Monthly Highlights on the Climate System (January 2019)

Highlights in January 2019
- El Niño conditions are considered to have persisted in the equatorial Pacific (see El Niño Outlook updated on 12 February 2019).
- Monthly mean temperatures were above normal in eastern and western Japan and Okinawa/Amami, and monthly precipitation amounts were below normal in northern and eastern and western Japan.
- Monthly mean temperatures were extremely high from northern to southeastern Australia and in New Zealand.
- Convective activity was enhanced over the western equatorial Pacific and the Indochina Peninsula, and was suppressed over a wide area from the central to eastern Indian Ocean and around the Philippines.
- In the 500-hPa height field, the polar vortex in the Northern Hemisphere split into the Siberian part and the North American part. Wave train was seen from the northern part of North Atlantic to the subtropical jet stream with positive anomalies over the northern part of North Atlantic and the East China Sea, and negative anomalies over and around the Mediterranean Sea and the seas east of Japan.
- Temperatures at 850-hPa were above normal from the Middle East to Central Asia and over East Asia, and below normal over the northeastern part of North America.

Climate in Japan (Fig. 1):
- Monthly mean temperatures were above normal in eastern and western Japan. Monthly precipitation amounts were significantly below normal on the Pacific side of northern and eastern Japan, and on the Sea of Japan side of western Japan, and monthly snowfall amounts were significantly below normal on the Sea of Japan side of Japan. Winter monsoon pattern was dominant mainly in northern Japan and few low pressure systems passed near the mainland of Japan, but strong cold air mass was temporarily observed and the warm air often covered the west of eastern Japan.
- Monthly mean temperatures were significantly above normal in Okinawa/Amami. Monthly precipitation amounts were above normal in Okinawa region, since the wet air often flowed into the region.

World Climate:
- The monthly anomaly of the global average surface temperature in January 2019 (i.e., the combined average of the near-surface air temperature over land and the SST) was +0.39 °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 0.77 °C per century in January (preliminary value).
- Extreme climate events were as follows (Fig. 3).
  - Monthly mean temperatures were extremely high from northeastern China to the southern part of Central Siberia, from southern China to the central part of Southeast Asia, in and around central Saudi Arabia, in and around southern Brazil, from northern to southeastern Australia, and in New Zealand.
  - Monthly precipitation amounts were extremely high from southern China to western Thailand, from western Rumania to central Greece, and from Uruguay to northern Argentina. Monthly precipitation amounts were extremely low from northern Japan to the southern Korean Peninsula and in southeastern Brazil.

Oceanographic Conditions (Fig. 4):
- In the equatorial Pacific, positive SST anomalies were observed in almost the entire region, in particular remarkably positive SST anomalies were observed west of the date line. In the NINO.3 region, the monthly mean SST anomaly and the SST deviation from the latest sliding 30-year mean were both +0.7°C (Fig.5).
- In the North Pacific, remarkably positive SST anomalies were observed from the South China Sea to the central part and in the western coast of North America.
- In the South Pacific, remarkably positive SST anomalies were observed from the area near the date line of the tropics to the area near 40°S, 100°W and from the area near the southeastern coast of Australia to the area around New Zealand, and remarkably negative SST anomalies were observed from the western coast of Chile to the area near 15°S, 120°W.
- In the Indian Ocean, remarkably positive SST anomalies were observed in the southern part of the Bay of Bengal and around Madagascar.
- In the North Atlantic, remarkably positive SST anomalies were observed in the equatorial area, off the eastern coast of the Florida Peninsula, and off the western coast of the Iberian Peninsula.

**Tropics:**
- Convective activity was enhanced over the western equatorial Pacific, from the central equatorial Atlantic to the Middle East, and over the Indochina Peninsula, and was suppressed over the western tropical North Atlantic, a wide area from the central to eastern Indian Ocean, and around the Philippines (Fig. 6).
- The active phase of equatorial intraseasonal oscillation propagated eastward from the Pacific to the Indian Ocean through Africa in early- and mid- January, and arrived at the central Pacific in late January (Fig. 7).
- In the upper troposphere, cyclonic circulation anomalies straddling the equator were seen over the Indian Ocean. Wave train was seen from southern Eurasia to the latitudinal band of 30°N in the North Pacific with anticyclonic circulation anomalies over the East China Sea (Fig. 8).
- In the lower troposphere, cyclonic circulation anomalies straddling the equator were seen over the western Pacific, and anticyclonic circulation anomalies were seen to the north of the Philippines.
- In the sea level pressure field, positive anomalies were seen from South America to the Maritime Continent through Africa, and negative anomalies were seen from the central to eastern Pacific near the equator. The Southern Oscillation Index value was 0.0 (Fig. 5).

**Extratropics:**
- In the 500-hPa height field (Fig. 9), the polar vortex in the Northern Hemisphere split into the Siberian part and the North American part. Wave train was seen from the northern part of North Atlantic to the subtropical jet stream with positive anomalies over the northern part of North Atlantic and the East China Sea, and negative anomalies over and around the Mediterranean Sea and the seas east of Japan.
- The westerly jet stream shifted northward from its normal position over the northern part of the Middle East and from eastern China to western Japan (Fig. 10).
- In the sea level pressure field (Fig. 11), positive anomalies were seen over the northern part of North Atlantic and over East Asia, and negative anomalies were seen from the Mediterranean Sea to Eastern Siberia. The Aleutian Low was stronger than normal around the Bering Sea.
- Temperatures at 850-hPa were above normal from the Middle East to Central Asia and over East Asia, and below normal over central Europe and the northeastern part of North America (Fig. 12).
- Zonal mean temperatures in the troposphere were above normal over the tropics to mid-latitudes. In association with a Stratospheric Sudden Warming, above-normal temperatures were dominant in the high-latitudes of the Northern Hemisphere stratosphere.
- In the 30-hPa height field, the stratospheric polar vortex split into Siberia and North America. The Stratospheric Sudden Warming ended in the end of the month.
Fig. 1 Monthly climate anomaly/ratio over Japan (January 2019)
Top: temperature anomalies (degree C)
Middle: precipitation ratio (%)
Bottom: sunshine duration ratio (%)
The base period for the normal is 1981-2010.

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 stations (January 2019)

Fig. 4  Monthly mean sea surface temperature anomaly (January 2019)
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 (January 2019)
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) (August 2018 – January 2019)
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 (January 2019)
The contour interval is 10x10⁶ m²/s. The base period for the normal is 1981-2010.
Fig. 9 Monthly mean 500-hPa height and anomaly in the Northern Hemisphere (January 2019)
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 (January 2019)
The black lines show wind speed at intervals of 20 m/s. The brown lines show its normal at intervals of 40 m/s. The base period for the normal is 1981-2010.

Fig. 11 Monthly mean sea level pressure and anomaly in the Northern Hemisphere (January 2019)
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 (January 2019)
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.
https://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.