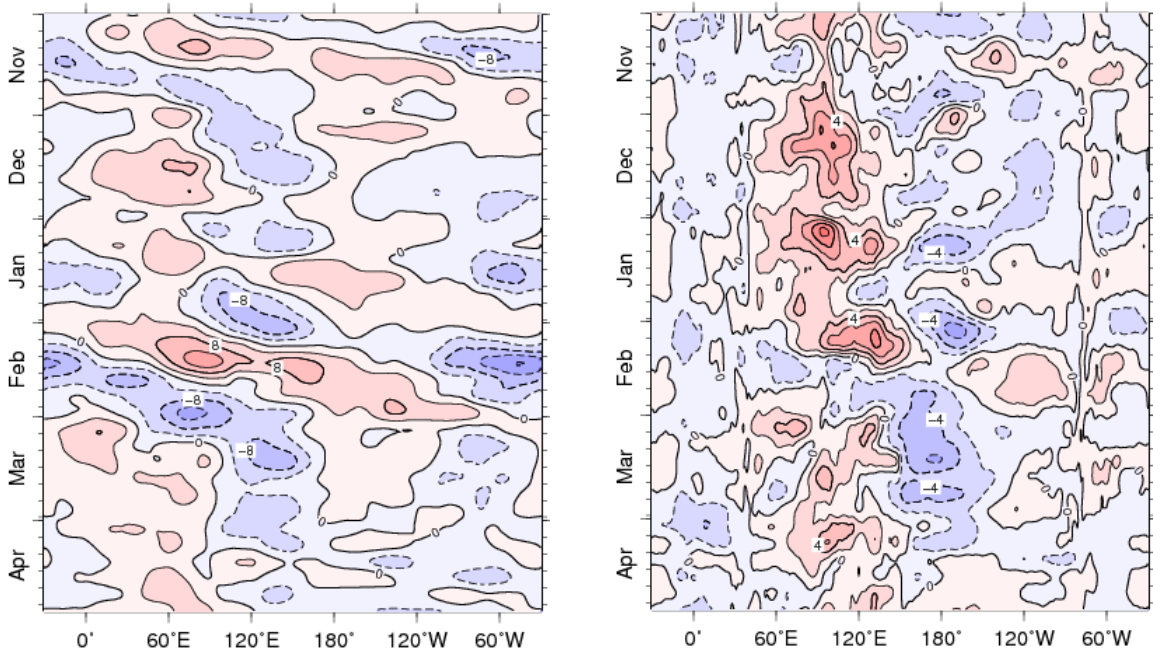


Fig. 7 Time-Longitude cross section (5°N-5°S) of five-day running mean 200-hPa velocity potential anomaly (left) and 850-hPa zonal wind anomaly (right) (November 2016 – April 2017). The contour intervals are 4x10⁶ m²/s (left) and 2 m/s (right). The base period for the normal is 1981-2010.

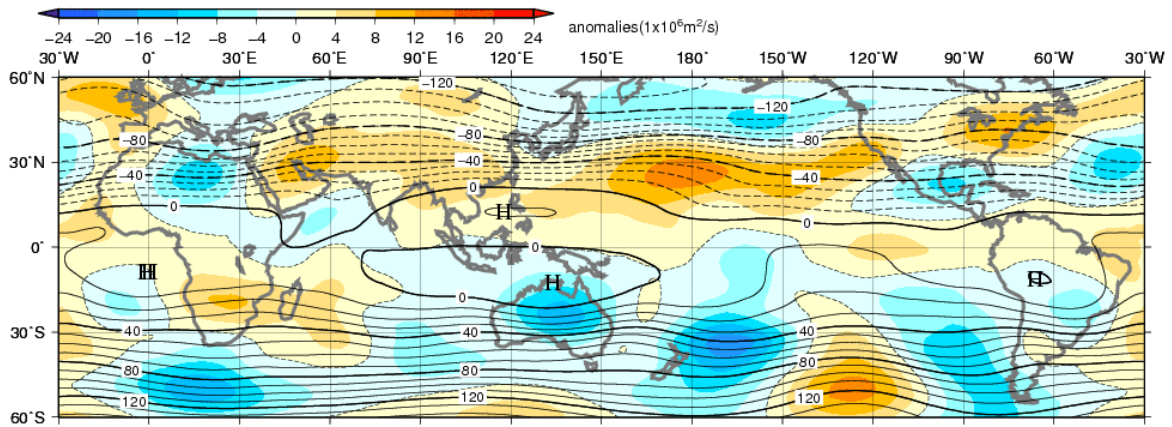


Fig. 8 Monthly mean 200-hPa stream function and anomaly (April 2017)
The contour interval is $10 \times 10^6 \text{ m}^2/\text{s}$. The base period for the normal is 1981-2010.

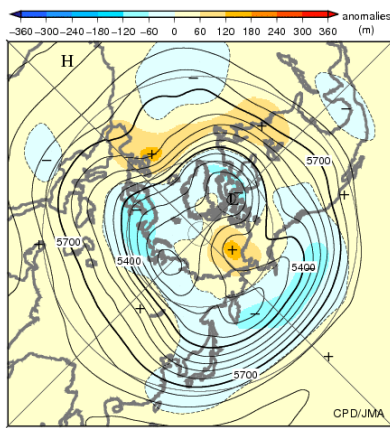


Fig. 9 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (April 2017)
The contours show 500-hPa height at intervals of 60 m. The shading indicates its anomalies. The base period for the normal is 1981-2010.

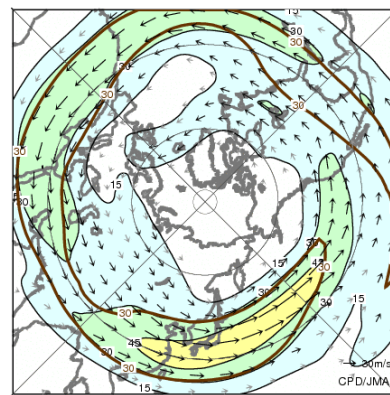


Fig. 10 Monthly mean 200-hPa wind speed and vectors in the Northern Hemisphere (April 2017)
The black lines show wind speed at intervals of 15 m/s. The brown lines show its normal at intervals of 30 m/s. The base period for the normal is 1981-2010.

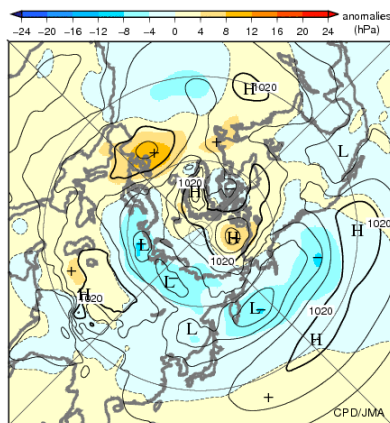


Fig. 11 Monthly mean sea level pressure and anomaly in the Northern Hemisphere (April 2017)
The contours show sea level pressure at intervals of 4 hPa. The shading indicates its anomalies. The base period for the normal is 1981-2010.

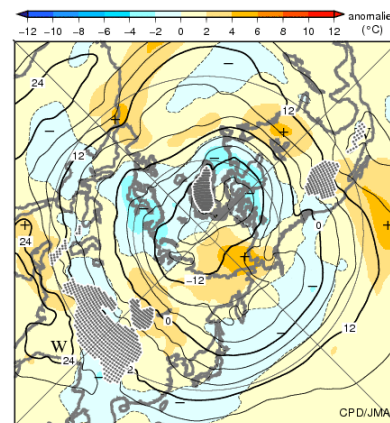


Fig. 12 Monthly mean 850-hPa temperature and anomaly in the Northern Hemisphere (April 2017)
The contours show 850-hPa temperature at intervals of 4 degree C. The shading indicates its anomalies. The base period for the normal is 1981-2010.

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