Tokyo Climate Center, Japan Meteorological Agency

TCC News

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El Niño Outlook (April – October 2009)

The NINO.3 SST is likely to become closer to normal in spring, and is expected to be near normal during summer. It is likely that the current La Niña conditions will end in spring.

In March 2009, the SST deviation from the sliding 30-year mean SST averaged over the NINO.3 region was -0.6°C. The five-month running mean value of NINO.3 SST deviations for January was -0.5°C. In March, SSTs were remarkably below normal in the eastern equatorial Pacific, while negative SST anomalies in the central part were weaker than in February. Negative SST anomalies in the eastern part strengthened temporarily in early March before gradually weakening again (Figures 1 and 3a). While positive subsurface temperature anomalies persisted in the western equatorial Pacific, negative anomalies in the central and eastern parts were weaker than in February (Figures 2 and 3b). La Niña conditions have persisted, but have been following a weakening trend.

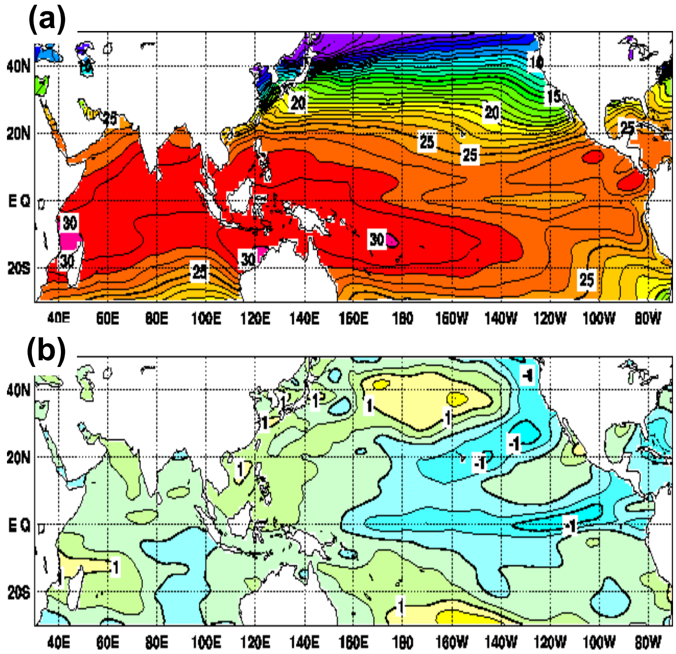

Figure 1 Monthly mean (a) sea surface temperatures (SSTs) and (b) SST anomalies in the Pacific and Indian Ocean sectors in March 2009
The contour intervals are 1˚C in (a) and 0.5˚C in (b). The base period for the normal is 1971 – 2000.

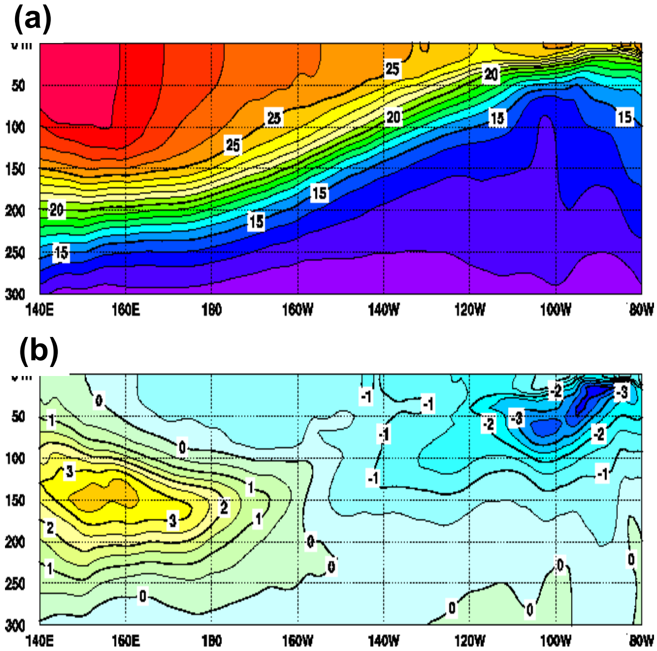

Figure 2 Monthly mean depth-longitude cross sections of (a) temperatures and (b) temperature anomalies in the equatorial Pacific for March 2009
The contour intervals are 1˚C in (a) and 0.5˚C in (b). The base period for the normal is 1979 – 2004.

It is possible that warm waters in the western equatorial Pacific will propagate eastward and that the area of negative SST anomalies will contract in the months ahead.

JMA's El Niño prediction model predicts that the NINO.3 SST will be near normal during the prediction period (Figure 4).

In consideration of the above factors, the NINO.3 SST is likely to become closer to normal in spring and to be near normal during summer. It is likely that the current La Niña conditions will end in spring.

(Ichiro Ishikawa, Climate Prediction Division)

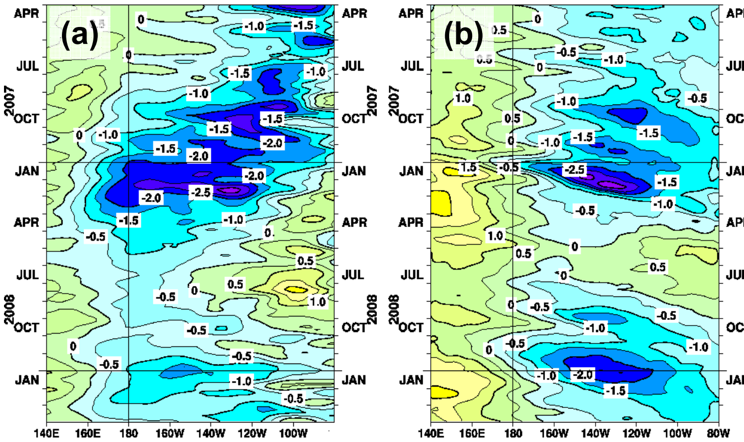

Figure 3 Time-longitude cross section of (a) SST and (b) ocean heat content (OHC) anomalies along the equator in the Pacific Ocean
OHC is defined here as the vertical average temperature to a depth of 300 m. The base periods for the normal are 1971 – 2000 for (a) and 1979 – 2004 for (b).

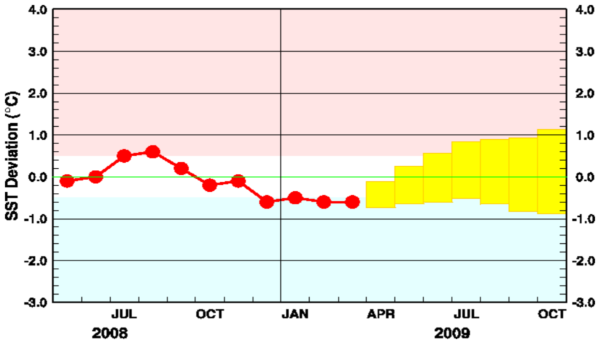

Figure 4 SST deviation outlook for NINO.3 as predicted by the El Niño prediction model
This figure shows a time series of monthly SST deviations for NINO.3 (5˚N – 5˚S, 150˚W – 90˚W). The thick line with closed circles shows the observed SST deviation values, and the boxes show the values predicted for the next six months by the El Niño prediction model. Each box denotes the range into which SST deviation is expected to fall with a probability of 70%.

JMA's Seasonal Numerical Ensemble Prediction for Summer 2009

In summer 2009, convection is predicted to be active in the Asian monsoon region in general and inactive in the central part of the equatorial Pacific and the equatorial Atlantic. In the Asian monsoon region, convection is expected to be relatively inactive to the east of the Philippines, which may induce a weak northwestward extension of the North Pacific High. However, these results should be interpreted with caution due to the insufficient reliability of data on the detailed distribution of precipitation in the Asian monsoon region.

1. Introduction

This report outlines JMA's seasonal numerical ensemble prediction for summer 2009 (June – August, JJA), which was used as a prognostic tool in the Agency's operational warm-season issued on 23 April 2009. The prediction consists of 51 ensemble members with an initial date of 17 April 2009, and employs a two-tier method: first, global SSTs are predicted using a combination of persistent anomalies, climatology and forecast using JMA's El Niño prediction model (an atmosphere-ocean coupled model), and the specific SSTs are then fed into an atmospheric model. Details of the prediction system and verification maps based on 22-year hindcast experiments (1984 – 2005) are available at http://ds.data.jma.go.jp/tcc/tcc/products/model/index.html. Section 2 below presents the global SST anomalies predicted, followed in Section 3 by a description of the predicted circulation fields in the tropics and sub-tropics associated with these anomalies. Finally, the predicted circulation fields in the middle and high latitudes of the Northern Hemisphere are explained in Section 4.

2. SST anomalies

In March 2009, SSTs in the equatorial Pacific were below normal from the central to the eastern parts and above normal in the western part. The El Niño monitoring index of the NINO.3 region, which is the deviation from the sliding 30-year mean SST averaged over the area, was -0.6°C, and La Niña conditions have continued since winter 2008/2009. According to the El Niño outlook, La Niña conditions will end this spring and near-normal conditions will persist this summer.

The SST anomalies used in JMA's seasonal numerical ensemble prediction system are shown in Figure 5. SSTs are expected to be near normal from the central to eastern parts of the equatorial Pacific, reflecting the termination of the La Niña conditions. Above-normal SSTs are expected widely in other regions.

3. Circulation fields in the tropics and sub-tropics (Figure 6)

Above-normal precipitation is generally predicted for the Asian monsoon region, and below-normal precipitation is predicted in the central part of the equatorial Pacific and the equatorial Atlantic. In the Asian monsoon region, remarkably above-normal precipitation is predicted around

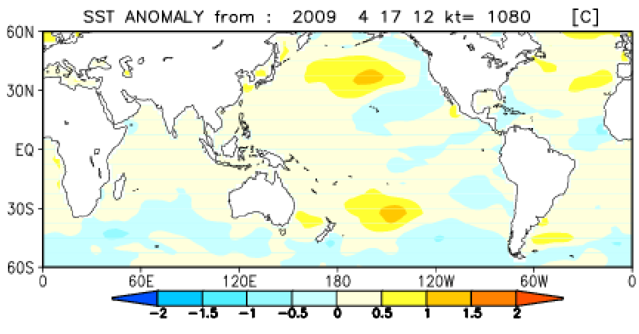

Figure 5 Predicted SST anomalies for JJA 2009

the Bay of Bengal and New Guinea Island, while relatively light precipitation is expected to the east of the Philippines. However, it is possible that the heavy precipitation predicted around New Guinea Island may be overestimated.

Upper tropospheric velocity potential anomalies are expected to be negative (i.e. more divergent) from the Bay of Bengal to the Maritime Continent, and positive (i.e. more convergent) around the central part of the equatorial Pacific and the equatorial Atlantic, reflecting the precipitation anomaly patterns in the tropics.

In the upper troposphere, anti-cyclonic circulation anomalies are predicted in the southern part of the Eurasian Continent. Cyclonic anomalies are expected on the Northern Hemisphere side of the tropical Pacific and from East Asia to the east of Japan. In the lower troposphere, cyclonic anomalies are predicted from the Arabian Sea to Southeast Asia and from East Asia to the east of Japan, and anti-cyclonic anomalies are predicted in the east of the Philippines. These features imply that the Tibetan High is stronger than normal, especially in the western part, and that the northwestward extension (to East Asia) of the North Pacific High is weaker. However, this may be caused by subdued convective activity in the east of the Philippines and excessively heavy precipitation around New Guinea Island.

4. Circulation fields in the middle and high latitudes of the Northern Hemisphere (Figure 7)

Predicted 500-hPa height anomalies are generally positive in the mid-latitudes, while negative anomalies are expected to the east of Japan. Negative anomalies of sea level pressure are predicted in the North Pacific region. However, these results should be interpreted with caution due to the insufficient reliability of the extension of the North Pacific High.

(Masayuki Hirai, Climate Prediction Division)

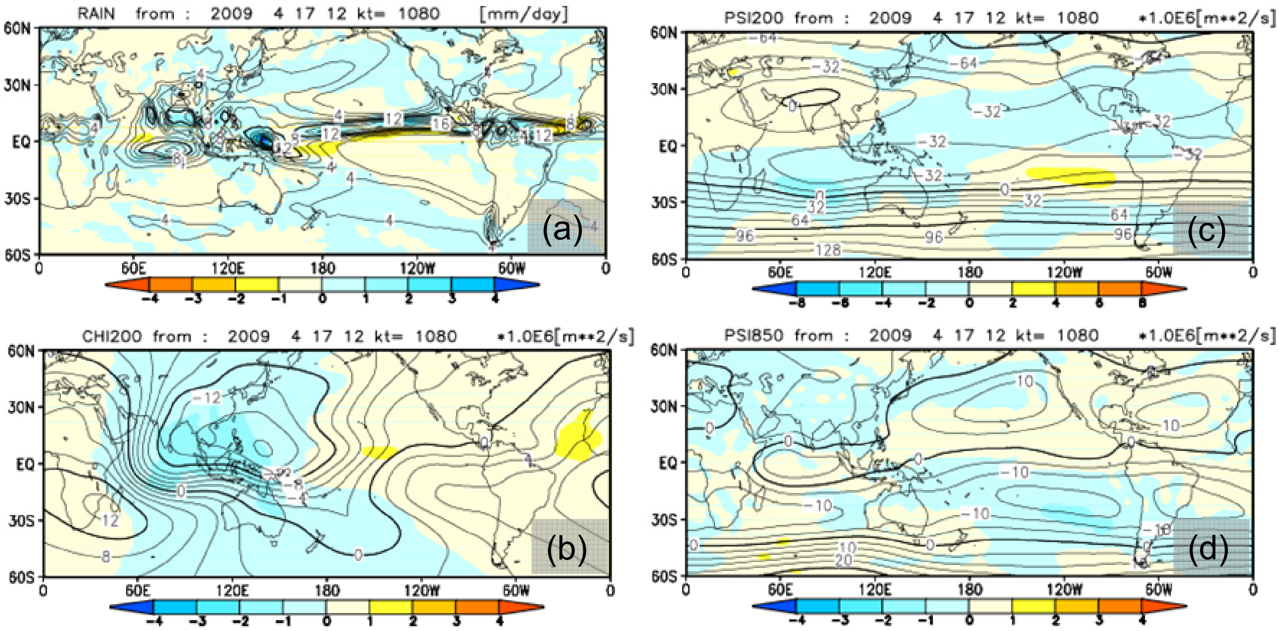

Figure 6 Predicted atmospheric fields in the tropics and sub-tropics for JJA 2009 (ensemble mean of 51 members)
(a) Precipitation (contours) and anomaly (shaded). The contour interval is 2 mm/day.
(b) Velocity potential at 200 hPa (contours) and anomaly (shaded). The contour interval is 2 x 10^6 m^2/s.
(c) Stream function at 200 hPa (contours) and anomaly (shaded). The contour interval is 16 x 10^6 m^2/s.
(d) Stream function at 850 hPa (contours) and anomaly (shaded). The contour interval is 5 x 10^6 m^2/s.

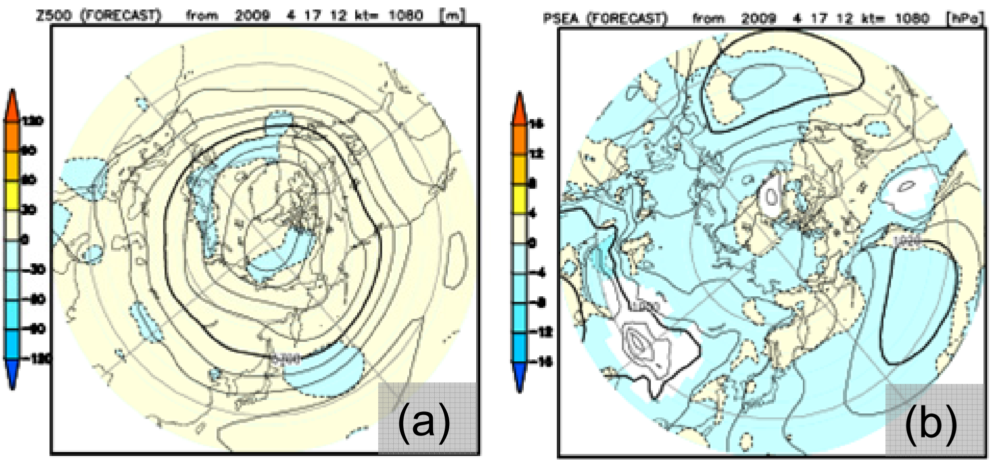

Figure 7 Predicted atmospheric fields in the middle and high latitudes of the Northern Hemisphere for JJA 2009 (ensemble mean of 51 members)
(a) 500 hPa height (contours) and anomaly (shaded). The contour interval is 60 m.
(b) Sea level pressure (contours) and anomaly (shaded). The contour interval is 4 hPa.

Warm Season Outlook for Summer 2009 in Japan

For 2009 summer in Japan, mean temperatures are likely to be above normal or near normal in most regions. The warm season and rainy season (Baiu) precipitation amounts have no significant features for all regions.

1. Outlook summary

JMA issued an outlook for the coming summer over Japan in February, and updated it in March and April. Mean temperatures are expected to be above normal with a 50% probability in western Japan and Okinawa/Amami, and near normal or above normal with a 40% probability each in eastern Japan (Figure 8). For all regions, the precipitation amount outlook for the warm season and rainy season (Baiu) has no significant features. Probabilistic forecasts of mean temperatures and precipitation amounts for the whole summer, as well as precipitation amounts in the Baiu season for each region of Japan, are available on the TCC website at http://ds.data.jma.go.jp/tcc/tcc/products/japan/outlooks/outlook2t.html.

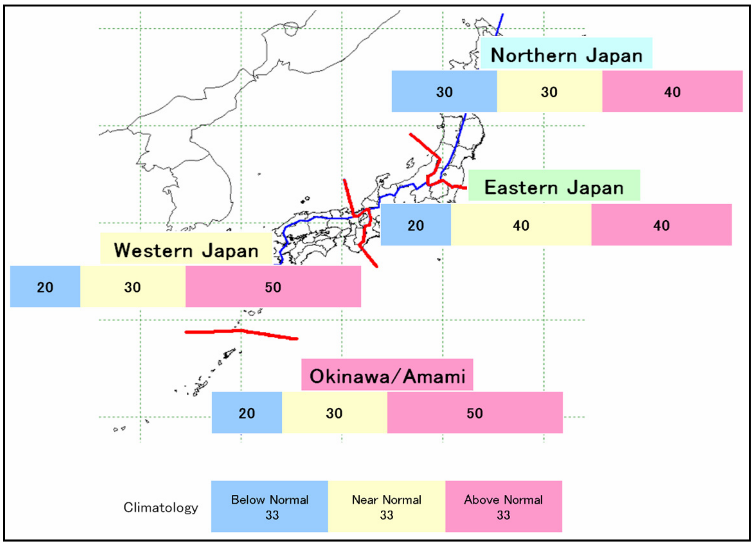

Figure 8 Probabilistic Forecast of Seasonal Mean Temperatures for summer (June – August 2009)

2. Outlook background

Long-term upward trends are clear in summer (June – August) mean temperatures nationwide. The zonal mean tropospheric temperature calculated from thickness averaged over the mid-latitudes of the Northern Hemisphere (30 – 50°N) also tends to be above normal.

Positive anomalies in 500-hPa height and 850-hPa temperature are predicted over the Asia-Pacific area. Considering that these positive anomalies will cover the Asia-Pacific area, the summer mean temperature base is expected to be higher than normal. Convective activity is predicted to be positive over the Bay of Bengal and New Guinea Island, and negative near the Philippines. On average, convective activity will be positive over Asian monsoon areas. Negative convective activity near the Philippines may lead to weaker-than-normal strength in the North Pacific High around Japan. However, as described in the previous article, the prediction skill for convective activity over Asian monsoon areas is not sufficient, and SSTAs in the western Pacific have been positive in recent years. Convective activity near the Philippines is therefore expected to be higher than the prediction, and the strength of the North Pacific High around Japan is expected to be near normal. On the other hand, positive sea-level pressure anomalies are predicted around the Sea of Okhotsk, suggesting the possibility of the Okhotsk High appearing and bringing cool air to the region around northern Japan.

(Noriaki Watanabe, Climate Prediction Division)

Summary of Asian Winter Monsoon 2008/2009 - Extremely high temperatures in Asia

Surface climate conditions

In winter 2008/2009, most Asian countries experienced higher-than-normal temperatures (Figure 9).

Figure 10 shows extreme climate events from December 2008 to February 2009. Extremely high temperatures were observed around the Indian subcontinent in December and January. Furthermore, extremely high temperatures were observed not only around the Indian subcontinent but also in other Asian countries in February. The former was thought to be caused by a meander in the Asian subtropical jet around the Indian subcontinent, while the latter is attributed to a significant northward shift in the westerly jet from its normal position (see the next section).

Meanwhile, extremely low temperatures were observed around the Indochina Peninsula in January, and extremely heavy precipitation was observed around the South China Sea in January and February.

(Takafumi Umeda, Climate Prediction Division)

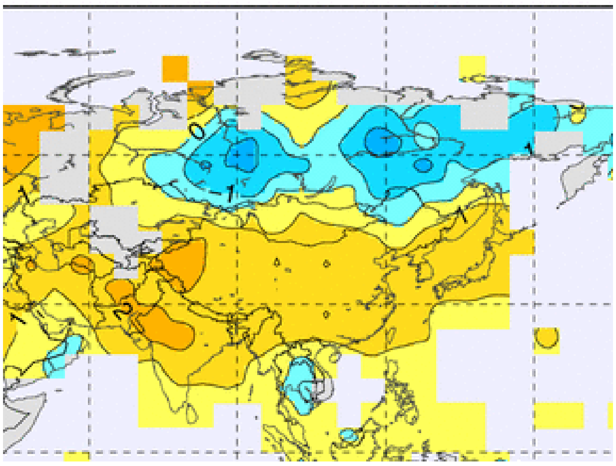

Figure 9 Seasonal temperature anomalies for winter (December – February) 2008/2009
Anomalies are deviations from the normal (i.e., the 1971 – 2000 average). The contour interval is 1°C.

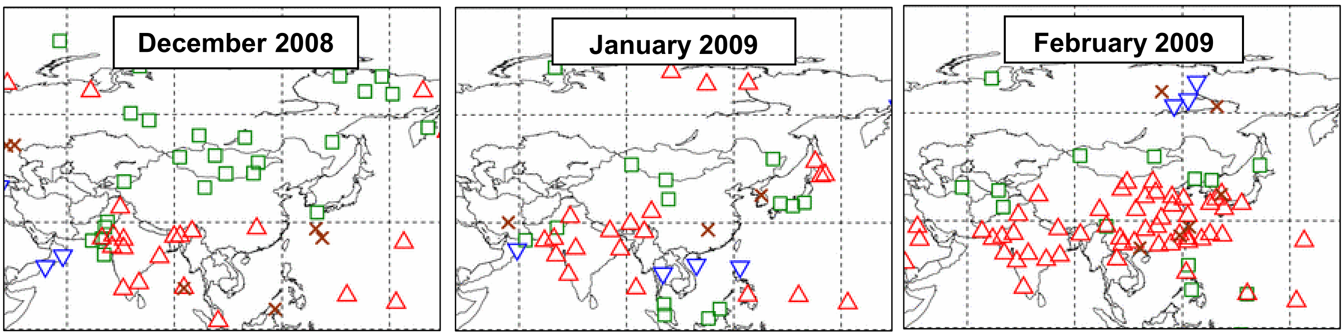

Figure 10 Extreme climate events from December 2008 to February 2009

△ Extremely high temperature (ΔT/SD≧ 1.83) □ Extremely heavy precipitation (Rd=6)
▽ Extremely low temperature (ΔT/SD≦ −1.83) × Extremely light precipitation (Rd=0)

Conditions of convective activity and atmospheric circulation

The winter monsoon in Southeast Asia was stronger than normal, and convective activity was enhanced around the South China Sea and the Philippines (Figure 11). Cold surges periodically affected Southeast Asia except in February, bringing extremely low temperatures to the Indochina Peninsula in January. These features were consistent with La Niña conditions.

Meanwhile, the winter monsoon in East Asia was weaker than normal because of a surface pressure anomaly pattern in which both the Siberian high and the Aleutian low were weaker than normal (Figure 12). These conditions were dominant in February, when the westerly jet shifted significantly northward from its normal position (Figure 13) and the polar vortex was located in eastern Siberia (Figure 14). Moreover, the subtropical jet meandered, and the phase of a ridge stayed over the Indian subcontinent in December and January (Figure 15), bringing extraordinarily high temperatures to India.

(Norihisa Fujikawa, Climate Prediction Division)

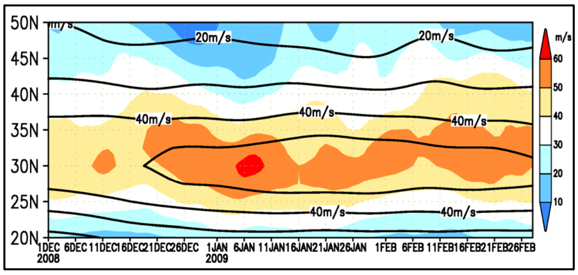

Figure 13 Latitude-time cross section of 250-hPa zonal wind speeds (shaded) and their normals (contours) averaged from 60˚E to 150˚E

The data here are seven-day running-mean values, with each date indicating the start of the seven-day period .

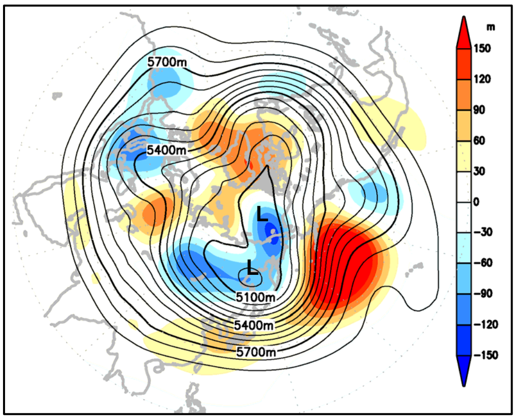

Figure 14 Monthly mean 500-hPa height (contours) and their anomalies (shaded) in February 2009

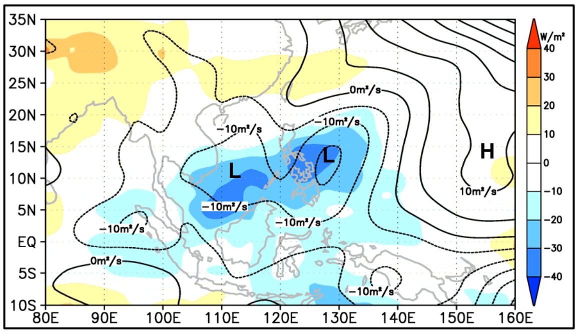

Figure 11 Seasonal mean OLR anomalies (shaded) and 925-hPa stream function anomalies (contours)

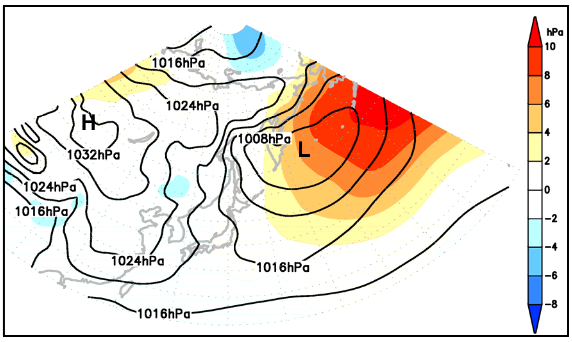

Figure 12 Seasonal mean SLP (contours) and their anomalies (shaded)

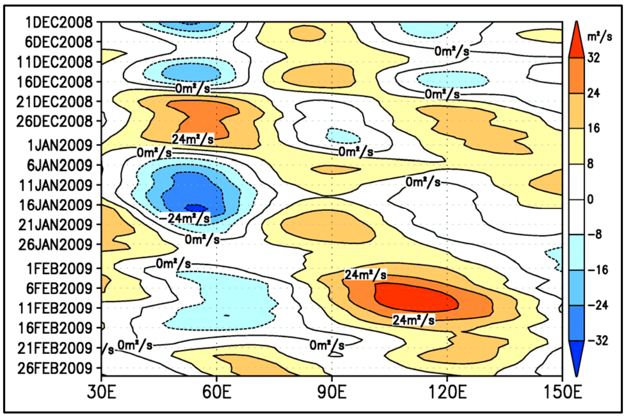

Figure 15 Time-longitude cross section of 200-hPa stream function anomalies averaged from 15˚N to 30˚N

The data here are seven-day running-mean values, with each date indicating the start of the seven-day period.

Unusual Major Stratospheric Sudden Warming Event from January to February 2009

An unusual major stratospheric sudden warming event took place from January to February 2009. The propagation of the planetary wave of zonal wave number 2 during winter 2008/09 was the strongest seen in the past 30 winters.

The Climate Prediction Division (CPD) of JMA routinely monitors stratospheric circulation, focusing on Stratospheric Sudden Warming (SSW) events. STRATALERT reports are issued via WMO's Global Telecommunication System every day during periods of SSW.

The 30-hPa temperature in the polar region was around -83˚C at the beginning of January, before a rapid increase in air temperature reaching above -35˚C was observed in mid-January (Figure 16). The CPD began to issue STRATALERT reports for a minor SSW on 19 January 2009. Then, zonal winds reversed from westerlies to easterlies in mid-latitudes, and easterlies expanded from 50°N to the North Pole. The polar vortex split clearly into two in late January (Figure 17), and the reversed zonal wind direction was observed throughout the stratosphere to the north of 60ºN in early February. Accordingly, this event was identified as a major SSW in line with WMO's classification. A poleward increase in temperature was clearly observed to the north of 60ºN. Consequently, the reverse of zonal mean zonal winds continued until the end of February 2009. More details on this major SSW event are available on the TCC website at http://ds.data.jma.go.jp/tcc/tcc/news/press_20090528.pdf.

(Yayoi Harada, Climate Prediction Division)

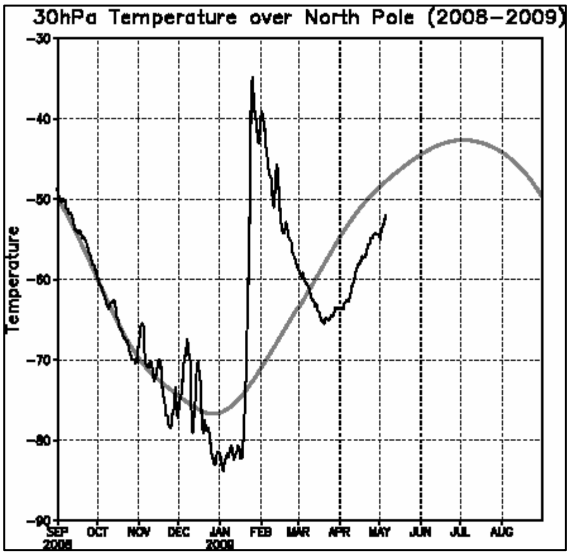

Figure 16 Time series of temperatures at 30-hPa level over the North Pole in winter 2008/2009
The black line shows temperatures for winter 2008/2009. The gray line shows the climatological mean.

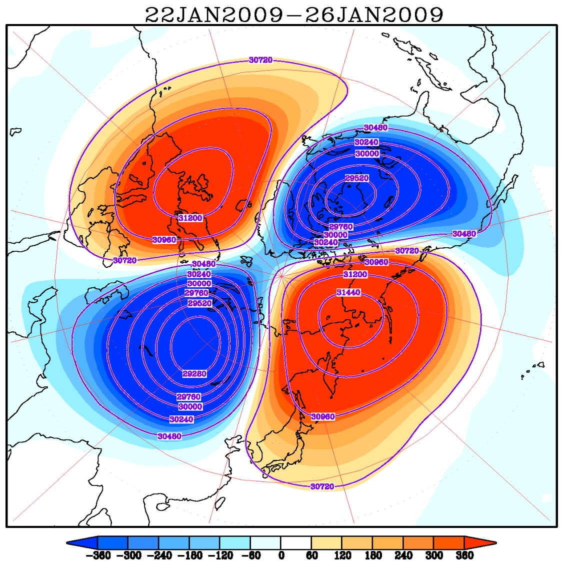

Figure 17 10-hPa Geopotential height (contours) and deviations from its zonal mean (shaded) for 22 – 26 January 2009
The contour interval is 240 m.

Experimental Introduction of ITACS

JMA has developed a useful web-based tool for climate diagnosis referred to as *ITACS*, which stands for Interactive Tool for Analysis of Climate System. ITACS will enable users not only to monitor current climate status but also to analyze the complicated system that lies behind climatic conditions. An experimental version of ITACS will be made available on the TCC website, which is intended for use by National Meteorological and Hydrological Services and related research institutes. For more details, including application, please see http://jra.kishou.go.jp/itacs-info/tcc/conditions.html.

The information available on ITACS includes climatological data such as JRA/JCDAS[*1] as well as data on ocean analysis, sea surface temperatures and monthly world climate data from surface stations. The first three types are produced by JMA. World climate data from surface stations are obtained from CLIMAT messages that JMA receives via the GTS line, and OLR data are provided courtesy of NOAA. All available historical data archived by JMA are used in ITACS, and daily data is updated a few days after observation.

Figure 18 shows the main page of the ITACS tool. The main procedure to create a chart of the user's choice is very straightforward, and involves simply choosing or setting parameters for the chart or statistical analysis and clicking the *Submit* button. Simple charts will be displayed within a few seconds, and the results of statistical analysis will appear within a few minutes. Some graphical parameters for GrADS can also be customized on this page. As shown in Figure 19, regular plane charts as well as vertical cross sections, time cross sections, time series representations and animations can be displayed with a number of ITACS axis options. As an example chart, Figure 20 shows the distribution of correlation coefficients between SST and OLR.

In this way, it has become possible to statistically analyze data using various methods such as correlation analysis, regression analysis, composite analysis and significant testing without the need for troublesome computer programming.

*1 JMA and the Central Research Institute of Electric Power Industry (CRIEPI) conducted a 26-year reanalysis project referred to as JRA-25. Following the completion of JRA-25, JMA also operates a real-time climatic assimilation system known as JCDAS. For details, please see http://jra.kishou.go.jp/JRA-25/index_en.html.

(Shingo Ushida, Climate Prediction Division)

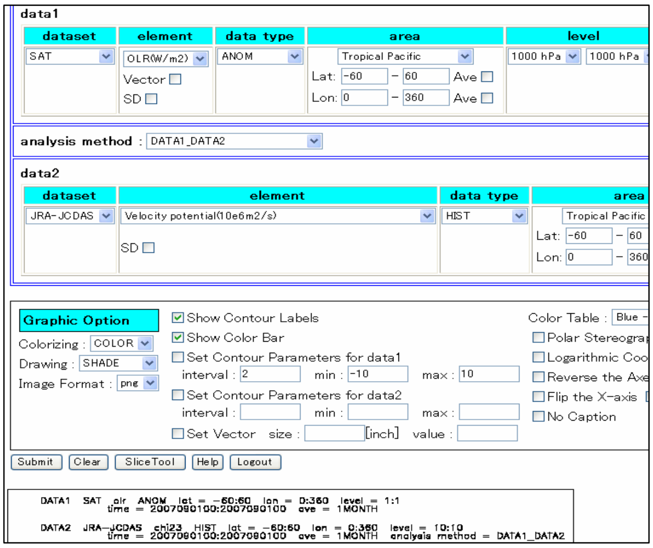

Figure 18 Top page of ITACS

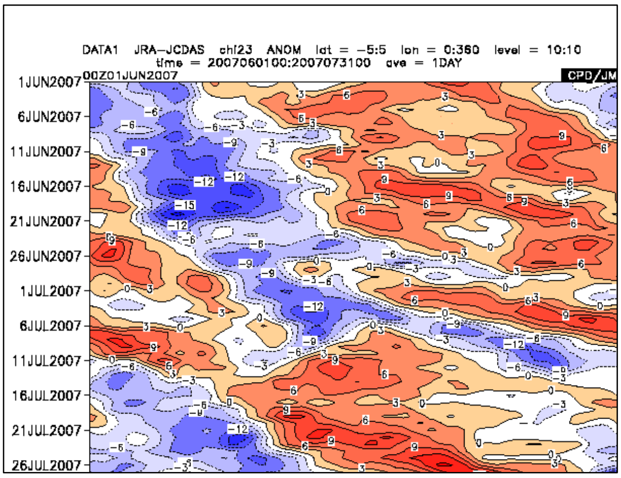

Figure 19 Time-longitude cross section of 200-hPa velocity potential (10˚S – 10˚N)

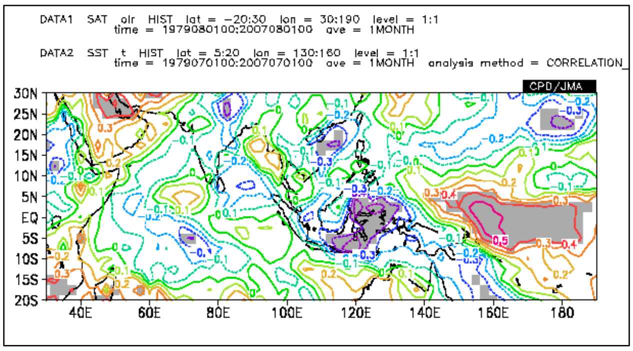

Figure 20 Map showing the correlation between SST values in August around the Philippines (10˚N, 110˚E – 20˚N, 150˚E) and OLR in September

Tokyo Climate Conference - *Better Climate Information for a Safe and Sustainable Society*

JMA will hold the *Tokyo Climate Conference: Better Climate Information for a Safe and Sustainable Society* in Tokyo, Japan, from 6 to 8 July 2009.

This Conference will bring together representatives both from users and providers of climate information and services as well as prominent scientists and experts on climate-related matters. The Conference aims at identifying actions and methods to develop an effective framework involving users and providers to create user-oriented products and promote their utilization, with a focus on the Asia-Pacific region. The results of the Conference are expected to contribute, as inputs from the region, to World Climate Conference-3 to be held in Geneva, Switzerland, from 31 August to 4 September 2009. In order to raise social awareness of climate information usage, an open symposium is scheduled for the final day.

(Kumi Hayashi, Tokyo Climate Center)

Draft Agenda

Monday, 6 July 2009
- Opening ceremony
- Keynote speeches
- Regional climate information: RCC and RCOF
- Best practices of climate information utilization in socio-economic sectors
- International cooperation for enhancement of climate services

Tuesday, 7 July 2009
- Working group discussion
- Summary of working group outcomes
- Draft of Conference Statement

Wednesday, 8 July 2009
- Open symposium
- Approval of Conference Statement

Any comments or inquiries on this newsletter and/or the TCC website would be much appreciated. Please e-mail to: tcc@climar.kishou.go.jp

(Chief Editor: Kumi Hayashi)

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