Tokyo Climate Center, Japan Meteorological Agency

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El Niño Outlook (November 2008–May 2009)

The NINO.3 SST is likely to be near normal in the months ahead. It is unlikely that an El Niño or a La Niña event will develop during autumn and winter.

In October 2008, SST deviation from a sliding 30-year mean SST averaged over the NINO.3 region was –0.2°C. The five-month running mean value of the NINO.3 SST deviations for August was +0.2°C. In October, positive SST anomalies were found in the western equatorial Pacific, and negative SST anomalies were found in the central part (Figure 1a). Negative subsurface temperature anomalies were found in the central to eastern parts, and positive anomalies were found in the western part (Figure 2). In the equatorial Pacific, convective activities around the date line were below normal, and easterly wind anomalies were found in the lower troposphere in October (Figure 1b).

SST averaged over the NINO.3 region has been near normal since September. Negative subsurface temperature anomalies in the central Pacific propagated eastward, which resulted in a slight weakening of positive SST anomalies in the eastern part.

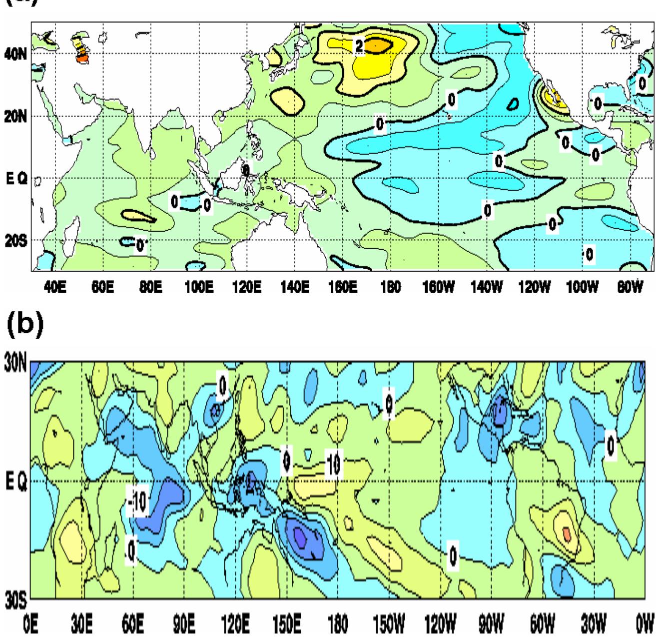


Figure 1 Monthly mean conditions of the Pacific and Indian Ocean sectors in October 2008 for (a) sea surface temperature (SST) anomalies and (b) outgoing long wave radiation (OLR) anomalies
Contour intervals are 0.5°C in (a) and $10W/m^2$ in (b). The base periods for the normal are 1971–2000 in (a) and 1979–2004 in (b).

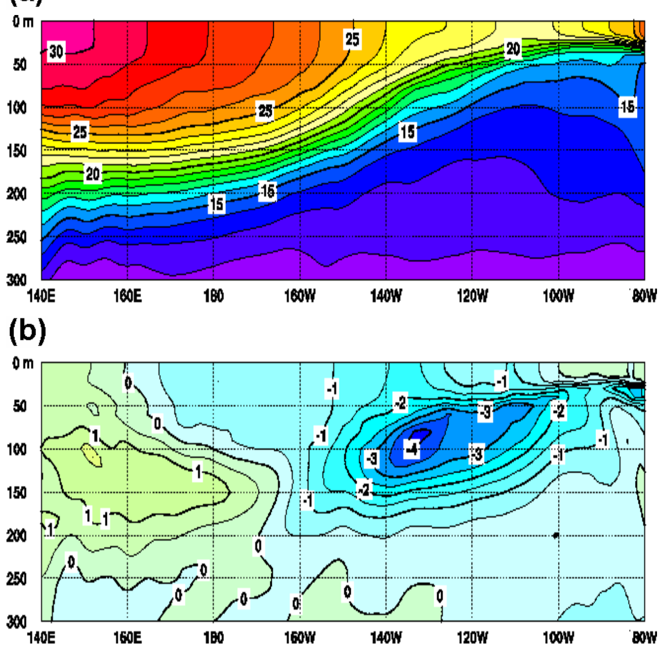


Figure 2 Monthly mean depth-longitude cross sections of (a) temperature and (b) temperature anomalies in the equatorial Pacific for October 2008
Contour intervals are 1°C in (a) and 0.5°C in (b). The base period for the normal is 1979–2004.

JMA's El Niño forecast model predicts that the NINO.3 SST will temporarily fall to approximately 0.5°C below normal, and will then will remain near normal for most of the prediction period (Figure 3).
Considering all the above factors, the NINO.3 SST is likely to be near normal in the months ahead. It is unlikely that an El Niño or a La Niña event will develop during autumn and winter.

(Ikuo Yoshikawa, Climate Prediction Division)

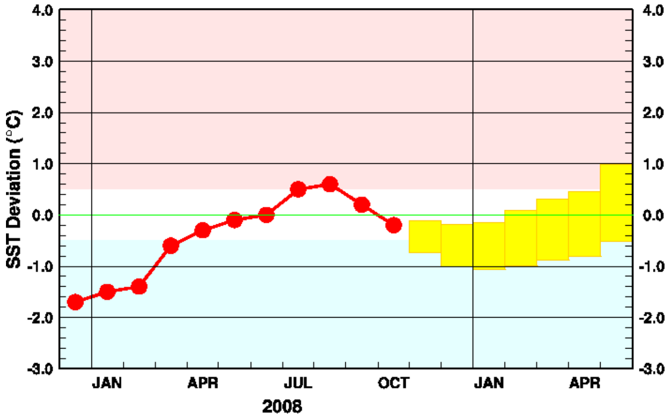


Figure 3 Outlook of SST deviation for NINO.3 by the El Niño forecast model
This figure shows a time series of the monthly SST deviation for NINO.3 (5°N–5°S, 150°W–90°W). The red line shows the observed SST deviation, while the yellow boxes show the SST deviation for the next six months predicted using the El Niño forecast model. Each box denotes the range of the predicted SST deviation with a probability of 70%.

JMA’s Seasonal Numerical Ensemble Prediction for Winter 2008/2009

In winter 2008/2009, active convection is predicted in the western tropical Pacific and the Indian Ocean, while inactive convection is predicted from the central part of the tropical Pacific to the eastern Philippines. In the middle and high latitudes, a positive Arctic Oscillation (AO)-like pattern is predicted, and the Aleutian low is predicted to be weaker than normal, which is consistent with the AO-like pattern. This implies that a cold air mass is unlikely to advance southward from the high latitudes to East Asia.

1. Introduction

This report introduces JMA’s seasonal numerical ensemble prediction for winter 2008/2009 (December–February), which was used as one of the prognostic tools for the Agency’s operational cold-season outlook issued on 23 October 2008. The prediction consists of 51 ensemble members with an initial date of 17 October 2008, and employs a two-tier method: first, global SSTs are predicted using a combination of persisted anomalies, climatology and prediction 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 predicted global SST anomalies, followed in Section 3 by a description of the predicted circulation fields in the tropics and sub-tropics associated with those 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 September 2008, SSTs in the equatorial Pacific were below normal in the central part and above normal in the western and eastern parts. The monthly SST anomaly in the NINO.3 region, which JMA uses as an El Niño monitoring index, was neutral (+0.2). According to JMA’s El Niño outlook, the NINO.3 SST is likely to be near normal, suggesting it is unlikely that an El Niño or a La Niña event will develop during winter 2008/2009.

The SST anomalies used in JMA’s seasonal numerical ensemble prediction system are shown in Figure 4. SSTs are predicted to be above normal in the western and eastern parts of the equatorial Pacific and below normal in the central part. Above-normal SSTs are also expected in the Indian Ocean and the Atlantic.

3. Circulation fields in the tropics and sub-tropics (Figure 5)

In the tropical Pacific, precipitation is predicted to be above normal in the eastern Maritime Continent and below normal from the central part to the eastern Philippines. In the Indian Ocean, precipitation is predicted to be above normal in the central-western part and below normal from the eastern part of the Indian Ocean to the western part of Australia. Upper tropospheric velocity potential anomalies are negative (i.e. more divergent) over the Indian Ocean and around Indonesia, and positive (i.e. more convergent) around the dateline over the equatorial Pacific, reflecting the precipitation anomaly patterns in the tropics. In the upper troposphere, anti-cyclonic circulation anomalies are predicted from West to South Asia. Cyclonic anomalies are found from Southeast Asia to the North Pacific. In the lower troposphere, anti-cyclonic anomalies are found in the eastern Philippines and the sub-tropical high region of the North Pacific.

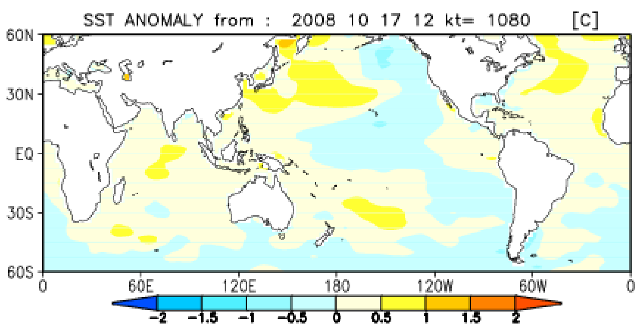


Figure 4 Predicted SST anomalies for 2008/2009 DJF

4. Circulation fields in the middle and high latitudes of the Northern Hemisphere (Figure 6)

Predicted 500 hPa height anomalies are generally positive in the mid-latitudes. In particular, significantly positive anomalies are found in the central North Pacific. Meanwhile, negative anomalies are found in the Arctic region, showing similarity to a positive phase of the Arctic Oscillation (AO). In Eurasia, positive anomalies are found in Europe, negative ones in western Siberia and positive ones in East Asia indicating a positive phase of the EU pattern. Positive sea level pressure anomalies are predicted in the Aleutian low region, and negative ones in the Icelandic low region. This implies that a cold air mass is unlikely to advance southward from the high latitudes to East Asia. However, the hindcast indicates that prediction accuracy in the middle and high latitudes using indicators such as the AO pattern is not so high, suggesting that the model results should be interpreted with caution.

(Masayuki Hirai, Climate Prediction Division)

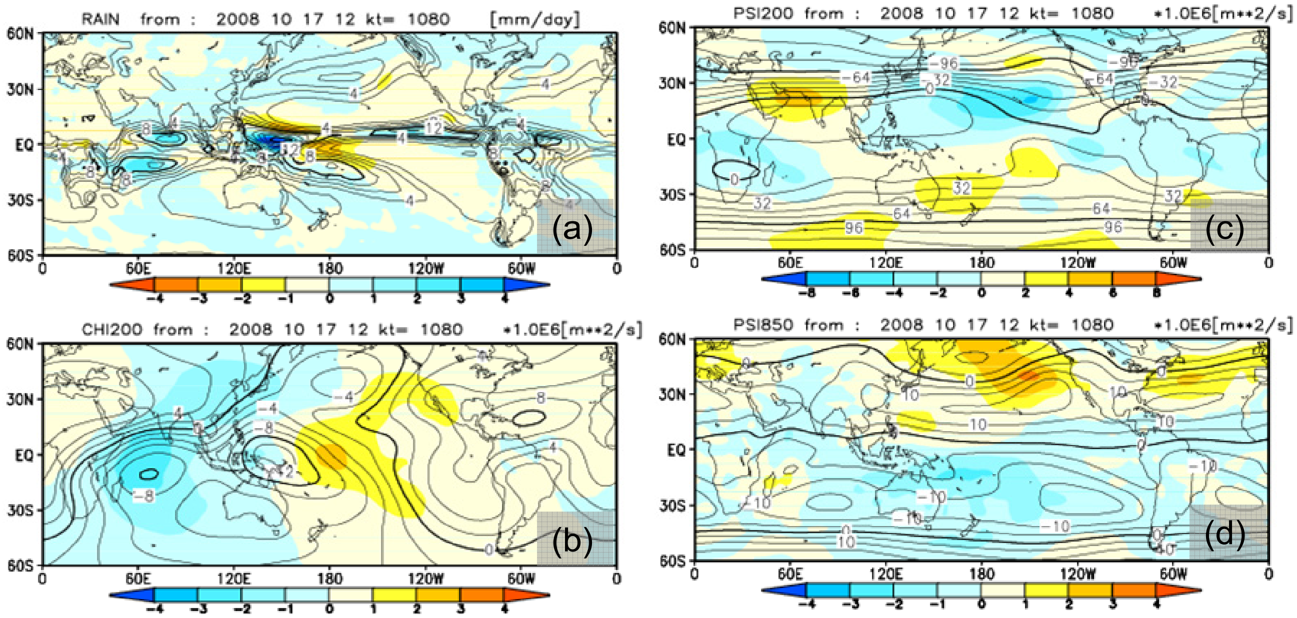


Figure 5 Predicted atmospheric fields in the tropics and sub-tropics for 2008/2009 DJF (ensemble mean of 51 members)
(a) Precipitation (contours) and anomaly (shaded). The contour interval is 2 mm/day.
(b) Velocity potential at 200 hPa (contours) and anomaly (shaded). The contour interval is 2×10^6 m^2/s.
(c) Stream function at 200 hPa (contours) and anomaly (shaded). The contour interval is 16×10^6 m^2/s.
(d) Stream function at 850 hPa (contours) and anomaly (shaded). The contour interval is 5×10^6 m^2/s.

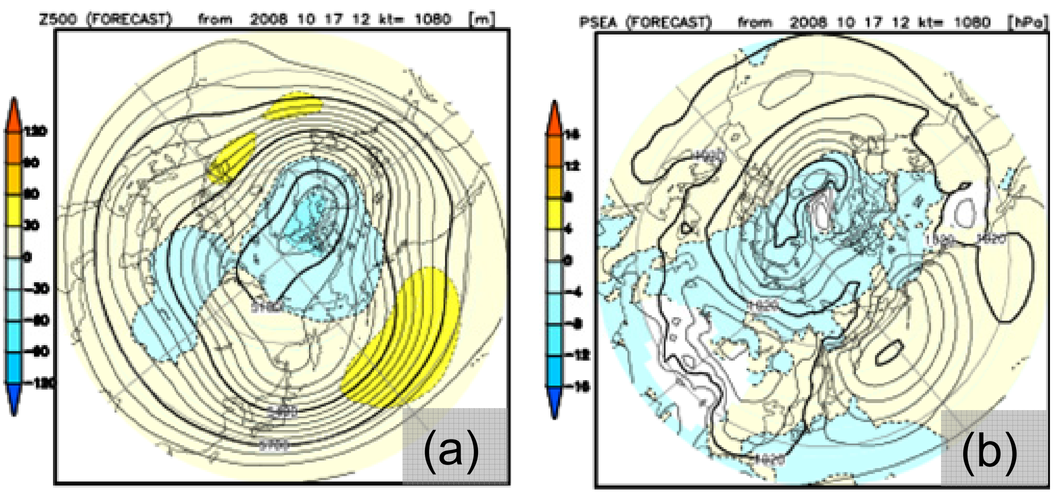


Figure 6 Predicted atmospheric fields in the middle and high latitudes of the Northern Hemisphere for 2008/2009 DJF (ensemble mean of 51 members)
(a) 500 hPa height (contours) and anomaly (shaded). The contour interval is 60 m.
(b) Sea level pressure (contours) and anomaly (shaded). The contour interval is 4 hPa.

Cold-season Outlook for Winter 2008/2009 in Japan

JMA's seasonal forecast for winter 2008/2009, issued on 25 September 2008, indicates above-normal temperatures with a 50% probability in Okinawa/Amami, and both near-normal and above-normal temperatures with a 40% probability for each in western and eastern Japan.

1. Long-term trend and decadal variation

Long-term upward trends are clear in winter (December-January-February) mean temperatures over Japan except for the northern area of the country. In this region, the winter mean temperature shows large year-to-year fluctuations, while mean temperatures have been near normal over the last ten winters. Winter precipitation has tended to be above normal on the Pacific side of northern, eastern and western Japan since the end of 1990s. In line with the global warming trend, winter mean 500 hPa height anomalies over the last decade are positive in most of the Northern Hemisphere. However, they are negative in the northern part of the North Pacific, including northern Japan. This implies that the large-scale anomaly has affected the recent climate in northern Japan, where mean temperatures have been near normal over the last ten winters (which is inconsistent with the global warming trend). The tropospheric thickness temperature averaged over the mid-latitudes of the Northern Hemisphere (30–50°N), which is positively correlated with temperatures in Japan, has tended to be above normal since 2006.

2. Oceanic conditions

Although the SST averaged over the NINO.3 region was above normal in August 2008, the conditions of subsurface temperatures and atmospheric circulation in the equatorial Pacific showed no signs of SST anomalies increasing further in the central and eastern equatorial Pacific. JMA's El Niño forecast model predicts that the NINO.3 SST will be near normal during the prediction period. Considering the above factors, the NINO.3 SST is likely to be near normal in the months ahead. It is unlikely that an El Niño or a La Niña event will develop during autumn and winter. Since El Niño and La Niña are the most important climate indicators for seasonal prediction and they are unlikely to develop during winter, high predictability is not expected for the coming cold season.

In recent years, above-normal SST anomalies have persisted in the equatorial western Pacific. In addition, El Niño (an event that tends to lower SST anomalies in the equatorial western Pacific) is unlikely to develop, as described above. Accordingly, it is likely that positive SST anomalies in the region will persist during the winter. SST anomalies in the region are positively correlated with the strength of the winter monsoon, and negatively correlated with temperature anomalies in Japan.

Due to the La Niña that faded out last spring, the global mean SST anomaly was near normal during last winter and spring. However, the value has risen rapidly in recent months, and it is likely that the global mean SST will be above normal during winter.

3. Numerical Prediction

The SST anomaly pattern fed into the atmospheric global model is similar to that of the mean SST anomaly pattern over the last ten winters (i.e. above normal in the western Pacific, the sub-tropical central North Pacific, the Indian Ocean and the Atlantic Ocean, and below normal in the equatorial central Pacific and the northern part of the North Pacific).

In association with the SST anomaly pattern, the ensemble averaged atmospheric circulation anomaly pattern predicted by the model is also similar to that of the mean circulation anomaly pattern in the tropics and sub-tropics over the last ten winters (i.e. anti-cyclonic circulation anomalies in the upper troposphere along the southern part of the Eurasian continent and in the central and eastern North Pacific). The former anomaly extends to eastern Japan. Between the two anti-cyclonic circulation anomalies, a cyclonic circulation anomaly is predicted to the east of Japan. This result clearly indicates that the greatest signal for winter prediction comes from the long-term trend including decadal variations.

In the mid- and high-latitudes, a positive phase of the Arctic Oscillation (AO) is predicted. This phase tends to bring a moderate winter monsoon and above-normal temperatures in northern Japan. However, the spread among ensemble members is large, and the hindcast (22 years from 1984 to 2005) shows low AO predictability.

4. Conclusion

Numerical prediction suggests that above-normal winter temperatures can be expected nationwide. However, considering the low predictability of the AO and long-term trends, it is likely that temperatures in northern Japan will be lower than the numerical prediction indicates. The positive SST anomaly in the equatorial western Pacific supports this modification.

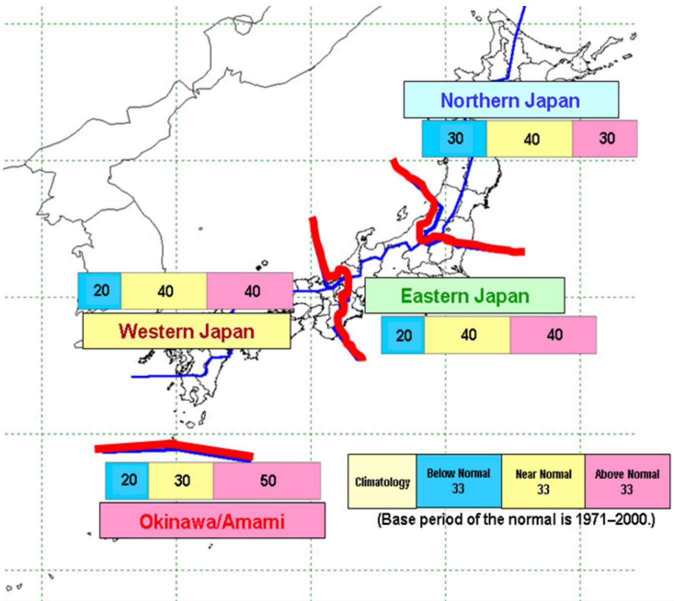
5. Outlook summary

JMA's cold-season outlook indicates above-normal temperatures with a 50% probability in Okinawa/Amami, and both near-normal and above-normal temperatures with a 40% probability for each in western and eastern Japan. It also suggests both near-normal and below-normal seasonal snowfall amounts on the Sea of Japan side with a 40% probability for each.

Note:

Since the AO is predicted to be negative in December according to JMA's latest one-month forecast (issued on 21 November 2008), below-normal December temperatures are probable nationwide. Consequently, JMA's latest three-month forecast (issued on 25 November 2008) predicts that temperatures for winter 2008/2009 will be both near-normal and above-normal with a 40% probability for each in Okinawa/Amami, while no significant features are seen for western and eastern Japan.

(Shuhei Maeda, Climate Prediction Division)



Summary of the 2008 Asian Summer Monsoon

1. Monsoon activities and atmospheric circulation

Asian summer monsoon activities inferred from the seasonal mean (i.e. from June to September) Outgoing Longwave Radiation (OLR) were enhanced from the Arabian Sea to the Bay of Bengal and from northern Vietnam to the northern part of the South China Sea (Figures 7 and 8). On the other hand, they were suppressed at around 10°N in the northwestern Pacific monsoon region, and they were remarkably suppressed from July to August. Consequently, remarkable anti-cyclonic circulation anomalies were observed in the lower troposphere of this region (Figure 8b). The Tibetan high was stronger than its climatological condition due to strong Asian summer monsoon activities (Figure 8a). Nevertheless, the northeastward extension of the Tibetan high was weaker than its climatological condition, corresponding to a westward shift of active convections in the Asian summer monsoon region.

In mid-June, an area of active convection moved northward to around the Indian subcontinent after the active phase of the Madden Julian Oscillation (MJO) passed over the western Indian Ocean (Figure 9). From late June to mid-July, convective activities were suppressed across wide areas from the Arabian Sea to the central Pacific. From late July to early August and in early September, northward movements of active convections were clearly observed, while convective activities were extraordinarily suppressed in the second half of August in the Indian Ocean.

As described above, the persistence of the enhanced convective activities was not observed from June to August in the northwestern Pacific monsoon region. However, convective activities, particularly in July, were sometimes found to be enhanced due to the southward penetration of upper cold vortexes from the mid-latitudes, which resulted in the formation of typhoons around the Philippines. When these typhoons moved northwestward to China, anti-cyclonic circulation anomalies in the lower troposphere intensified over western Japan (Figure 10).

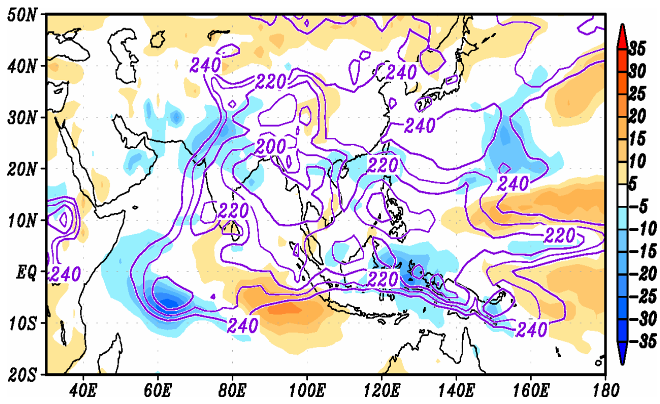


Figure 7 Four-month mean OLR and its anomaly in June–September 2008
Solid lines indicate OLR (W/m^2) with a contour interval of 10 W/m^2, and color shadings indicate OLR anomalies.

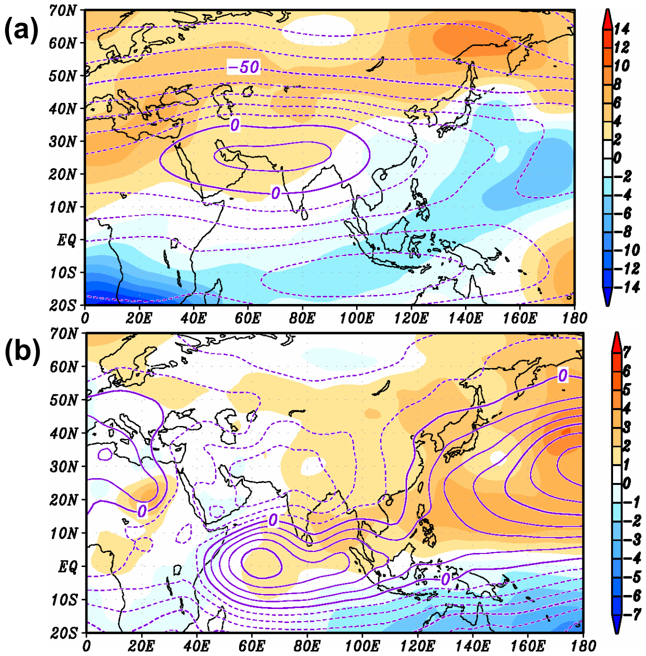


Figure 8 Four-month mean stream function and its anomaly in June–September 2008
(a) Contours indicate 200-hPa stream function (m^2/s) at intervals of 10×10^6 m^2/s, and color shading indicates 200-hPa stream function anomalies (2×10^6 m^2/s). (b) Contours indicate 850-hPa stream function (m^2/s) at intervals of 2.5×10^6 m^2/s, and color shading indicates 850-hPa stream function anomalies (1×10^6 m^2/s).

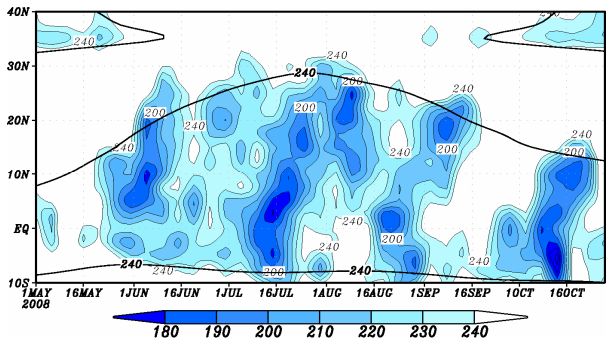


Figure 9 Latitude-time cross section of the five-day mean OLR from 31 May to 1 November 2008 (65–85°E mean)
The thick black lines indicate the climatological mean OLR for the period from 1979 to 2004. Shadings indicate the OLR in 2008 (W/m^2).

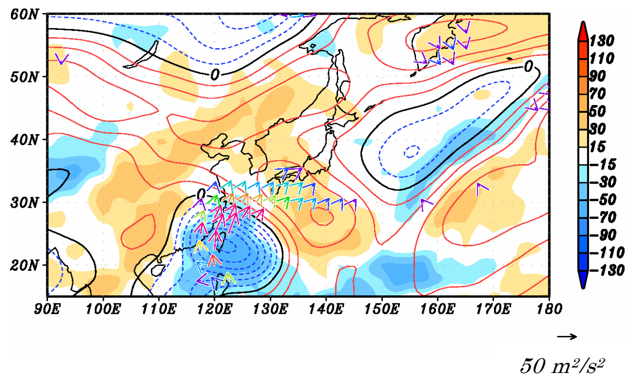


Figure 10 Five-day mean 850-hPa wave activity flux, stream function anomaly and OLR anomaly from 25–29 July 2008
Vectors indicate the horizontal component of 850-hPa wave activity flux (m^2/s^2). Contours indicate 850-hPa stream function anomaly in an interval of 1×10^6 m^2/s. Shadings indicate OLR anomaly (W/m^2). Wave activity flux is calculated based on Takaya and Nakamura, 2001, J. Atmos. Sci., 58, 608-627.

2. Precipitation, temperature and extreme events

Total precipitation amounts based on CLIMAT reports during the monsoon season (June–September) were above normal in southern Asia, and in particular were above 120% of the normal in southeastern China, Pakistan, Malaysia and northern Indonesia. Conversely, they were below 80% of the normal in western Japan and northeastern/northwestern China (Figure 11). These figures are mostly consistent with the distribution of OLR anomalies (Figure 7).

In June, monthly precipitation amounts were extremely heavy around eastern Mongolia and from Pakistan to southwestern China, and were extremely light from southeastern Siberia to northern Japan. In July, the amounts were extremely light in western Japan.

In the area of monsoon activity, a stationary front caused more than 60 fatalities in southern China in June. In India, torrential monsoon rains from June to September caused more than 2,700 fatalities, mainly in northern India.

Four-month mean temperatures for the same period were higher than normal over most of eastern Asia, and their anomalies were more than 1°C in inland areas (Figure 12). Conversely, they were slightly lower than normal in most of southern Asia.

Monthly temperatures were extremely high in and around Mongolia in June, July and September, and in southern China in September. Meanwhile, temperatures were extremely low from southern China to the Indochina Peninsula in June.

3. Tropical cyclones

From June to September 2008, 11 tropical cyclones of tropical storm (TS) intensity or higher formed over the western North Pacific (Figure 11, Table 1). This was lower than the 1971–2000 average of 16.3. More than half of them moved northwest passing over or to the north of the Philippines and approached/made landfall on southern China. Two of them passed over the south of the main islands of Japan.

In the Philippines, Typhoon FENGSHEN caused more than 780 fatalities in June, and Typhoon KALMAEGI also caused damage in July. In August, Severe Tropical Storm (STS) KAMMURI caused more than 120 fatalities in Vietnam and floods over wide areas of the Mekong River basin including Thailand and Laos. In September, Typhoon HAGUPIT caused more than 50 fatalities in total in China and Vietnam, and TS MEKKHALA caused damage in Vietnam and Thailand.

Note: Disaster information is based on reports by governmental organizations (China, India and Japan) and UN organizations (IRIN and OCHA-Kobe).

(1 Yayoi Harada, 2-3 Hidehiko Isobe, Climate Prediction Division)

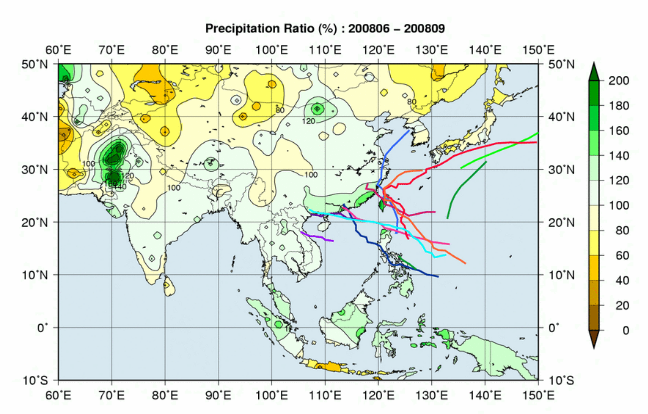


Figure 11 Four-month precipitation ratio (%) and tropical cyclone tracks in the northwestern Pacific from June to September 2008

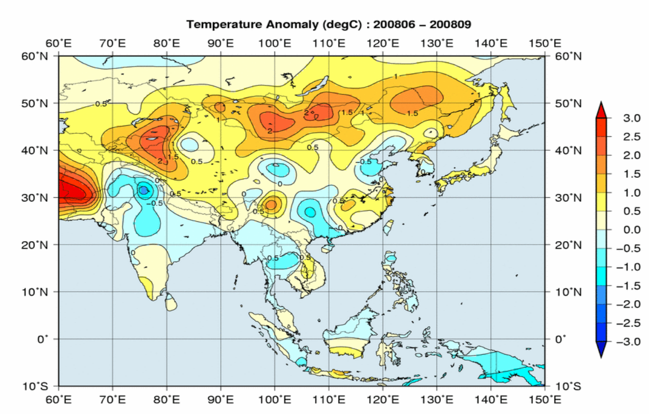


Figure 12 Four-month mean temperature anomaly (°C) from June to September 2008

Table 1 Tropical cyclones that approached/made landfall on East and Southeast Asia from June to September 2008

ID Number	Name	Date (UTC)	Category[1)]	Maximum winds[2)] (Knots)
T0806	FENGSHEN	6/19–6/25	TY	90
T0807	KALMAEGI	7/15–7/18	TY	65
T0808	FUNG-WONG	7/25–7/29	TY	75
T0809	KAMMURI	8/5–8/7	STS	50
T0810	PHANFONE	8/10–8/11	STS	50
T0811	VONGFONG	8/15–8/17	STS	50
T0812	NURI	8/17–8/22	TY	75
T0813	SINLAKU	9/8–9/20	TY	100
T0814	HAGUPIT	9/19–9/24	TY	90
T0815	JANGMI	9/24–9/30	TY	115
T0816	MEKKHALA	9/29–9/30	TS	45

Note: Tentatively prepared by the RSMC-Typhoon Center

1) Intensity classification of tropical cyclones
TS: Tropical Storm
STS: Severe Tropical Storm
TY: Typhoon
2) Estimated maximum 10-minute mean winds

Summary of the Antarctic Ozone Hole in 2008

The Antarctic ozone hole in 2008 was slightly larger than its average over the last ten years.

The Antarctic ozone hole is defined as the area where the total ozone column is equal to or less than 220 m atm-cm. According to JMA's analysis of satellite data supplied by the National Aeronautics and Space Administration (NASA), the area of the Antarctic ozone hole was slightly larger than its average over the last ten years. The conditions of the ozone hole in 2008 are summarized as follows:

- *Area: 26.5 million km^2 (peaked on 12 September, 1.9 times as large as the Antarctic Continent)*
- *Ozone deficit: 94.2 million tons (peaked on 3 October)*

Figure 13 shows daily changes in the area of the ozone hole in 2008 (left) and its annual maximum area since 1979 (right). The five spheres show total ozone column distributions in the Southern Hemisphere with the ozone hole shown in gray. According to *WMO/UNEP Scientific Assessment of Ozone Depletion: 2006*, the Antarctic ozone hole is expected to continue for decades and Antarctic ozone abundances are projected to return to pre-1980 levels around 2060–2075.

(Nagatoshi Inoue, Ozone Layer Monitoring Office, Atmospheric Environment Division)

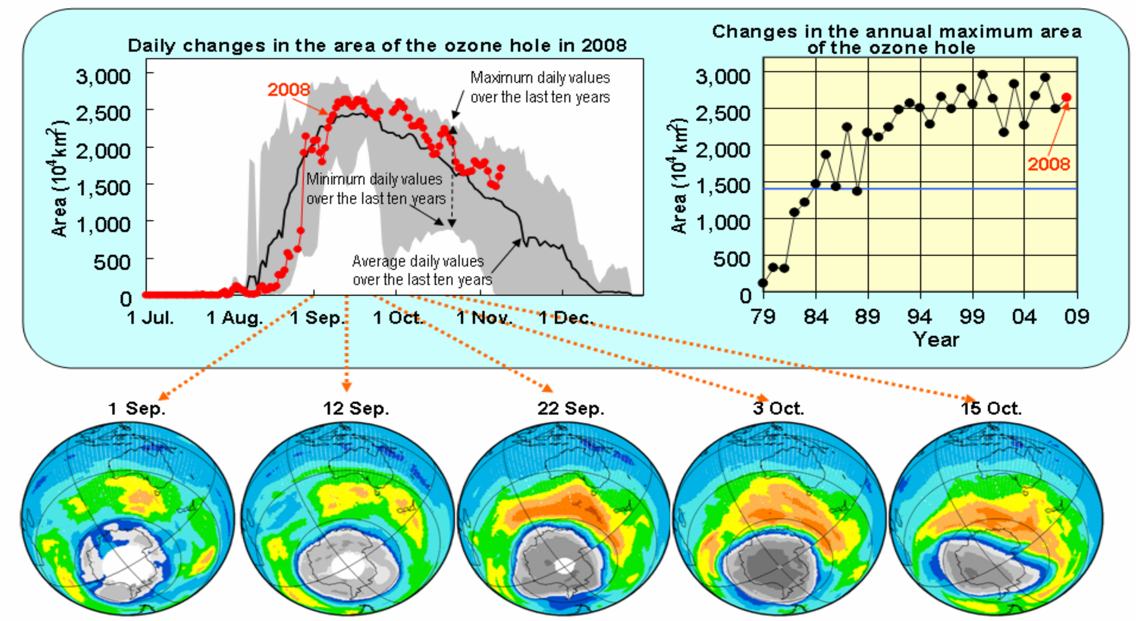


Figure 13 Daily changes in the area of the ozone hole in 2008 (left) and changes in its annual maximum area since 1979 (right), and total ozone distributions in the Southern Hemisphere on the indicated dates (bottom)
The Antarctic ozone hole is shown in gray, and white areas indicate missing data due to the polar night. These figures and distributions were produced from TOMS and OMI data supplied by NASA.

Training Seminar on Climate Information and Forecasting and the Ninth Joint Meeting for the Seasonal Prediction of the East Asian Winter Monsoon

The Training Seminar on Climate Information and Forecasting was held at JMA Headquarters in Tokyo from 4 to 6 November 2008, followed by the Ninth Joint Meeting for the Seasonal Prediction of the East Asian Winter Monsoon from 6 to 7 November 2008.

The Training Seminar was attended by 13 participants from 12 countries and regions engaged in operational long-range forecasting at NMHSs in East and Southeast Asia. Through lectures and exercises using PCs, the participants learned how to use data and products available on the TCC web page for long-range forecast.

At the Joint Meeting, more than 30 participants from NMHSs in East and Southeast Asia discussed the latest outlook for the 2008–2009 winter monsoon and exchanged information on and knowledge of the East Asian Winter Monsoon system, the El Niño/La Niña outlook, long-term trends and decadal variability and seasonal outlooks using statistical and dynamical forecast models.

As a conclusion to the meeting, the participants agreed that enhancing the exchange of seasonal forecast products and information made by NMHSs should be considered in order to improve the capabilities of seasonal forecasting and meet the needs of users.

(Kumi Hayashi, Climate Prediction Division)

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

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