Tokyo Climate Center, Japan Meteorological Agency

TCC News

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Global Average Surface Temperatures for 2013

The annual anomaly of the global average surface temperature for 2013 was the second highest on record at +0.20°C above the 1981 – 2010 baseline.

Monitoring changes in temperature records on a decadal to centennial scale worldwide is of primary importance in ensuring scientifically sound diagnostics and understanding of the state of the global climate. In its role as one of the world's leading climate centers, the Japan Meteorological Agency (JMA) provides global mean surface temperature data (i.e., combined averages of near-surface air temperatures over land and sea surface temperatures) on a monthly, seasonal and annual basis, thereby helping to raise public awareness of the changing climate.

The annual global average surface temperature anomaly for 2013 was +0.20°C with regard to the 1981 – 2010 baseline period. This ranks as the second-highest figure since 1891 – the earliest year of JMA's global temperature anomaly records (Figure 1, Table 1). The average temperature over land areas alone was the fourth highest on record at +0.34°C above the 1981 – 2010 average.

Warm temperature anomalies were most noticeable across much of the Eurasian Continent, in Australia and over the central part of the North Pacific Ocean, while the equatorial Pacific experienced cooler-than-normal conditions (Figure 2).

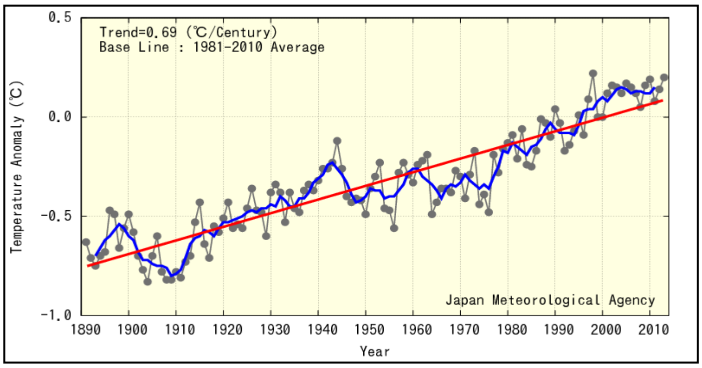

Figure 1 Long-term change in annual surface temperature anomalies averaged worldwide
The grey line with filled circles indicates yearly anomalies of surface temperature. The blue line indicates the five-year running mean, and the red line shows the long-term linear trend. Anomalies are represented as deviations from the 1981 – 2010 average.

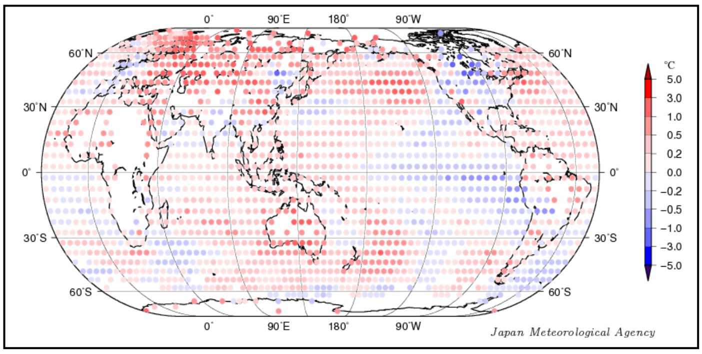

Figure 2 Annual mean temperature anomalies for 2013
The red and blue dots indicate temperature anomalies from the baseline period (1981 – 2010) averaged in 5° x 5° grid boxes.

On a longer time scale, the annual global average surface temperature has been rising at a rate of about 0.69°C per century. As shown in Table 1, each of the first 13 years of the current century ranks among the warmest 15 years since 1891. The recent high annual temperatures are best explained as a consequence of disturbed energy balance between incoming solar radiation and outgoing infrared radiation resulting from increased anthropogenic greenhouse gas concentrations observed since industrialization began. On an annual-to-decadal time scale, the natural variability inherent in the earth's climate system is considered to contribute significantly to temperature fluctuations.

The highest-ever global average temperature was recorded in 1998 in the aftermath of a strong El Niño event. In 2013, by contrast, the equatorial Pacific exhibited a La Niña-like pattern of sea surface conditions, which is generally associated with cooler global temperatures. This makes 2013's second-highest global average surface temperature on record all the more remarkable in the context of global warming.

Global average temperatures are monitored on an operational basis by multiple climate centers (the Met Office Hadley Centre (UK), the National Climate Data Center (USA), the Goddard Institute for Space Studies (USA) and JMA). On a monthly basis, these centers calculate the global temperature independently of one another in terms of data quality control policies, analytical approaches and other computational procedures. Despite this methodological divergence, the results they produce indicate remarkably similar levels of month-to-month and year-to-year variability and an almost-identical long-term warming trend, though the ranks for individual years may vary. The four sets of records all show that the planet has become almost 0.8°C warmer than it was at the beginning of the 20th century.

Monthly and annual temperature anomaly datasets for 5° × 5° grid boxes are available for download at http://ds.data.jma.go.jp/tcc/tcc/products/gwp/temp/map/download.html.

(Yoshinori Oikawa, Climate Prediction Division)

Table 1 Top 15 annual global average temperatures since 1891 (Relative to the 1981 – 2010 baseline period)

Rank	Year	Temperature anomaly
1	1998	+0.22
2	**2013**	**+0.20**
3	2010	+0.19
4	2005	+0.17
5	2009	+0.16
	2002	+0.16
7	2006	+0.15
	2003	+0.15
9	2012	+0.14
10	2007	+0.12
	2004	+0.12
	2001	+0.12
13	1997	+0.09
14	2011	+0.08
15	2008	+0.05

Highlights of the Global Climate for 2013

Annual mean temperatures were above normal in Siberia, from eastern China to eastern Europe, in Africa, from Alaska to western Canada, in the northeastern part of North America, in northern and southern parts of South America and in Australia, and were below normal around northeastern China, in northern India, in western Europe, from central Canada to the central USA and in Peru (Figure 3). Extremely high temperatures were frequently observed from eastern Japan to central China, in northern Europe, from Mauritius to Madagascar, in eastern Brazil and in Australia, and extremely low temperatures were frequently observed in western Europe.

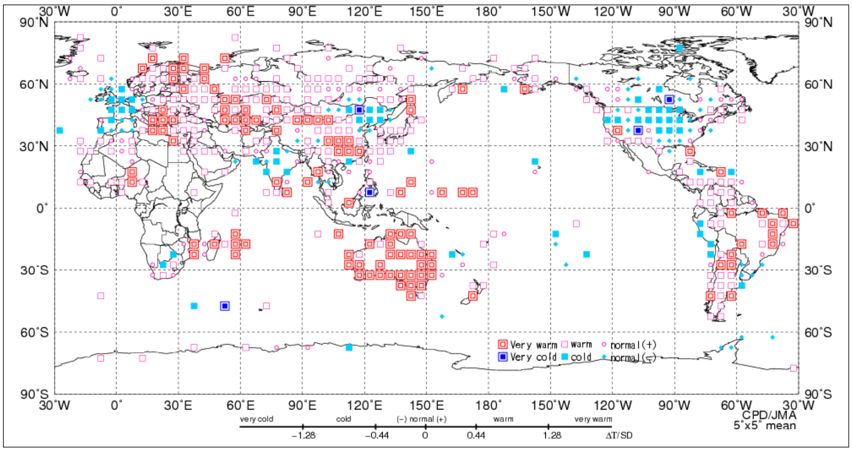

Figure 3 Annual mean temperature anomalies for 2013
Categories are defined by the annual mean temperature anomaly against the normal divided by its standard deviation and averaged in 5° × 5° grid boxes. The thresholds of each category are -1.28, -0.44, 0, +0.44 and +1.28. The normal values and standard deviations are calculated from 1981-2010 statistics. Land areas without graphics represent regions for which the sample size of observation data is insufficient or normal data are unavailable.

Annual precipitation amounts were above normal from eastern Siberia to northeastern China, from the southern part of central Siberia to central Asia, in India, Southeast Asia and Alaska, from northern to southeastern parts of the USA, in Central America and in northwestern Australia, and were below normal in northwestern Africa, the western USA, the southern part of South America and in central Australia (Figure 4). Extremely heavy precipitation amounts were frequently observed from eastern to central Europe and from southern Canada to the southeastern USA, and extremely light precipitation amounts were frequently observed in eastern and western Japan, in the northwestern USA and in eastern Brazil.

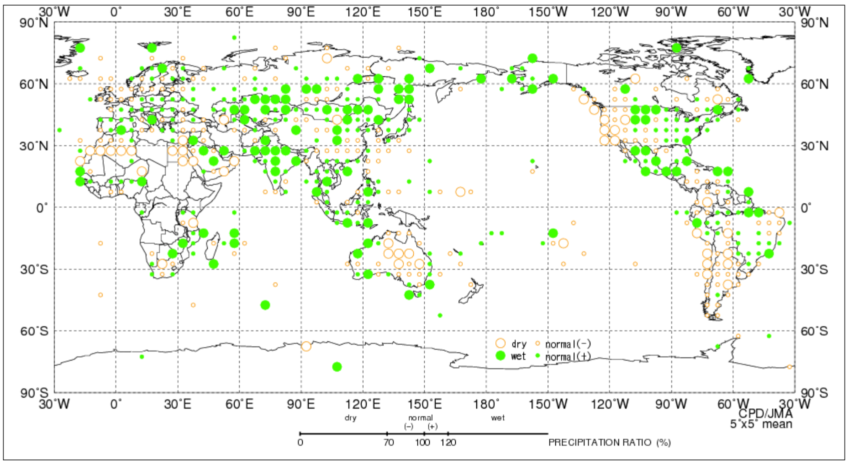

Figure 4 Annual total precipitation amount ratios for 2013
Categories are defined by the annual precipitation ratio to the normal averaged in 5° × 5° grid boxes. The thresholds of each category are 70%, 100% and 120%. Land areas without graphics represent regions for which the sample size of observation data is insufficient or normal data are unavailable.

Major extreme climatic events and weather-related disasters occurring in 2013 are listed below (Figure 5).

(1) Flooding in the southern part of eastern Siberia (July – September)
(2) High temperatures from eastern Japan to central China (March, July − August)
(3) Light precipitation in eastern and western Japan (March, May)
(4) Typhoon in the Philippines (November)
(5) Torrential rain over the Indochina Peninsula (September – October)
(6) Torrential rain in India and Nepal (June)
(7) Torrential rain in Pakistan and Afghanistan (August)
(8) High temperatures in northern Europe (May – June, August – September)
(9) Low temperatures in western Europe (March – June)
(10) Heavy precipitation from eastern to central Europe (January – March, May – June)
(11) Cyclone in Somalia (November)
(12) Torrential rain in Zimbabwe and Mozambique (January)
(13) High temperatures from Mauritius to Madagascar (September – December)
(14) Heavy precipitation from southern Canada to the southeastern USA (January, April – June, October)
(15) Light precipitation around the northwestern USA (November – December)
(16) Hurricanes in Mexico (September)
(17) High temperatures (January – April, June) and light precipitation (February – March) in eastern Brazil
(18) High temperatures in Australia (January, March – April, July – October)

(Kazuyoshi Yoshimatsu, Tokyo Climate Center)

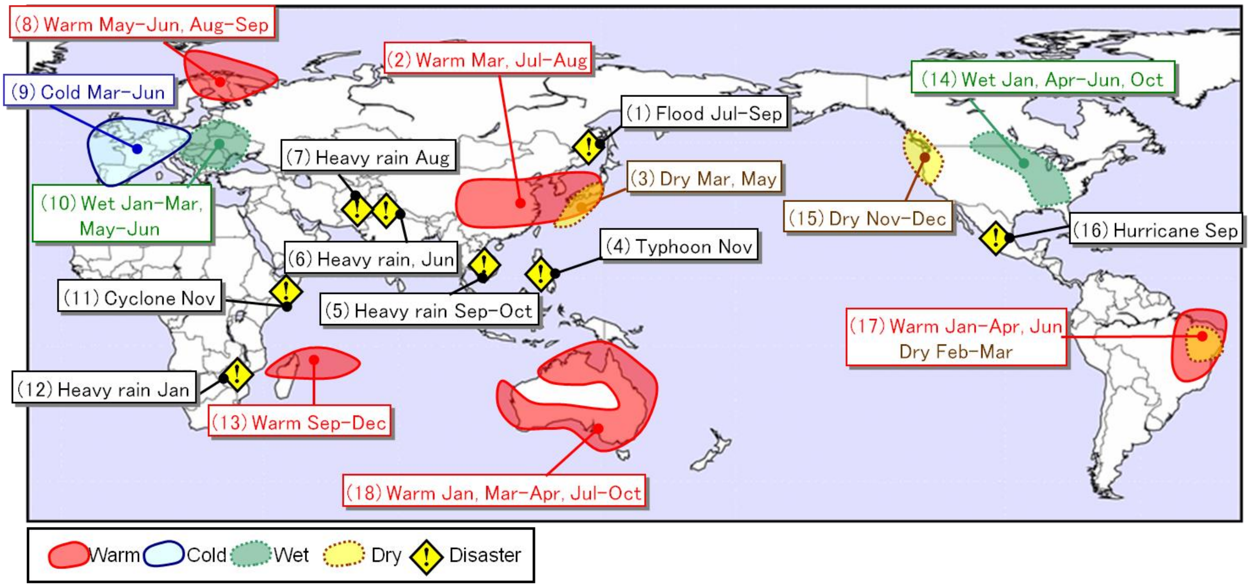

Figure 5 Major extreme climate events and weather-related disasters across the world in 2013
Major extreme climate events and weather-related disasters that occurred during the year are indicated schematically.

Summary of Japan's Climatic Characteristics for 2013

- Annual mean temperatures were above normal all over Japan except in northern Japan, where they were near normal. Annual precipitation amounts were significantly above normal on the Sea of Japan side of northern and eastern Japan. Annual sunshine durations were significantly above normal in eastern and western Japan.
- Northern, eastern and western Japan experienced cold winter conditions. On the Sea of Japan side of northern Japan, record-breaking snow was observed at some stations such as Sukayu in Aomori Prefecture, where the maximum snow depth was 566 cm (the deepest ever recorded in Japan).
- The summer mean temperature was the highest since 1946 in western Japan. The temperature at Ekawasaki in Kochi Prefecture reached 41.0°C (the highest ever recorded in Japan).
- Hazardous extremely heavy rains were observed in some areas due to active fronts and typhoons.

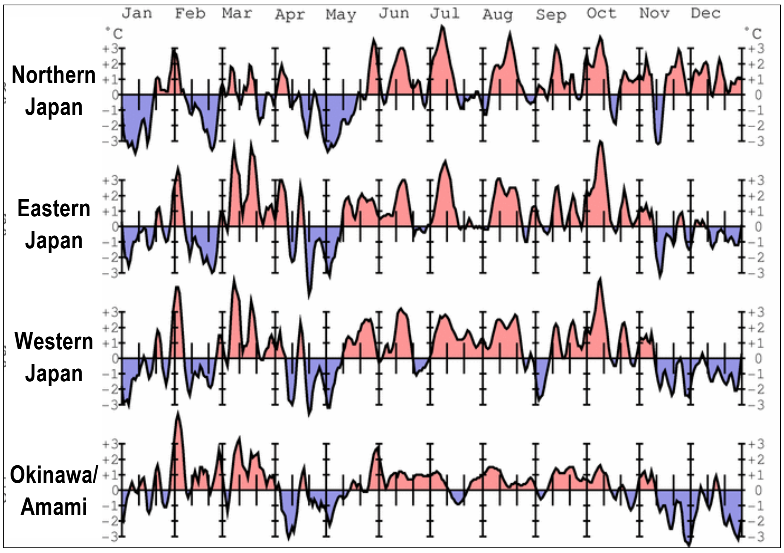

Figure 6 Time series of five-day running mean temperature anomalies for subdivisions (January – December 2013)
The normal is the 1981 – 2010 average.

(1) Annual characteristics (Figures 6 and 7)

Temperatures tended to be above normal during the warm season, and significantly above-normal temperatures were observed periodically. Moving high pressure systems were dominant and brought sunny weather to eastern and western Japan in spring and autumn. Meanwhile, northern Japan remained susceptible to the influence of cyclones throughout the year. Okinawa/Amami experienced more sunny days than usual in summer and autumn.

(2) Seasonal characteristics

(a) Winter (December 2012 – February 2013)

The winter monsoon was stronger than normal throughout winter, especially in northern Japan. Temperatures were below normal all over the country except in Okinawa/Amami. The Sea of Japan side of northern Japan was often hit by heavy snowfall, and record-breaking maximum snow depths were recorded at 12 stations.

(b) Spring (March – May)

Moving high pressure systems brought more sunny days than usual to eastern and western Japan, while cyclones and cold air advection brought more wet and chilly days than usual to northern Japan.

(c) Summer (June – August)

The North Pacific high was dominant over the southern part of Japan and brought sunny and hot conditions to Okinawa/Amami, western Japan and the Pacific side of eastern Japan. Meanwhile, the Baiu front lingered around northern Japan mainly in July, and significantly humid air masses flowed over the Sea of Japan along the western edge of the North Pacific high. As a result, extremely heavy rains caused disasters in some areas.

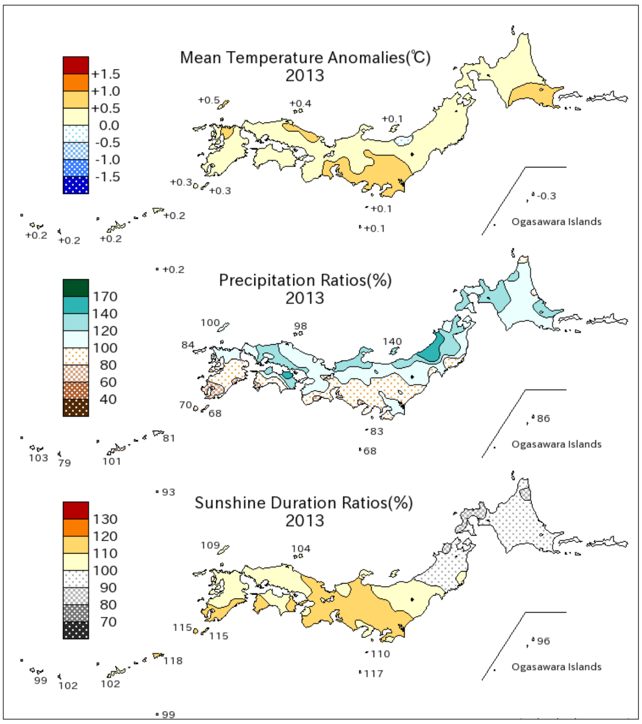

Figure 7 Annual climate anomalies/ratios for Japan in 2013

(d) Autumn (September – November)

In most parts of Japan, moving high pressure systems brought more sunny days than usual, while heavy rains were occasionally brought by typhoons, active fronts and cyclones. Nine typhoons approached Japan during autumn, which was the joint-highest total on record.

(Norihisa Fujikawa, Climate Prediction Division)

The Japanese 55-year Reanalysis (JRA-55)

Production of the new JRA-55 dataset is now complete, and early results of quality assessment suggest that many of the deficiencies seen in JRA-25 have been eliminated or reduced. The temporal consistency of temperature analysis with JRA-55 shows optimal performance with few jumps among instances of reanalysis. JRA-55 family inter-comparison provides opportunities for quantitative assessment regarding the representation of climatic trends and low-frequency variations.

1. Outline of JRA-55 (Figure 8, Table 2)

JMA has completed the second Japanese global reanalysis, known formally as JRA-55 and informally as JRA Go! Go! (as “go” is the Japanese word for “five”), to provide a comprehensive atmospheric dataset suitable for the study of climate change and multi-decadal variability. The data cover a period of 55 years extending back to 1958 when regular radiosonde observations became operational on a global basis. The data assimilation system for JRA-55 is based on JMA’s operational data assimilation system (as of December 2009), which has been extensively improved since the JRA-25 dataset was produced. JRA-55 is the first global atmospheric reanalysis to apply four-dimensional variational assimilation (4D-Var) to the last half century including the pre-satellite era. For details of JRA-55, see the JRA-55 comprehensive report (to be submitted to the Journal of the Meteorological Society of Japan shortly).

JMA continues the production of JRA-55 dataset on a near real-time basis using the same data assimilation system as used for this dataset. The near real-time product is also called JRA-55.

2. Basic performance of the data assimilation system (Figure 9)

Forecast scores obtained using JRA-55 data show remarkable improvement over those obtained with JRA-25. Scores for the Northern Hemisphere are particularly stable, indicating high temporal consistency in the region.

3. Early results of quality assessment (Figure 10)

Representation of long-term trends and low-frequency variations has been a major issue in reanalysis. With JRA-55, the temporal consistency of temperature analysis has improved considerably from that of previous instances of reanalysis.

4. JRA-55 family (Figure 11)

JMA’s Meteorological Research Institute is currently conducting conventional observation-only reanalysis (JRA-55C) and AGCM simulation (JRA-55AMIP) with the common base Numerical Weather Prediction (NWP) system used for JRA-55. Figure 11 shows the quasi-biennial oscillation (QBO) represented by each member of the family. This inter-comparison suggests that radiosonde observations play an important role in reproducing QBO in the JRA-55 system.

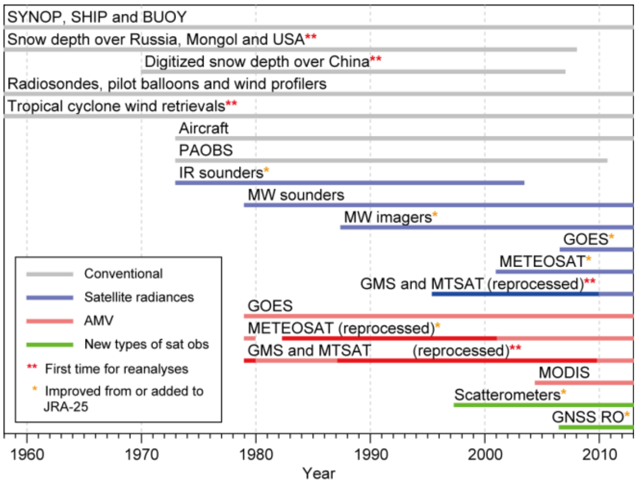

Figure 8 Chronology of observational data types assimilated in JRA-55

Table 2 Comparison of JRA-25 and JRA-55 data assimilation systems

	JRA-25/JCDAS	JRA-55
Version	Operational as of Mar 2004	Operational as of Dec 2009
Resolution	T106L40 (~ 120 km) top layer at 0.4 hPa	TL319L60 (~ 60 km) top layer at 0.1 hPa
Assimilation scheme	3D-Var (T106 resolution)	4D-Var (T106 inner model) *Background error covariances are inflated by 1.8 before 1972*
Satellite radiance bias correction	Adaptive but not variational	Variational bias correction
Long-wave radiation scheme	*Line absorption* Statistical band model *Water vapor continuum* e-type only	*Line absorption* Table lookup + K-distribution *Water vapor continuum* e-type + P-type
Green house gases	CO_2 only (constant at 375 ppmv)	CO_2, CH_4, N_2O, CFC-11, 12, HCFC-22 (historical concentrations)

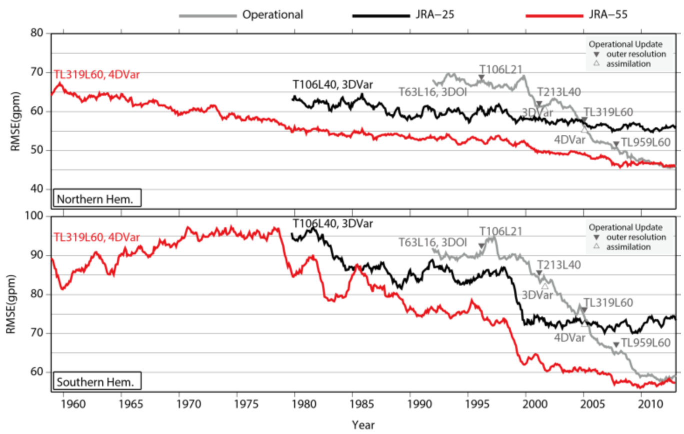

Figure 9 Time-series representation of RMS errors in five-day forecasts of 500-hPa geopotential height (gpm) verified against their own analyses

5. Product availability

The JRA-55 product is available for research purposes from the JMA Data Distribution System (JDDS) (http://jra.kishou.go.jp/JRA-55/index_en.html). A JRA-25 user account can also be used to download the product. JRA-55 data are provided by collaborative organizations as well as by JMA. JRA-55C and JRA-55AMIP production will be completed in FY 2014, and basic related products are scheduled for release soon after.

Collaborating organizations:

- Data Integration & Analysis System (DIAS)
  Link for data access:
  http://dias-dmg.tkl.iis.u-tokyo.ac.jp/dmm/doc/JRA-55-DIAS-en.html
- National Center for Atmospheric Research (NCAR)
  Links for data access:
  Daily 3-hourly and 6-hourly Data
  http://rda.ucar.edu/datasets/ds628.0/
  Monthly Means and Variances
  http://rda.ucar.edu/datasets/ds628.1/

(Shinya Kobayashi, Yukinari Ota, Yayoi Harada and Hirokatsu Onoda, Climate Prediction Division)

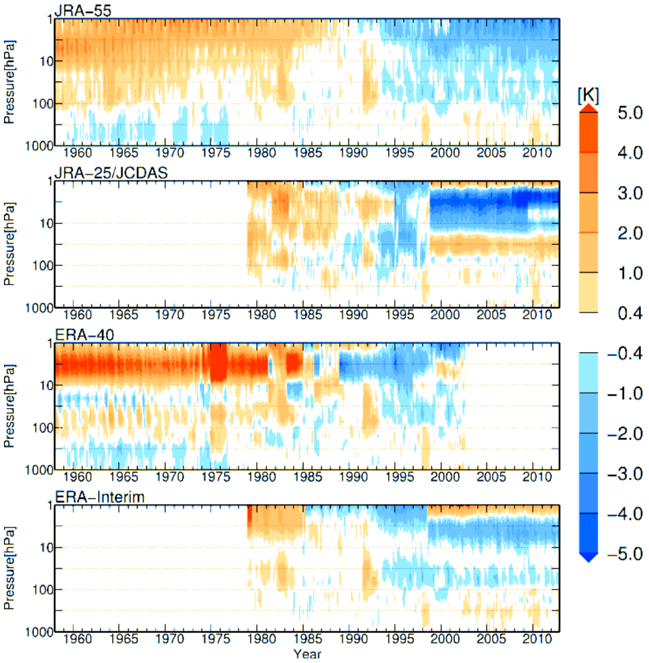

Figure 10 Time-series representation of global mean temperature anomalies

Anomalies are calculated with respect to their own averages for the years from 1980 to 2001.

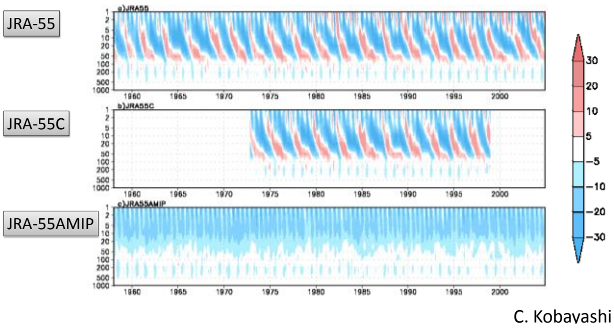

Figure 11 Time-series representation of zonal wind (m/s) averaged for the equatorial band between 5°S and 5°N

Upgrade of JMA's One-month Ensemble Prediction System

JMA plans to implement a major upgrade of its Ensemble Prediction System (EPS) for operational one-month forecasting (One-month EPS) on 6 March 2014. The product dissemination day will change from Friday to Thursday in connection with this development, which will enable users to obtain One-month EPS products a day earlier. The major changes to the One-month EPS and related performance are described below.

New product dissemination timing

The dissemination day for graphical products and gridded datasets will change from Friday to Thursday with no modification to the specifications of gridded datasets (such as data format and variables). As a result, users will be able to obtain One-month EPS products a day earlier. This will take effect on Thursday, 6 March 2014.

Major updates

Major changes in the new One-month EPS are given as follows:

- Atmospheric global circulation model (AGCM)
  - ➢ Increased horizontal resolution from TL159 (110 km) to TL319 (55 km)
- Improvement of boundary conditions for the AGCM
  - ➢ Usage of merged satellite and in-situ data Global Daily Sea Surface Temperatures (MGDSST; JMA 2013; Kurihara et al., 2006) and related sea ice concentration data with higher resolution (0.25 x 0.25 degrees) than current SST and ice data (COBE-SST; 1.0 x 1.0 degrees; Ishii et al., 2005)
  - ➢ Application of initial anomalies of sea ice distribution to calculate prescribed boundary conditions for sea ice in order to produce more appropriate results than those of calculation from climatological distribution only
- Ensemble method
  - ➢ Introduction of a stochastic physics scheme in consideration of model uncertainties associated with physical parameterization

Performance

In advance of the upgrade, a full set of hindcasts for the 30-year period from 1981 to 2010 has been executed using the new system. Atmospheric and land initial conditions for the experiments were taken from the Japanese 55-year Reanalysis (JRA-55; See page 5), which is a new advanced reanalysis dataset produced by JMA. Verification of the hindcasts indicates significant prediction skill enhancement. For example, anomaly correlation coefficients of 850-hPa temperature (T850) and sea level pressure (SLP) over the tropics show improvement under the new system (Figure 12).

One-month EPS products are available on the TCC website at http://ds.data.jma.go.jp/tcc/tcc/products/model/index.html.

The gridded datasets used for operational forecasting and hindcasting are also available exclusively to registered NMHSs. To register, contact TCC at tcc@met.kishou.go.jp.

References

Ishii, M., A. Shouji, S. Sugimoto, and T. Matsumoto, 2005: Objective analyses of sea-surface temperature and marine meteorological variables for the 20th century using ICOADS and the KOBE collection. *Int. J. of Climatology*, **25,** 865−879.

JMA, 2013: Merged satellite and in-situ data global daily sea surface temperature. *Outline of the operational numerical weather prediction at the Japan Meteorological Agency. Appendix to WMO Technical Progress Report on the Global Data-processing and Forecasting System (GDPFS) and Numerical Weather Prediction (NWP) Research*, Japan Meteorological Agency, Tokyo, Japan, 138. Available online at http://www.jma.go.jp/jma/jma-eng/jma-center/nwp/outline2013-nwp/index.htm.

Kurihara, Y., T. Sakurai, and T. Kuragano, 2006: Global daily sea surface temperature analysis using data from satellite microwave radiometer, satellite infrared radiometer and in-situ observations (in Japanese). *Weather Bull.*, **73,** s1 – s18.

(Masayuki Hirai, Climate Prediction Division)

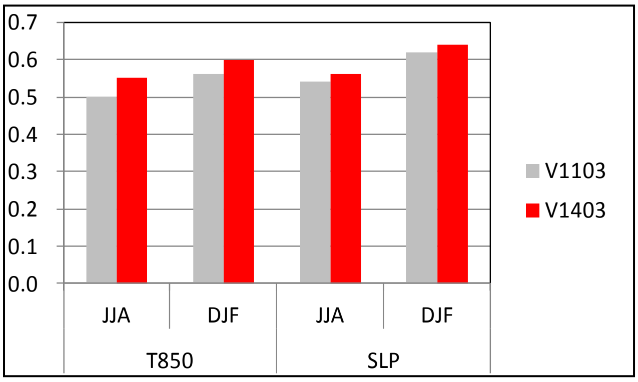

Figure 12 Anomaly correlation coefficients of one-month mean 850-hPa temperature (T850) and sea level pressure (SLP) over the tropics (20°S – 20°N)
The grey and red bars denote the current system (V1103) and the new system (V1403), respectively. The verification period is 1981 to 2010.

Table 3 Specifications of JMA's current and new one-month EPSs

	Current system (until Feb. 2014) V1103	New system (from Mar. 2014) V1403
Atmospheric model	JMA-GSM (AGCM)	
Resolution	Horizontal: approx. 110 km (TL159) Vertical: 60 levels up to 0.1 hPa	Horizontal: approx. 55 km (TL319) Vertical: 60 levels up to 0.1 hPa
Sea surface temperature	Persisted anomaly with COBE-SST (1.0 x 1.0 degrees)	Persisted anomaly with MGDSST (0.25 x 0.25 degrees)
Sea ice	Climatology of sea ice analysis (1.0 x 1.0 degrees)	Prescribed sea ice distribution (0.25 x 0.25 degrees)
Ensemble method	Combination of Breeding of Growing Modes (BGM) Lagged Average Forecast (LAF)	Combination of Breeding of Growing Modes (BGM) Lagged Average Forecast (LAF) stochastic physics scheme
Ensemble size	50	
Frequency of model product creation	Once a week Every Friday	Once a week Every Thursday

Complete revision of ClimatView for plug-in-free compatibility with Web browsers

In January 2014, JMA/TCC implemented a complete revision of the ClimatView online interactive climate database. This tool enables viewing and downloading of monthly world climate data, giving users access to statistics on monthly mean temperatures, monthly total precipitation amounts and related anomalies or ratios for all stations where such data are available.

To view ClimatView graphics in the previous version, a plug-in (Adobe SVG Viewer for Windows Internet Explorer) was required, and graphics could not be displayed with other browsers. The new version is designed to allow browsing without plug-ins using PHP and its graphic library. It enables viewing with web browsers including Firefox and Google Chrome in addition to Internet Explorer.

Graphics such as distribution maps, time-sequential graphs and data-lists are displayed in the same style as those of the previous version, and data can be downloaded in comma-separated-value (csv) format (Figure 13). Data are available for the period since June 1982, when JMA started receiving CLIMAT messages. Current data are from the previous month or the month before it, and are usually updated around the 10th of each month.

Note that the ClimatView web page has been moved to http://ds.data.jma.go.jp/gmd/tcc/tcc/products/climate/climatview/frame.php on the World Climate section of the TCC website.

(Toshiyuki Sakurai, Tokyo Climate Center)

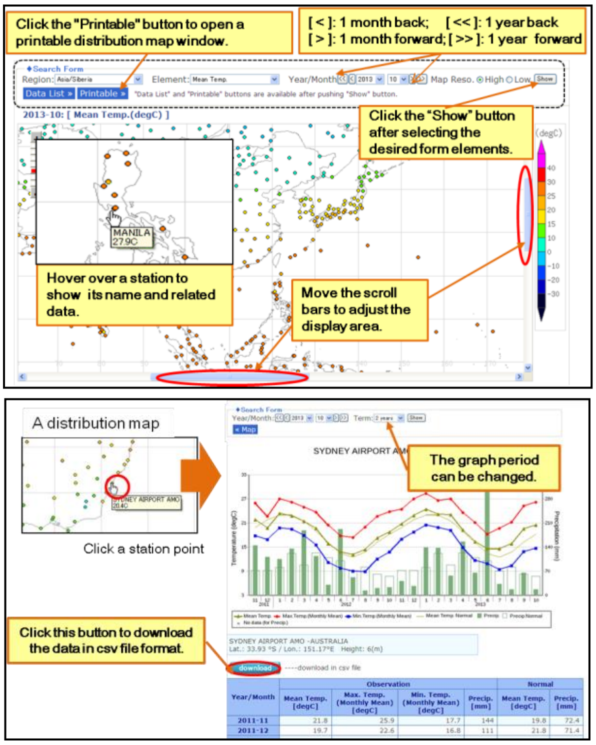

Figure 13 Sample images from the new ClimatView

TCC Activity Report for 2013

In 2013, the Tokyo Climate Center (TCC) continued to support the climate services of NMHSs in Asia-Pacific countries by providing and enhancing data and products, holding training seminars, sending experts and hosting visitors.

1. Highlights of 2013

1.1 Pilot project on Information Sharing on Climate Services

TCC plays a leading role in the implementation of the WMO RA II Pilot Project on Information Sharing on Climate Services. In 2013, the Center collected climate information provided by NMHSs as well as details of good practices on the application of climate information in society via a questionnaire survey. Based on the information received, TCC worked on the development of a dedicated website.

1.2 Issuance of special reports on extreme events

In its role as a WMO Regional Climate Center (RCC) in RA II, TCC monitors world climate conditions with focus on Asia and the surrounding area. The Center issues reports on extreme climate events and summaries of the Asian summer/winter monsoon on its website at http://ds.data.jma.go.jp/tcc/tcc/products/clisys/reports/index.html.

In 2013, Japan experienced extremely hot summer conditions. During this period on 13 August, TCC issued a preliminary report on the heat. To support the issuance of a more comprehensive statement on this extreme event, the Center invited members of its Advisory Panel on Extreme Climate Events (TCC News No. 28) to investigate and discuss related factors. The preliminary report and the statement were issued both in Japanese and in English on the JMA website, and the English versions were also made available on the TCC website.

TCC also closely monitored a number of extreme events, especially those listed below, and issued related media releases in Japanese. These are available on the JMA website at http://www.data.jma.go.jp/gmd/cpd/monitor/extreme_world/index.html.

- Heavy rainfall in Europe from May to the middle of June
- Heavy rainfall in India in June
- Heavy rainfall from central China to the northern part of the Korean Peninsula in July
- Heat-wave and dry conditions in southern China in July/August
- Heavy rainfall over the Amur River basin (Russian Federation) from July to September
- Heavy rainfall over the Indochina Peninsula mainly in September

In its role as an RCC in RA II, TCC informed WMO of events in the region to assist in the preparation of the WMO Statement on the Global Climate in 2013.

1.3 JRA-55

JMA recently completed the second Japanese reanalysis, known as JRA-55, thereby providing a comprehensive atmospheric dataset suitable for the study of climate change and multi-decadal variability. The data cover a period of 55 years extending back to 1958 when regular radiosonde observations became operational on a global basis. JRA-55 is the first global atmospheric reanalysis to apply four-dimensional variational data assimilation (4D-Var) to the last half century including the pre-satellite era. The JRA-55 product is available for research purposes. For details, see the JRA-55 web page at http://jra.kishou.go.jp/JRA-55/index_en.html and the article *The Japanese 55-year Reanalysis (JRA-55)* in this issue.

1.4 RA II RCC portal site modification

In 2013, the Russian Federation's North Eurasia Climate Centre (NEACC) was formally designated as a new RCC in RA II. In response, TCC modified the RA II RCC website (http://www.rccra2.org/) in collaboration with BCC by adding links to NEACC climate data and products.

2. Enhancement of data/products/tools on the TCC website

TCC strives to continuously enhance its services in the provision of data, products and tools. In 2013, the following data and products were made available on its website:

- 27 February: Table showing historical El Niño and La Niña Events (El Niño Monitoring)
- 21 May: Time series of anomaly correlation in the tropics (NWP Model Prediction)
- 1 July: Regional map of ten-day/half-monthly mean temperatures and total precipitation (World Climate)

Some of these new data/products were made available in response to requests by NMHSs, and are also expected to be useful to other parties. The Center will continue to accommodate requests from NMHSs wherever possible.

3. Capacity development

TCC holds annual training seminars as part of capacity-development activities related to its role as an RCC in RA II. In addition to running annual training seminars, it also arranges expert visits to and hosts visitors from NMHSs to support exchanges of views on climate services and the effective transfer of technology.

3.1 Training seminar

In 2013, TCC held the Training Seminar on Seasonal Prediction Products from 11 to 15 November at JMA Headquarters in Tokyo. The event was attended by 16 experts from NMHSs in Bangladesh, Cambodia, Hong Kong (China), Indonesia, Lao People's Democratic Republic, Malaysia, Mongolia, Myanmar, Nepal, Papua New Guinea, the Philippines, Sri Lanka, Thailand and Viet Nam. The seminar focused on familiarizing the participants with the outputs of JMA's numerical prediction model and improving their skills in generating seasonal prediction products using statistical downscaling methods. Presentations given by the lecturers are available on the TCC website (TCC News No. 34).

3.2 Expert visits

In February, TCC sent experts to Indonesia for follow-up work relating to the visit by experts from Indonesia's Meteorological, Climatological and Geophysical Agency (BMKG) in July 2012 (TCC News 29). The main purpose of the visit was to install a module for site-specific probabilistic guidance for one-month forecasting, which is expected to contribute to enhancing BMKG's Climate Early Warning System. The experts also led discussions and exchanged views with attendees on improving climate services and engaging in future collaboration.

In October, a TCC expert visited the Philippine Atmospheric, Geophysical and Astronomical Services Administration (PAGASA) to install a module for site-specific probabilistic guidance for one-month forecasting. The expert also gave technical guidance on the module to support its use on an operational basis in the near future.

3.3 Visitors

In November, three experts from Indonesia's BMKG visited TCC for further follow-up activity toward the installation of a module to support site-specific probabilistic guidance for one-month forecasting. During the visit, TCC provided the experts with technical guidance focusing on verification procedures for one-month forecasting. The attendees also participated in the TCC Training Seminar on Seasonal Prediction Products.

4. International meetings

4.1 Regional Climate Outlook Forums

RCCs are expected to actively contribute to discussions in Regional Climate Outlook Forums (RCOFs). In 2013, TCC experts participated in the following RCOFs in Asia:

- Ninth session of the Forum on Regional Climate Monitoring, Assessment and Prediction for Regional Association II (FOCRA II) held in Beijing, China, from 8 to 10 April
- Fourth session of the South Asian Climate Outlook Forum (SASCOF-4) held in Kathmandu, Nepal, from 18 to 19 April
- Fifth session of the North Eurasian Climate Outlook Forum (NEACOF-5) held in Moscow, Russian Federation, from 29 October to 1 November
- First session of the East Asia winter Climate Outlook Forum (EASCOF), held in Ulaanbaatar, Mongolia, from 4 to 6 November
- Inaugural session of the Asian Climate Outlook Forum (ASEANCOF) held in Singapore from 3 to 5 December

TCC attendees gave presentations on seasonal predictions based on JMA's numerical model and participated in discussions toward the formulation of a consensus statement on regional forecasts.

4.2 WMO Workshop on Operational Long-range Forecasting: GPCs and RCCs, in support of NMHSs and RCOFs

TCC experts participated in the WMO Workshop on Operational Long-range Forecasting: GPCs and RCCs, in support of NMHSs and RCOFs (November, Brasilia, Brazil), giving presentations on examples of information/data/products output by RCC Tokyo and GPC Tokyo (a Global Producing Center for long-range forecasts). The Workshop made recommendations on steps needed to strengthen the process of generating regional seasonal forecasts through increased capability for the synthesis of prediction information on global, regional and national scales.

4.3 Other meetings

On 28 October, the Second Joint RA VI Regional Climate Centres Network Coordination Meeting took place in conjunction with NEACOF-5. The TCC representative who attended NEACOF-5 was also present at this meeting, which provided valuable opportunities to learn about the activities and coordination of the RA VI RCC Network and to introduce TCC's work.

In 2013, TCC was also represented at other meetings including the first session of the Intergovernmental Board on Climate Services (IBCS-1, July, Geneva, Switzerland) and the International Workshop on Climate Data Requirements and Applications (March, Nanjing, China). At the Operational Climate Services: A Dialogue on Practical Action session held as part of IBCS-1, TCC gave a poster presentation on JMA's contribution to improving climate risk management highlighting a new dedicated website to promote the use of climate information in such management.

5. Publications

TCC has published its newsletter (TCC News) on a quarterly basis since 2005. The publication is intended to enhance communication and provide information to NMHSs and related communities about recent TCC developments, events and activities as well as details of the Center's reports on the state of the climate, monitoring results and outlooks. In 2013, TCC News Nos. 31 – 34 were issued and made available on the TCC website.

Other English-language publications related to the climate, such as Climate Change Monitoring Report 2012 and Annual Report on the Climate System 2012, were also published on the TCC website.

6. Other activities

TCC's Ryuji Yamada, who serves as Chairman of the RA II Working Group on Climate Services (WG-CS consisting of Expert Groups on Climate Services (EG-CS) and Agrometeorology (EG-AgM)) developed a work plan for the Working Group in collaboration with co-coordinators and theme leaders from each Expert Group.

7. Plans for 2014

- Contribution to the Global Framework for Climate Services (GFCS)

The implementation of the GFCS has made international collaboration through RCCs even more important, and TCC plans to further strengthen its activities to lead RA II's contribution to the Framework. In light of the important roles played by NMHSs in climate-related disaster risk management (one of the key sectors in the GFCS), TCC plans to enhance regional climate watch observation by more actively providing NMHSs with relevant information as necessary. A portal site for the Pilot Project on Information Sharing on Climate Services will be launched in spring, and TCC will continue to collect pertinent information from NMHSs to be shared with Members.

- New/upgraded data and products

In January, the web-based ClimatView interactive climate database will be upgraded. To view ClimatView graphics in the previous version, a plug-in (Adobe SVG Viewer for Windows Internet Explorer) was required, and graphics could not be displayed with other browsers. The new version is designed to allow browsing without plug-ins using PHP and its graphic library. It enables viewing with web browsers including Firefox and Google Chrome in addition to Internet Explorer. (Also see the article *Complete revision of ClimatView for plug-in-free compatibility with Web browsers* in this issue.).

JMA plans to upgrade its one-month numerical prediction system in March. Hindcast experiments have already been executed using the new system with the target period of 1981 – 2010. Forecast data and products as well as hindcast gridded data with the new system will be made available on the TCC website. (Also see the article *Upgrade of JMA's One-month Ensemble Prediction System* in this issue.).

In response to the release of JRA-55 data, all climate products generated using JRA-25 data will be replaced by versions generated using JRA-55 data in March.

In spring, TCC plans to start monthly issuance of comprehensive information on climate monitoring and seasonal prediction to assist NMHSs in the creation of seasonal forecasts. The document, provisionally named *Monthly Climate Discussion on Seasonal Outlooks*, will contain results of climate system monitoring and other observations from the previous month as well as interpretation of seasonal prediction products from GPC Tokyo, and will be published on the TCC website.

In spring, TCC will also start releasing Extreme Forecast Index (EFI) maps via its website to show areas at high risk of extreme weather conditions in the next two weeks, such as high/low temperatures, heavy precipitation/drought conditions or strong winds. The maps will be produced using one-month forecast products from GPC Tokyo.

- Capacity development

In the last quarter of the year, TCC will hold its annual training seminar with a dozen invited experts as attendees. The Center will also continue to dispatch experts to NMHSs as necessary and host visitors from NMHSs upon request.

- Hosting of EASCOF

In autumn, TCC will host the second session of the East Asia Winter Climate Outlook Forum (EASCOF) with the participation of experts engaged in climate services at NMHSs and researchers from China, Japan, Mongolia and the Republic of Korea. At the event, the climate conditions of the previous season will be reviewed, and the current status of the climate system as well as the seasonal Asian winter monsoon forecast for winter 2014/2015 will be discussed.

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