Tokyo Climate Center, Japan Meteorological Agency

TCC News

No. 9 July 2007

Contents

Summary of Yellow Sand over Japan in 2007

The number of days when yellow sand, or Aeolian dust, was observed was 34 in Japan from January to May 2007, which was the eighth largest since 1967. Yellow sand was observed extensively over Japan on 2 April and 26 May. The total number of meteorological stations which observed yellow sand on 2 April was the second largest only to 2002.

Observation of yellow sand has been made at 98 meteorological stations of the Japan Meteorological Agency (JMA). From 1 January to 31 May 2007, the number of days when meteorological stations observed yellow sand was 34, which was the eighth largest since 1967 (Figure 1). The accumulated total number of days when each meteorological station observed yellow sand was 544, which was the seventh largest since 1967 (Figure 2). As to monthly data, the total number of days when yellow sand was observed was 14 in May, which was far above normal (3.9 days). Meanwhile, it was nearly normal from January to April.

The feature of 2007 is that large-scale yellow sand phenomena, in which most meteorological stations in Japan observed yellow sand, occurred in a short period of time. The numbers of meteorological stations which observed yellow sand were 75 on 2 April, and 72 on 26 May. These were the second and third largest records, respectively, only to 10 April 2002 (76).

Monthly CLIMAT data shows light precipitation in the southern part of Mongolia from April to May. In addition, temperature of the area was higher than last year, and snow-covered days were smaller than normal. It is considered that dust storms generated frequently under such conditions, which caused the yellow sand phenomenon around Gobi desert.

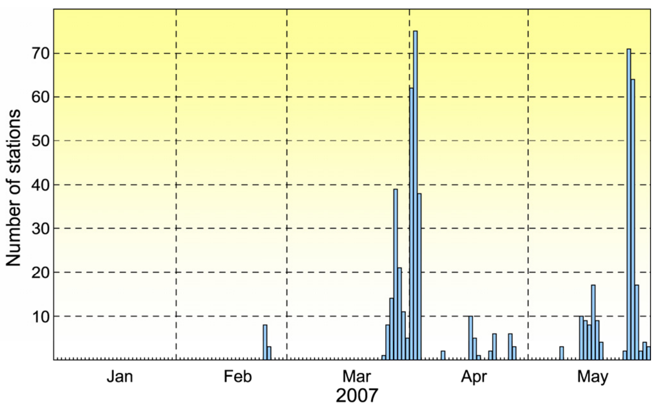


Figure 1 Daily number of meteorological stations which observed yellow sand from 1 January to 31 May 2007 (Total number of meteorological stations: 98)

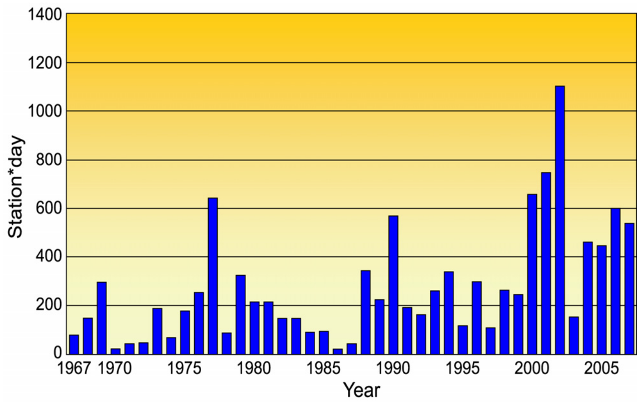


Figure 2 Accumulated total number of days when each meteorological station observed yellow sand from 1967 to 2007

JMA's operational numerical dust model (Model of Aerosol Species IN the Global Atmosphere: MASINGAR), improved its performance by updating the distribution of vegetation in February 2007. This model accurately forecast yellow sand which was observed extensively over Japan from 1 to 3 April and from 25 to 28 May (Figures 3 and 4). Forecast of yellow sand is available at: http://www.jma.go.jp/en/kosa/kosafcst.html.

(Atsuya Kinoshita, Atmospheric Environment Division)

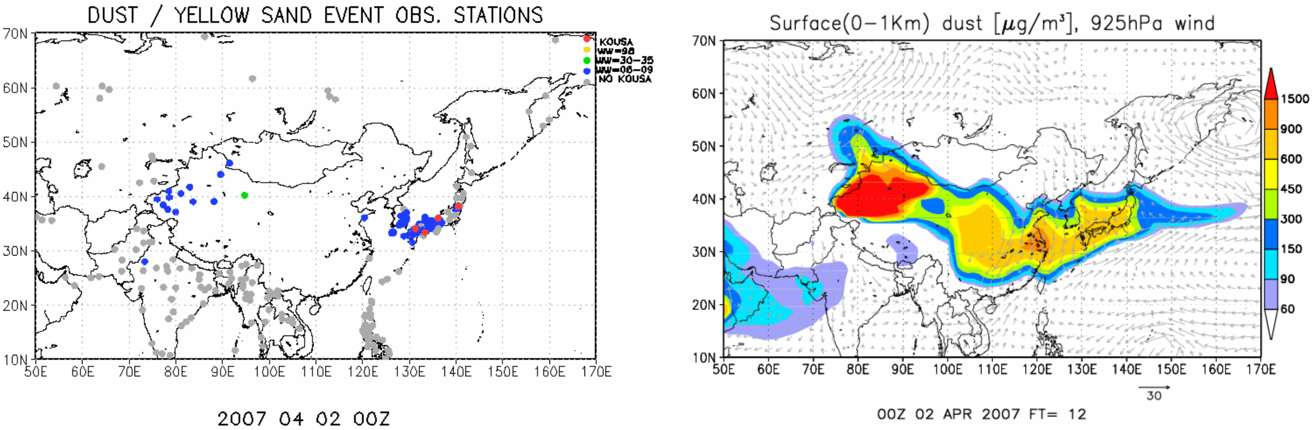


Figure 3 Meteorological stations which observed yellow sand (left), and forecast for the concentration of yellow sand with JMA's operational numerical dust model (right) on 2 April 2007

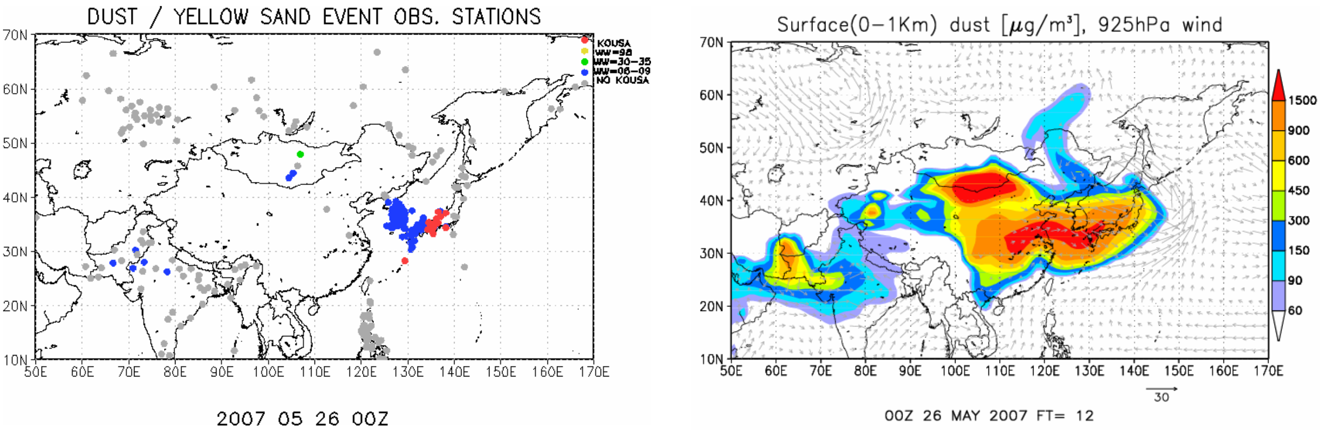


Figure 4 Meteorological stations which observed yellow sand (left), and forecast for the concentration of yellow sand with JMA's operational numerical dust model (right) on 26 May 2007

Update of JMA's Long-range Ensemble Prediction System for Three-month and Warm/Cold Season Predictions

As announced in the TCC News No.7 (January 2007), the Japan Meteorological Agency (JMA) plans to upgrade its Long-range Ensemble Prediction System (EPS) for three-month and warm/cold season predictions in September 2007. There is no change in one-month prediction.

Changes of EPS are as follows:

(i) The new atmospheric model (GSM0703C) is introduced, which is a low-resolution version of the model used in the extended-range EPS for one-month prediction since March 2007. (Please refer to the TCC News No.7 for more information (http://ds.data.jma.go.jp/tcc/tcc/news/tccnews07.pdf)).

(ii) The number of ensemble members is increased from 31 to 51.

(iii) Uncertainties in SSTs are considered. In the JMA's long-range EPS, global SSTs are predicted using a combination of persisted anomalies, climatology and prediction with the JMA's El Niño prediction model (atmosphere-ocean coupled model; CGCM), and then the specific SSTs are fed in an atmospheric model (AGCM), which is called two-tier method. To consider uncertainties of the prescribed SSTs, small perturbations based on observed SSTs are added to the prescribed SSTs.

By this upgrade, the skill of probabilistic forecast is expected to be improved. For example, it has been confirmed through 22-year hindcast experiments that Brier Skill Score (BSS) for 2m temperature increased. Details on the prediction system and verification maps based on the hindcast experiments will be available at http://ds.data.jma.go.jp/tcc/tcc/products/model/index.html.

(Akihiko Shimpo, Climate Prediction Division)

Sea Ice in the Sea of Okhotsk for 2006/2007 Winter Season

Sea ice conditions

Sea ice extent in the Sea of Okhotsk rapidly decreased and reached near-record minimum after the seasonal maximum ice extent occurred in early March 2007 (Figure 5). Sea ice conditions for March 2007 show a rapid retreat of sea ice edge over the northern and eastern Sea of Okhotsk (Figure 6). Sea ice was drifted westward and melted by strong south-easterly winds because a developed low stayed in the Sea of Okhotsk in the middle of March 2007. Sea ice over the northern Sea of Okhotsk melted away faster than the 1971–2000 mean after March 2007. One of the reasons for its fast retreat is that the monthly mean surface temperatures for March–May were 2-3 degrees higher than normal over the northern Sea of Okhotsk (Figure 7). For detailed sea ice conditions for 2006/2007 winter season, please refer to the following JMA website: http://www.data.kishou.go.jp/db/seaice/okhotsk_2007.html.

Trends of sea ice extent

Overall trends for the period from 1971 to 2007 can be discerned (Figure 8). The estimated declining rate of the maximum sea ice extent is -5.5×10^{3} km^{2}/year. However, sea ice in the Sea of Okhotsk is first-year ice (ice of no more than one year's growth) and its interannual extent varies dramatically. For example, the maximum sea ice extent was 55 % of the area of the Sea of Okhotsk in 1984. Meanwhile, sea ice covered almost the entire Sea of Okhotsk in 2001. Small changes in meteorological and oceanographic forcing could result in significant changes in the extent and state of the sea ice cover. It should be noted that available record of sea ice extent is not sufficient to conclude that long-term explicit trends have been found.

(Takao Imaizumi, Office of Marine Prediction)

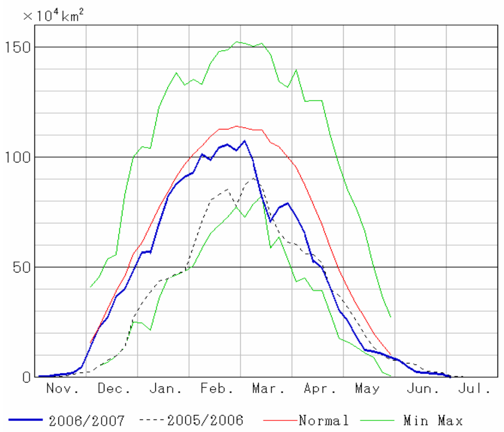
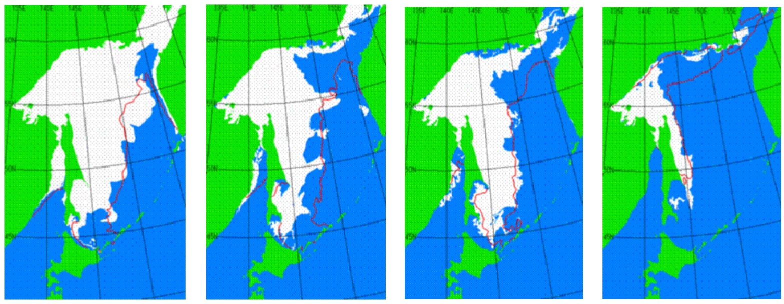
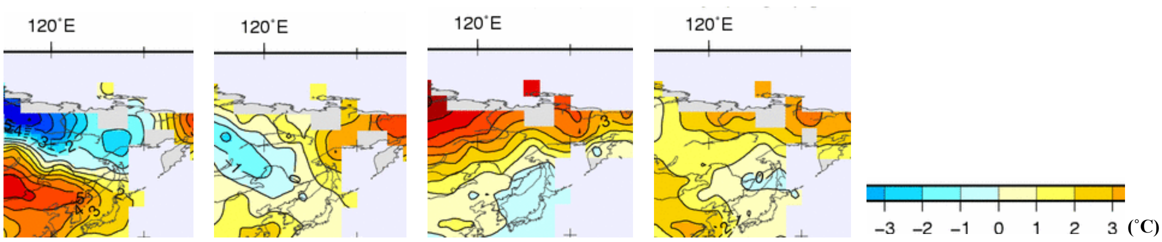


Figure 5 Five-day means of sea ice extent for the Sea of Okhotsk, November 2006 to July 2007



5 March 2007 | 20 March 2007 | 5 April 2007 | 5 May 2007

Figure 6 Sea ice conditions for March–May 2007
White area shows sea ice extent, and red line indicates the edge of normal sea ice extent (1971 - 2000).



February 2007 | March 2007 | April 2007 | May 2007

Figure 7 Monthly surface temperature anomalies for February–May 2007

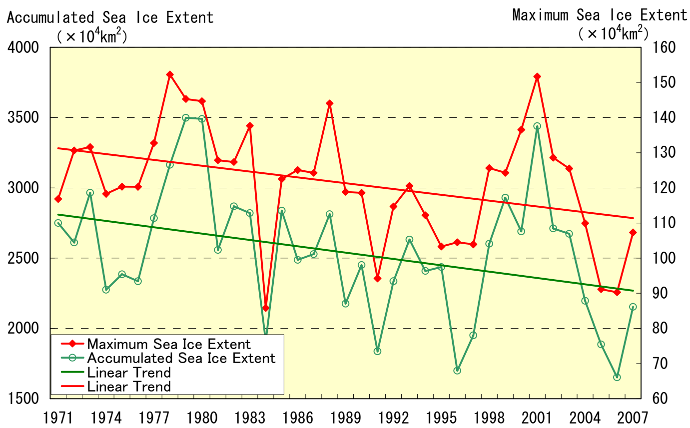


Figure 8 Interannual variations of maximum sea ice extent and accumulated sea ice extent for the Sea of Okhotsk, 1971 to 2007
Accumulated sea ice extent: the seasonal sum of sea ice extents at five-day intervals from December in the previous year to May.

Long-term Trends of SST in the Seas adjacent to Japan

For the purpose of monitoring climate changes, the Japan Meteorological Agency (JMA) investigated long-term trends of Sea Surface Temperatures (SSTs) in the seas adjacent to Japan through analysis of in-situ data observed by vessels over the past 100 years.

The seas adjacent to Japan were divided into 13 areas on the basis of different patterns of SST variation by location. The monthly mean SST anomalies were calculated for the respective areas, and then compiled into annual and seasonal mean SST anomalies (Figure 9). Anomalies in the 1940's were unable to be determined owing to insufficient data during World War II.

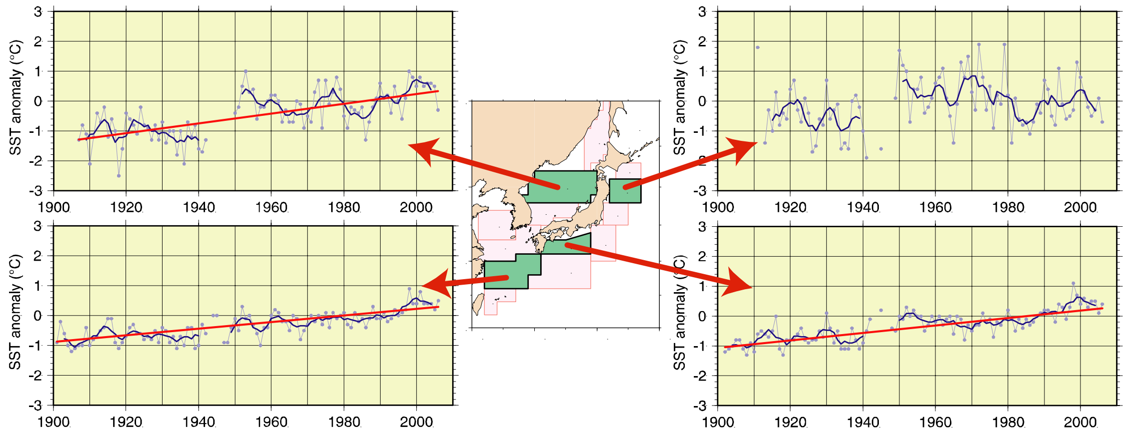


Figure 9 Time series of annual SST anomaly in the seas adjacent to Japan
Blue and red lines indicate 5-year running mean and long-term linear trend from the early 20th century to 2006, respectively. Base period for normal is 1971-2000.

Long-term time series of annual mean SST anomalies show linear warming trends in most areas at a rate of +0.7 to +1.6˚C per 100 years with a statistical significance of 95% confidence level. The warming rates are larger than those of global SST (+0.50˚C per 100 years) (Figure 10). Specifically, warming trends are at a rate of +1.0 to +1.3˚C per 100 years in many areas such as the southern part of the Japan Sea, the East China Sea and south of Honshu (the main island of Japan). The rate is almost the same as that of annual mean surface air temperature in Japan (+1.1˚C per 100 years). Meanwhile, due to large decadal variability, no statistically significant trends are shown in the northern part of the Japan Sea, the seas adjacent to Hokkaido and east of Japan. As for seasonal mean SST anomalies, warming trends are most prominent in fall (October–December) and winter (January–March) (Figure 11), whereas those of surface temperature in Japan are most prominent in spring (March–May). Seasonal difference in warming trends is greater than that of surface temperatures in Japan.

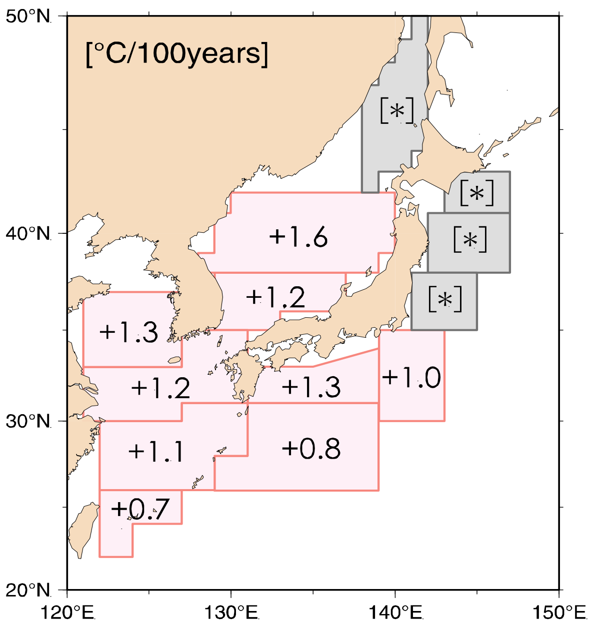


Figure 10 Linear trends of annual SST anomalies from the early 20th century to 2006 (˚C per 100 years)
Areas with [*] indicate that the trend is not significant at the 95% confidence level.

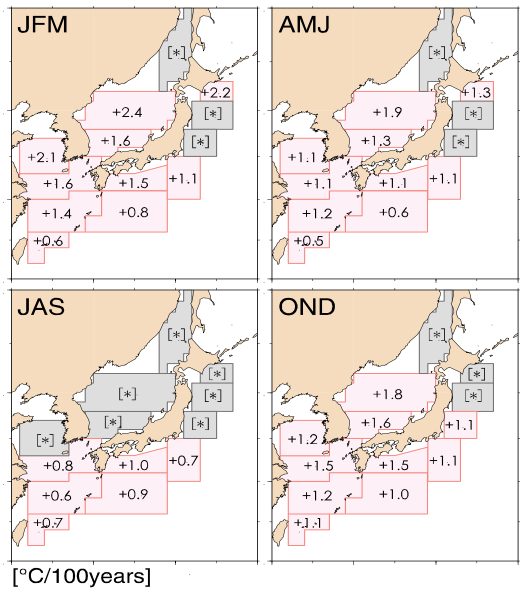


Figure 11 Linear trends of seasonal SST anomalies from the early 20th century to 2006 (˚C per 100 years)
Areas with [*] indicate that the trend is not significant at the 95% confidence level.

The larger trend in the seas adjacent to Japan than the global average is probably affected by the fast warming in the mid-latitude of the Eurasian Continent. However, the larger trend of SSTs is not entirely attributed to global warming due to the observed increase in anthropogenic greenhouse gas concentrations, because the investigated areas are limited around Japan and year-to-year variability is not negligible there.

Results of the investigation are available at the JMA website (http://www.data.kishou.go.jp/kaiyou/shindan/a_1/japan_warm/japan_warm.html) (in Japanese only).

(Yasushi Takatsuki, Marine Division)

Establishment of an Advisory Panel on Extreme Climatic Events

An Advisory Panel on Extreme Climatic Events was established to discuss extreme climatic events that are mainly caused by variations in the atmospheric general circulation and continue for a long time (about two weeks or more), e.g. heat waves in 2004, heavy snow in 2005/06 and warm winter in 2006/07 in Japan. Outline of the Panel is as follows.

1. Mission

- Climatological analysis and research on extreme climatic events
- Advice on information that the Japan Meteorological Agency (JMA) prepares on extreme climatic events including causes and, if possible, outlooks of the events
- Recommendation on the application of results from climatological research on extreme climatic events to JMA's services and activities

2. Scope

The Panel discusses extreme climatic events that are mainly caused by variations in the atmospheric general circulation and continue for a long time (about two weeks or more), e.g. heat waves in 2004, heavy snow in 2005/06 and warm winter in 2006/07 in Japan. The Panel may discuss, as necessary, shorter events including typhoons, heavy rains and wind storms to provide advice on relations to large-scale atmospheric variations and global warming, etc.

3. Membership

The Panel consists of 10 prominent experts from universities and research institute. Professor Masahide KIMOTO of the University of Tokyo has been selected as chairperson. The Panel may invite, as necessary, experts outside of the Panel to discuss specific issues. The Panel will establish a working group to prepare materials to be discussed by the Panel.

4. Functions

The Panel is to initiate discussions when an extreme climatic event has occurred or is expected. JMA has established a system to share related information with the Panel members through web to open preliminary discussions on-line. Following the preliminary discussions, the Panel holds a session at the JMA headquarters. The session may be held on-line in urgency. Shortly after the session, JMA is to issue a statement including causes and, if possible, outlooks of the event based on the advice of the Panel and other relevant information. The statement will be provided to decision makers, industries and the general public to help them avoid or minimize adverse effects from extreme climatic events. The Panel is to review its activities at its annual sessions.

5. Others

The first session was held on 12 June 2007 to select the chairperson and vice-chairperson, decide the Panel's mandate and agree upon its future activities.

Members of the Advisory Panel on Extreme Climatic Events

YAMAZAKI, Koji
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YAMAGATA, Toshio
Professor, Graduate School of Science, University of Tokyo

KIMOTO, Masahide **(Chairperson)**
Professor, Center for Climate System Research, University of Tokyo

NAKAMURA, Hisashi **(Vice-Chairperson)**
Associate Professor, Graduate School of Science, University of Tokyo

YASUNARI, Tetsuzo
Professor, Hydrospheric Atmospheric Research Center, Nagoya University

MUKOUGAWA, Hitoshi
Associate Professor, Disaster Prevention Research Institute, Kyoto University

HIROOKA, Toshihiko
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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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