Tokyo Climate Center, Japan Meteorological Agency

TCC News

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Contents

El Niño Outlook (April–October 2008)

The NINO.3 sea surface temperature (SST) is likely to gradually come closer to normal in the months ahead. The current La Niña event is expected to proceed to termination by summer.

In March 2008, SST deviation from a sliding 30-year mean SST averaged over the NINO.3 region was -0.6°C. The five-month running mean value of the NINO.3 SST deviations for January was -1.4°C, and SSTs were remarkably below normal in the central equatorial Pacific in March (Figure 1a). Compared to February, subsurface negative temperature anomalies weakened through the central and eastern parts in March, while prominently positive temperature anomalies persisted in the western part (Figure 2). Convective activities were below normal near the dateline (Figure 1b). In the central equatorial Pacific, westerly wind anomalies in the upper troposphere and easterly wind anomalies in the lower troposphere were found.

While La Niña conditions persisted in the equatorial Pacific, subsurface waters in the western equatorial Pacific remained substantially warmer than normal as in February. It is likely that these warm waters will migrate eastward and further weaken the negative SST anomalies in the central and eastern parts.

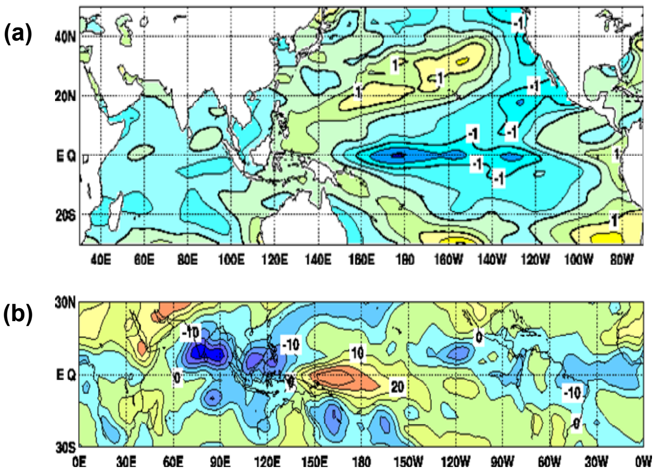


Figure 1 Monthly mean conditions of the Pacific and Indian Ocean sectors in March 2008 for (a) sea surface temperature (SST) anomalies and (b) outgoing longwave radiation (OLR) anomalies
Contour intervals are 0.5°C in (a) and 100 W/m^2 in (b). The base periods for the normal are 1971–2000 in (a) and 1979–2004 in (b).

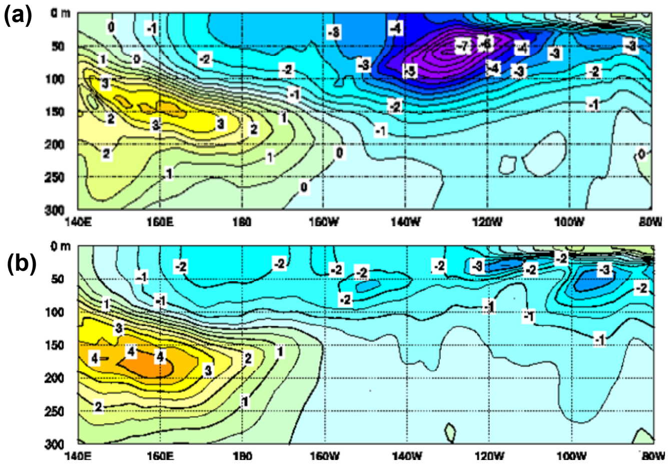


Figure 2 Monthly mean depth-longitude cross sections of temperature anomalies in the equatorial Pacific for (a) February and (b) March 2008
Contour intervals are 0.5°C. The base period for the normal is 1979–2004.

JMA's El Niño forecast model predicts that the NINO.3 SST will come closer to normal during spring, and that it will be near normal during summer (Figure 3).

Considering all the above factors, the NINO.3 SST is likely to gradually come closer to normal in the months ahead, and the La Niña event is expected to proceed to termination by summer.

(Ichiro Ishikawa, Climate Prediction Division)

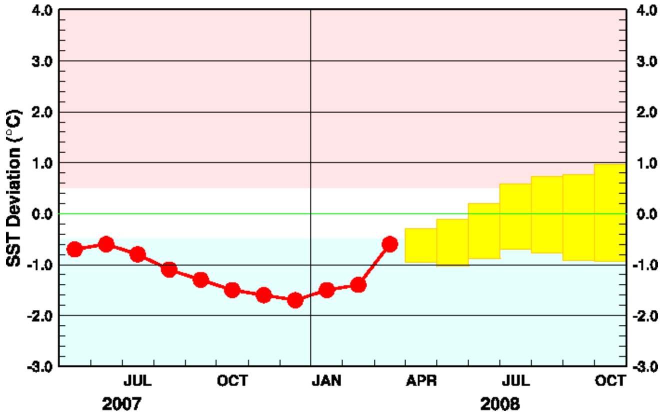


Figure 3 Outlook of SST deviation for NINO.3 obtained using the El Niño forecast model

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 indicates 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 Summer 2008

In summer 2008, slightly active Asian monsoon conditions are predicted by JMA’s seasonal numerical ensemble prediction system. The results should be interpreted with caution due to the system’s insufficient ability to predict SSTs and precipitation in the Asian monsoon region.

1. Introduction

This report introduces JMA’s seasonal numerical ensemble prediction for summer 2008 (June–August, JJA), which was used as one of the prognostic tools for JMA’s operational warm season outlook issued on 25 April 2008. The prediction consists of 51 ensemble members with an initial date of 18 April 2008, and employs a two-tier method: first, global SSTs are predicted using a combination of persistent 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 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 (Figure 4)

During summer 2008, SSTs in the equatorial Pacific are predicted to be slightly above normal in the western and eastern parts, while negative anomalies are predicted in the central part. Positive anomalies will be seen over the Pacific in the mid-latitudes of both the Northern and Southern Hemispheres. This anomaly pattern is similar to those typically observed during La Niña events. It should be noted that JMA’s El Niño Outlook shows that the La Niña event will proceed to termination by summer. However, the predicted SST anomaly patterns described above may be caused by the characteristics of the aforementioned two-tier method for SST prediction used in JMA’s seasonal numerical ensemble prediction system. In the Indian Ocean, SSTs are predicted to be near normal in general, and slightly above normal in the eastern part. Slightly positive SST anomalies are predicted in the Atlantic.

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

In tropical and sub-tropical regions, above-normal precipitation is predicted over the western North Pacific region and the Indian summer-monsoon region. It is predicted that the Intertropical Convergence Zone (ITCZ) will shift slightly northward from its normal position. Below-normal precipitation is predicted around the equator between 150˚E and 160˚W, and around 130˚W over the ITCZ. Over the Atlantic, slightly above-normal precipitation is predicted. Although above-normal precipitation is also seen in the equatorial Indian Ocean, the hindcast indicates that the capacity to forecast rainfall is generally not so high in this area, suggesting that the results should be interpreted with caution.

Consistent with the precipitation pattern, the upper-tropospheric velocity potential anomalies are negative (more divergent) over the Maritime Continent and the Indian Ocean. Positive (more convergent) anomalies are predicted over the tropical eastern Pacific.

In the upper troposphere, cyclonic circulation anomalies

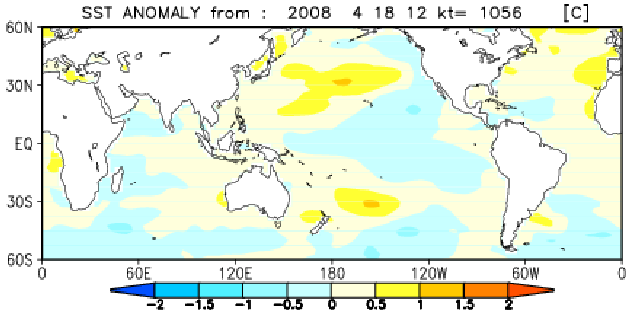


Figure 4 Predicted SST anomalies for 2008 JJA

are located over both the north and south areas of the central and eastern Pacific, while anti-cyclonic circulation anomalies are located poleward of each cyclonic anomaly. Such anomaly patterns are often seen during La Niña events. However, the amplitudes of these anomalies are very small at this time. While patterns typical of La Niña events are not observed in the lower troposphere, they are seen to a small extent in the upper troposphere. The Tibetan High is predicted to be stronger, which may be related to the negative anomalies of the upper-tropospheric velocity potential over the Indian Ocean.

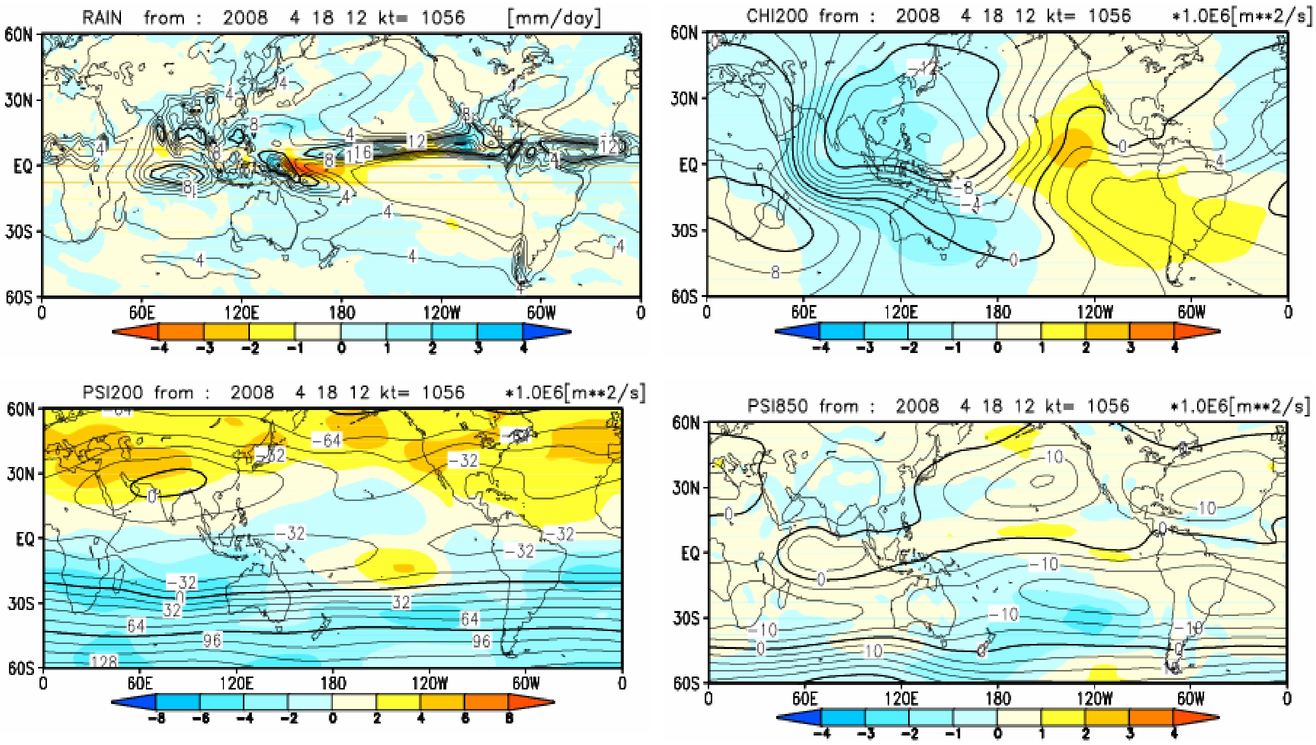


Figure 5 Predicted atmospheric fields for JJA 2008 (ensemble mean of 51 members)

(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 200 hPa (contours) and anomaly (shaded). The contour interval is 5×10^6 m^2/s.

4. Circulation fields in the middle and high latitudes of the Northern Hemisphere (Figures 6 and 7)

The ensemble prediction forecasts that summer mean 500-hPa height anomalies will be above normal over most parts of the Northern Hemisphere. These large-scale positive anomalies might be explained by the leading modes of low-frequency atmospheric variability in boreal summer, i.e., EOF1 and EOF2 of 500-hPa height anomalies in JJA. The EOF1 (EOF2) scores derived from different members are biased negatively (positively), which indicates that positive anomalies would be dominant in the mid-latitudes of the Northern Hemisphere. On the other hand, below-normal anomalies are predicted over the western and central Pacific and the northern part of the African continent at around 25°N. Below-normal anomalies over the western and central Pacific may be explained by the positive SST anomalies around the region, which could produce positive anomalies of convective precipitation in the model simulations.

(Akihiko Shimpo, Climate Prediction Division)

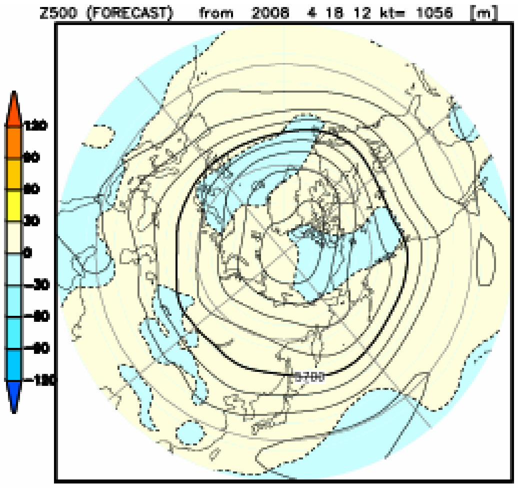


Figure 6 Predicted 500-hPa height in the Northern Hemisphere for JJA 2008 (ensemble mean of 51 members)
The contour interval is 60 m. Anomalies are shaded.

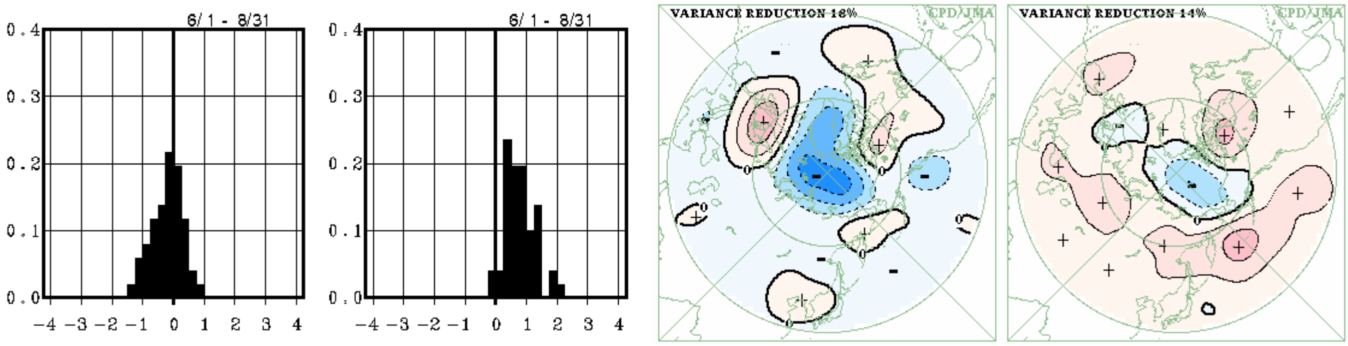


Figure 7 Histogram of JJA 2008 prediction (a) EOF1 and (b) EOF2 scores defined by the (c) first and (d) second EOFs of 500hPa height anomalies in the Northern Hemisphere

Warm Season Outlook for Summer 2008 in Japan

For 2008 summer in Japan, mean temperatures are likely to be near normal or above normal in most regions. The warm season and rainy season (Bai-u) precipitation amounts have no particular conditions for all regions.

For summer 2008 in Japan, mean temperatures are likely to be near normal or above normal in most regions. For all regions, the precipitation amount outlook for the warm season and rainy season (Baiu) has no significant features.

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/outlook3w.html.

2. Outlook background

Long-term upward trends are clear in the summer (June–August) mean temperatures over Japan except for northern Japan, where the summer mean temperature has large year-to-year fluctuations (generally above normal in recent years, but below normal in some years). The tropospheric thickness temperature averaged over the mid-latitudes of the Northern Hemisphere (30–50°N) tends to be above normal. Oceanic conditions in the equatorial Pacific are likely to come gradually closer to normal in the months ahead, and JMA's El Niño forecast model also predicts that the NINO.3 SST anomalies will gradually come closer to normal toward this summer. The La Niña event will therefore proceed to termination by summer. JMA’s seasonal forecast model predicts that convective activities will be generally positive over the tropical ocean except in the central and eastern equatorial Pacific. In regard to extra-tropical circulation, positive convective activities will lead to the northward shift of the subtropical jet stream, and 500-hPa height anomalies and 850-hPa temperature anomalies will be positive over almost the whole Northern Hemisphere. Considering that these positive anomalies will cover the Asia-Pacific region, the summer mean temperature base is predicted to be higher than normal. The objective forecast based on the seasonal prediction model’s output shows a larger probability of above-normal temperatures in Japan. However, a positive sea-level pressure anomaly is 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)

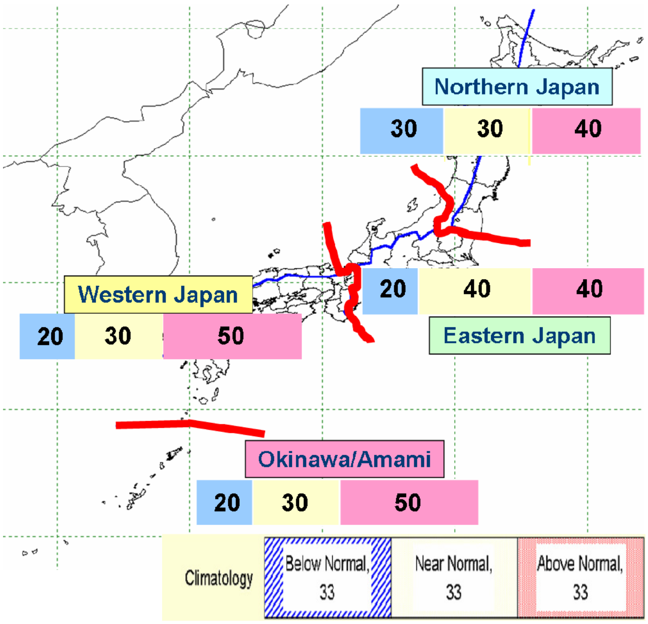


Figure 8 Seasonal mean temperature probabilities for summer (June–August) 2008

Summary of Asian Winter Monsoon 2007/2008
- Extremely low temperatures in Asia

Surface climate conditions

In winter 2007/2008, Asian countries experienced extremely low temperatures.

Figure 9 shows the seven-day mean temperature anomalies from December 2007 to February 2008. At first, extremely low temperatures were observed in central Asia from the end of December 2007. The low-temperature area then extended eastward and covered most of China in January. Seven-day mean temperature anomalies were estimated at -10 to -15°C in central Asia in mid-January 2008, and were observed at -5 to -10°C in China at the end of January 2008.

The Siberian high pressure that developed is thought to have brought these low temperatures (see the next section). According to the statistical relationship with ENSO, the La Niña event persisting from spring 2007 is not considered to be the main reason for these extremely low temperatures.

In southern China, extremely heavy precipitation amounts were observed in late January. Figure 10 shows seven-day precipitation totals derived from SYNOP reports over China from 25 to 31 January 2008. The amounts for this period were close to or more than the normal precipitation totals for the whole month in southern China. The positive anomalies in the number of days of snow cover, based on observations by SSM/I in February 2008 (Figure 11), indicate above-normal snowfall over most of Asia including the Chang River basin.

The low temperatures and heavy precipitation caused more than 800 fatalities in Afghanistan, while more than 120 fatalities were reported in China (Integrated Regional Information Network and the Chinese Government).

(Hidehiko Isobe, Climate Prediction Division)

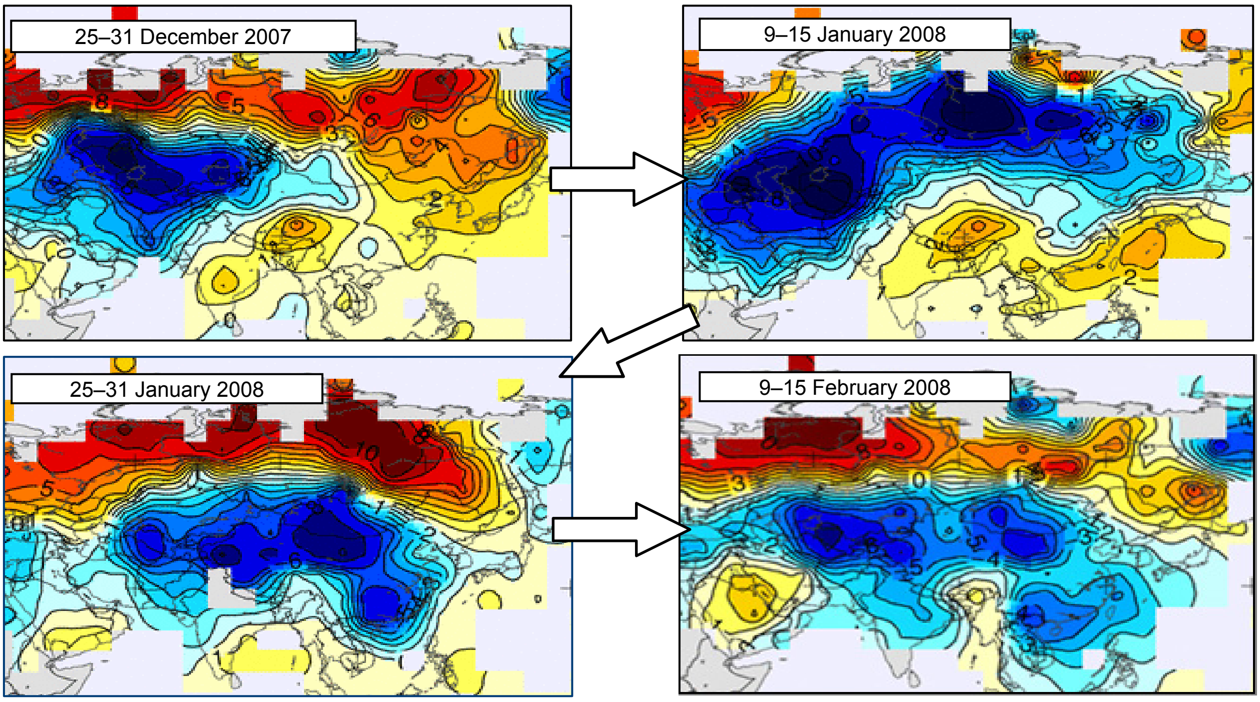


Figure 9 Distribution of seven-day mean temperature anomalies from December 2007 to February 2008
Observational temperature data are derived from SYNOP reports. The daily normals are interpolated from monthly normals for the period 1971–2000.

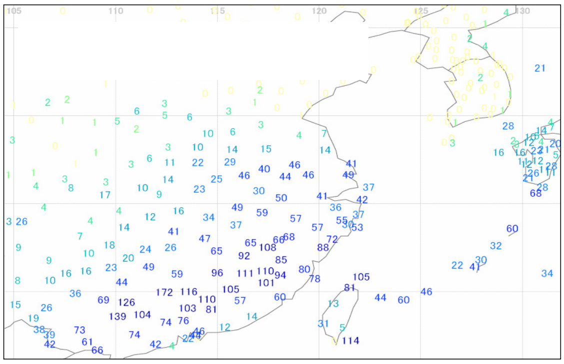


Figure 10 Seven-day total precipitation amounts from 25–31 January 2008
Data are derived from SYNOP reports.

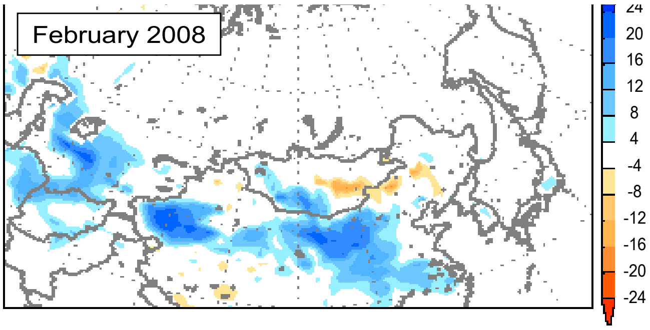
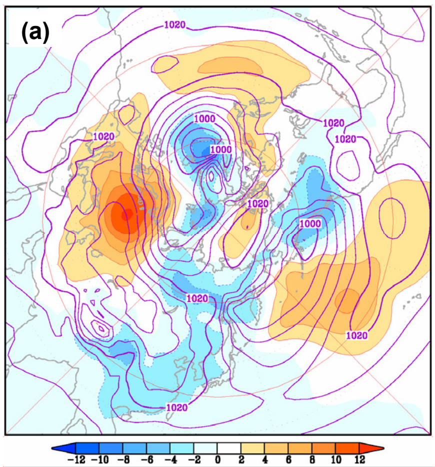


Figure 11 Anomalies in number of days covered with snow in February 2008
Data for the number of days of snow cover are based on observations by SSM/I onboard the DMSP (Defense Meteorological Satellite Program) polar orbiting satellites. The base period for the normal is 1987–2000.

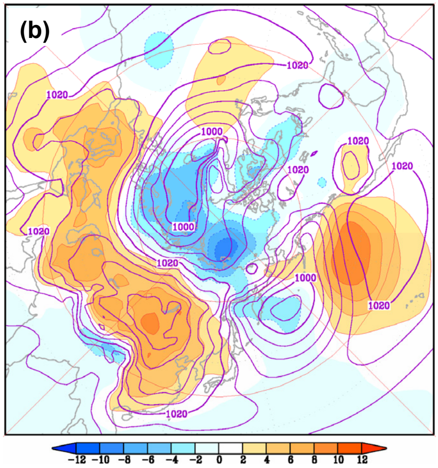
Atmospheric circulation

In the first half of winter 2007/2008 (i.e. from December 2007 to February 2008, referred to below as DJF07/08), low-pressure anomalies were observed from eastern to central Siberia and from northeastern to southern China (Figure 12a), indicating the weak Siberian High. In addition, high-pressure anomalies were seen from the area east of Japan to the Aleutian Islands. This suggests that the development of low-pressure systems was weaker than normal. In other words, the northeastern Asian winter monsoon was weak, and cold surges occurred less frequently. Conversely, in the second half of DJF07/08, remarkable high-pressure anomalies were observed from central Asia to China (Figure 12b). This indicates that strong high-pressure systems developed with the cold air mass in the lower troposphere.

Figure 13 shows mean 300-hPa wind vectors for DJF07/08, wind speed and its anomalies in the Northern Hemisphere. The subtropical jet from the Middle East to East Asia was stronger than normal and shifted northward from its climatological position. The polar-front jet shifted clearly northward from its climatological position over the northeastern Pacific and the Atlantic. In particular, high-frequency disturbances were much more active than normal. This corresponds to the strong polar-front jet over the Atlantic throughout the season (Figure 14). On the other hand, westerly winds were weaker than normal in the region between 40° and 50°N from Europe to central Siberia. Associated with the weak westerly winds, high-frequency disturbances were much less active over Eurasia.



Mean from 1 Dec. 2007 to 10 Jan. 2008



Mean from 11 Jan. to 29 Feb. 2008

Figure 12 Sea-level pressure and anomalies in the Northern Hemisphere
Contours show sea-level pressure at intervals of 4 hPa. Shading indicates sea-level pressure anomalies.

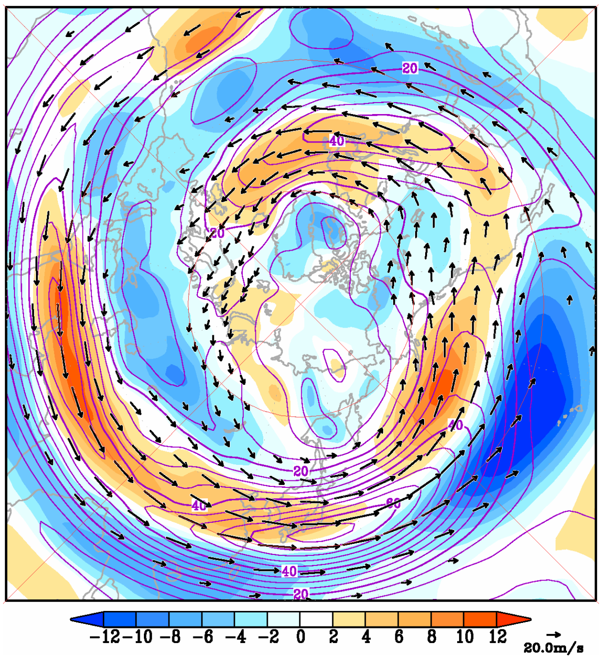


Figure 13 Seasonal mean 300-hPa wind speed anomalies and vectors in the Northern Hemisphere for winter 2007/2008
Shading indicates wind speed anomalies. Contours show wind speeds at intervals of 5 m/s. Vectors show winds.

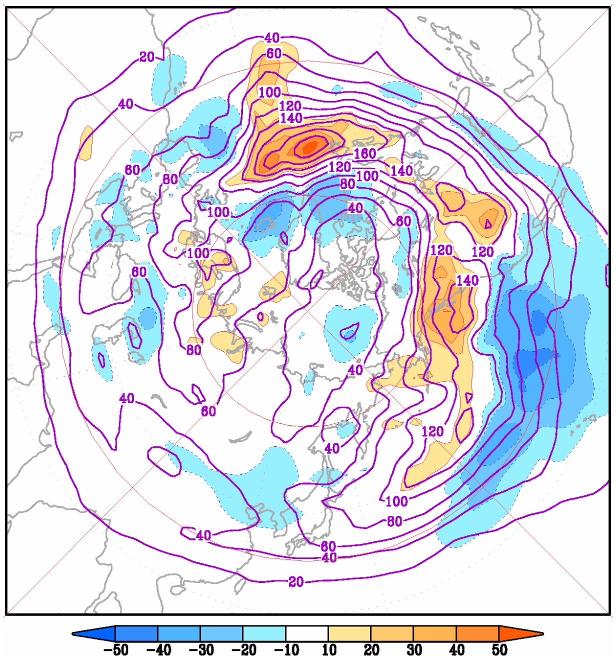


Figure 14 Seasonal mean 300-hPa kinetic energy of high-frequency variation in the Northern Hemisphere for winter 2007/2008
Contours show kinetic energy per unit mass of high-frequency variation at intervals of 20 m^2/s^2, and shading indicates its anomalies. Kinetic energy per unit mass of high-frequency variation is defined as the mean of the squared zonal and meridional wind speeds filtered with a 2–8-day bandpass.

In these conditions, a quasi-stationary Rossby wave packet propagated from the north Pacific to Eurasia in mid-January 2008; Rossby-wave breaking occurred, and a ridge was observed over western Siberia (Figure 15). In addition, another Rossby wave packet along the subtropical jet intensified the trough over central Asia. Associated with this intensification, cold air masses in the lower troposphere accumulated around central Asia, and a strong surface high developed over the central part of Eurasia (Figure 16a). Following the development of the strong high, a cold surge occurred from China to Southeast Asia in late January 2008 (Figure 16b). A quasi-stationary Rossby wave packet along the subtropical jet intensified the trough over the Tibetan Plateau (Figure 17), and moist air flowed from the Bay of Bengal to Southeast Asia (Figure 18). A low-pressure system developed and brought heavy snowfall over wide areas of China. In February, the Siberian High frequently developed, and cold surges occurred over East Asia (Figure 19).

(Yayoi Harada, Climate Prediction Division)

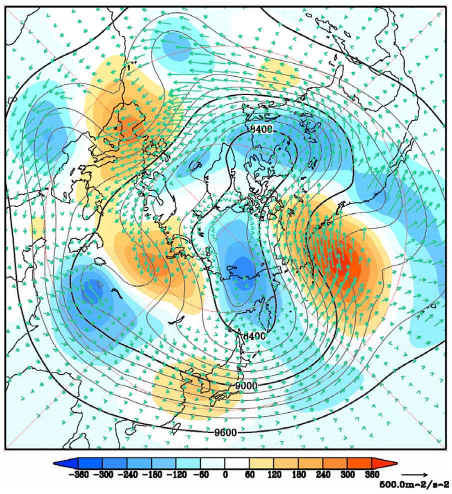


Figure 15 Seven-day mean 300-hPa wave activity flux, 300-hPa height and anomalies in the Northern Hemisphere from 18–24 January 2008
Vectors show the horizontal components of 300-hPa wave activity fluxes (unit: m^2/s^2). Contours and shading indicate 300-hPa height and its anomalies respectively. The contour interval is 60 m.

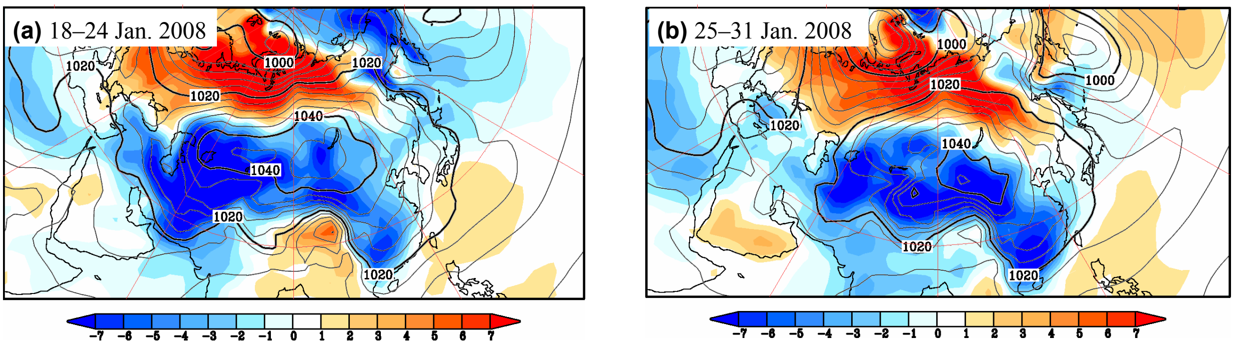


Figure 16 Seven-day mean sea-level pressure and 2-m temperature anomalies
Contours show sea-level pressure at intervals of 4 hPa. Shading indicates 2-m temperature anomalies.

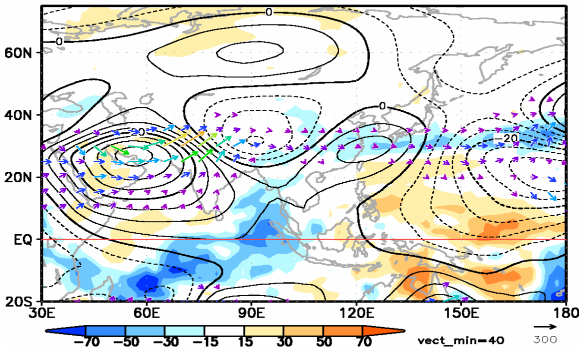


Figure 17 Five-day mean 200-hPa wave activity flux, 200-hPa stream function anomalies and OLR anomalies from 27–31 January 2008
Vectors show horizontal components of 200-hPa wave activity fluxes (unit: m^2/s^2). Contours show 200-hPa stream function anomalies at intervals of 5×10^6 m^2/s. Shading indicates OLR anomalies (unit: W/m^2).

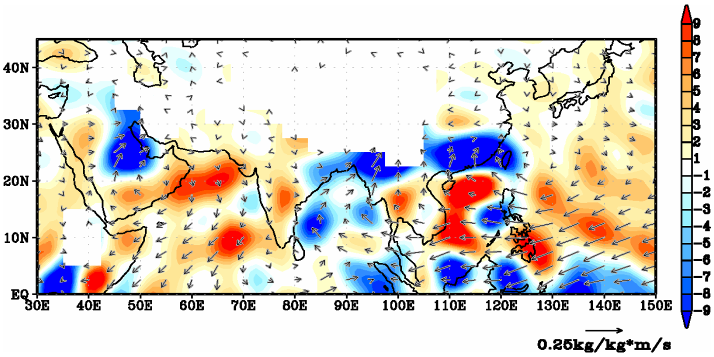


Figure 18 Daily mean 850-hPa water vapor flux and its horizontal divergence on 26 January 2008
Vectors show water vapor flux (unit: 10^{-8}kg/kg m/s). Shading indicates horizontal water vapor flux divergences (unit: kg/kg/s).

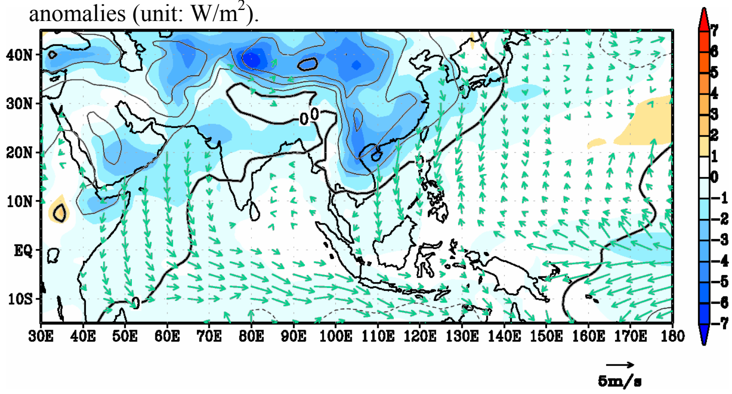


Figure 19 Mean sea-level pressure anomalies, 2-m temperature anomalies and 10-m wind anomalies for February 2008
Vectors show 10-m wind anomalies (unit: m/s). Contours show sea-level pressure anomalies at intervals of 2 hPa. Shading indicates 2-m temperature anomalies.

Update of JMA's One-month Ensemble Prediction System

JMA upgraded its one-month ensemble prediction system (EPS) in March 2008. As a result of upgrading to the new EPS model (V0803C), forecast errors in wind fields in the troposphere and temperature fields in the middle-high latitudes have decreased in comparison with the previous model (V0703C). The main improvements are as follows:

(i) An increase in the vertical resolution of the atmospheric model from 40 to 60 layers, with a change in the uppermost level from 0.4 hPa to 0.1 hPa

This increase in vertical resolution (particularly in the lower and upper troposphere) has enabled higher reproducibility, especially in the boundary layer and near the tropopause.

(ii) Modifications to the physical parameterization of the model, including adjustment of the strength of gravity-wave drag

These modifications have resulted in a reduction in wind-speed bias around the upper-tropospheric jet stream and strong bias in tropical easterly winds (Figure 20).

(iii) Refinement of initial land conditions (climatology) used in hindcast experiments

The treatment of initial land-surface snow conditions used in hindcast experiments was refined to make them more consistent with JMA's operational land analysis data.

This improvement has led to a reduction in the incidence of systematic errors by the model. In particular, high temperature bias has been greatly reduced in the lower troposphere over the Eurasian Continent from spring to summer (Figure 21).

These improvements have contributed not only to better model climatology but also to a smaller bias in one-month prediction products.

One-month prediction products are available on the TCC website at http://ds.data.jma.go.jp/tcc/tcc/products/model/index.html. Registered National Meteorological and Hydrological Services can download and see the products. To register, please contact TCC (e-mail: tcc@climar.kishou.go.jp).

(Shokichi Yabu, Climate Prediction Division)

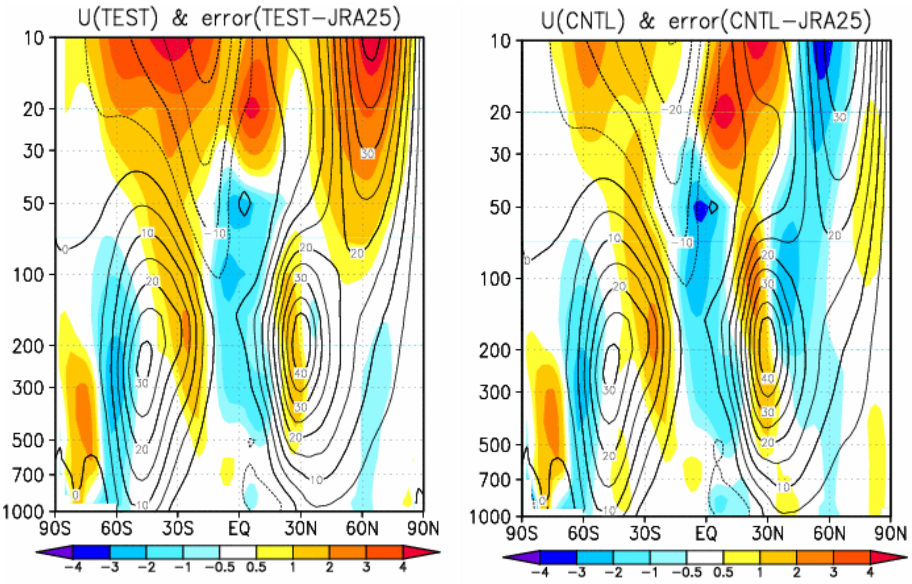


Figure 20
Comparison of the models' systematic errors in zonal mean winds for January
Left: New model (V0803C), Right: Previous model (V0703C)
Contours show model climatology (20-year average (1982–2001) of five ensemble-member hindcast data), and shading indicates model errors (differences from JRA-25 reanalysis). The unit is m/s.

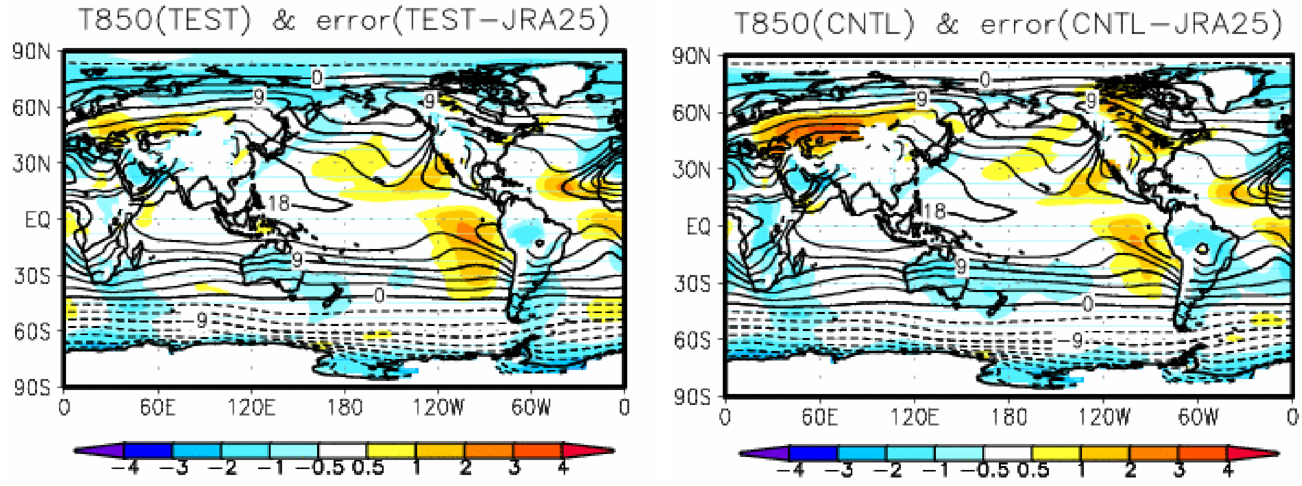


Figure 21 Comparison of the models' systematic errors in 850-hPa temperatures for July
Left: New model (V0803C), Right: Previous model (V0703C)
Contours show model climatology (20-year average (1982–2001) and five ensemble-member hindcast data), and shading indicates model errors (differences from JRA-25 reanalysis). The unit is K.

Visit of the Head of TCC to the Philippines and Thailand

Ms. Kumi Hayashi, Head of TCC, and Mr. Shotaro Tanaka, Senior Scientific Officer at JMA’s Office of International Affairs, visited the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) from 3–4 March and the Thai Meteorological Department (TMD) on 6 March. The purpose of the visits was to meet with experts for discussions and exchanges of view on the improvement of climate services.

The main agenda items of the two meetings were:

- Introduction to a prototype for detailed probabilistic forecast guidance and the transfer of related techniques,
- Introduction to JMA's new *Early warning information on extreme weather* service for domestic users, and
- Exchange of views on the current usage status of GPV data, and cooperation necessary for the development of application products.

TCC would like to express its sincere gratitude to PAGASA and TMD for their arrangements in regard to the meetings and for the hospitality extended during the stay.

(Kumi Hayashi, Climate Prediction Division)

Meeting in PAGASA on 3 March

Meeting in TMD on 6 March

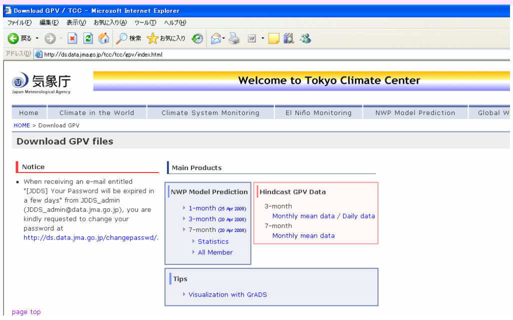
GPV data for long-range forecast

TCC provides GPV data for long-range forecasts through the TCC website, and has made the data available to registered National Meteorological and Hydrological Services (NMHSs). JMA provides interested NMHSs with a user ID and password to access the data.

To ensure security, all registered NMHSs are requested to change their passwords regularly. Each password is valid for 123 days, and a warning e-mail message titled “***[JMA/ JDDS Your password will expire in a few days]***” will be automatically sent to each user’s registered e-mail address every day starting from seven days before the expiry. On receiving this message, users should access the website (http://ds.data.jma.go.jp/changepasswd) to set a new password, otherwise the account will be locked on the day of expiry.

If you have any questions, please contact TCC (e-mail: tcc@climar.kishou.go.jp).

(Kumi Hayashi, Climate Prediction Division)



Download GPV files

Notice

- When receiving an e-mail entitled "[JDDS] Your Password will be expired in a few days" from JDDS_admin (JDDS_admin@data.jma.go.jp), you are kindly requested to change your password at http://ds.data.jma.go.jp/changepasswd/.

Main Products

NWP Model Prediction
- 1-month (25 Apr 2008)
- 3-month (20 Apr 2008)
- 7-month (20 Apr 2008)
  - Statistics
  - All Member

Hindcast GPV Data
3-month
Monthly mean data / Daily data
7-month
Monthly mean data

Tips
- Visualization with GrADS

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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