

# Recent Developments in Climate Information Services at JMA

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Climate Prediction Division, Japan Meteorological Agency (CPD/JMA) has conducted research and development activities related with climate information services over the years. This presentation introduces CPD's recent activities including the diagnosis of the Northern Hemispheric circulation in December 2005, completion of the Japanese 25-year Re-Analysis project (JRA-25), and a new global surface temperature analysis for monitoring the global warming. It is noted that all of these data and information are available from Tokyo Climate Center (TCC/JMA).

## **1. Diagnosis of the Northern Hemispheric circulation in December 2005 – linkage between the Arctic Oscillation and the tropical convective activity -**

Japan and some East Asian countries suffered extremely cold weather during the early winter of 2005/2006. In Southeastern Asia, on the other hand, heavier-than-normal precipitation was observed and significant damage by floods and landslides were reported.

At 500-hPa height field, positive anomalies in the Arctic area and negative anomalies in the mid-latitudes in the Northern Hemisphere were observed in December 2005. It was the predominantly negative phase of the “Arctic Oscillation” (AO), which persisted through the month. In the tropics, convective activities were much stronger than normal over the Bay of Bengal, the South China Sea and the Philippine Sea. In the upper troposphere north of the active convection areas, an anti-cyclonic circulation anomaly was formed, and followed by a cyclonic anomaly and an anti-cyclonic anomaly centered east off Japan and over the mid-Pacific, respectively. The set of the anomalies was analyzed as a stationary Rossby wave train, which was forced by the strong convection in the tropics and propagated along the sub-tropical jet stream, and caused the large-scale southward shift of the jet over Japan.

JMA's operational ensemble predictions for December 2005 suggested the possibility of issuing early warning for this extreme event with a few weeks in advance.

## **2. Completion of the Japanese 25-year Re-Analysis project (JRA-25)**

The Japanese 25-year Re-Analysis project (JRA-25) by JMA and the Central Research Institute of Electric Power Industry (CRIEPI) of Japan successfully completed in March 2006. A high quality dataset of the atmosphere and the land in the last 26 years (from Jan. 1979 to Dec. 2004) will soon become available for operational meteorological organizations and research institutes through its official website (<http://www.jreap.org>), after the post-processing and checking data quality. Preliminary evaluation shows that JRA-25 data have some advantages in the performances of 6-hour precipitation and tropical cyclones analysis, compared with existing re-analyses. Following the JRA-25, CPD/JMA has started quasi-real-time JCDAS (JMA Climate Data Assimilation System) with the same system as that of JRA-25 from March 2006 onward. JRA-25 and JCDAS will be fundamental datasets for verifying dynamical seasonal predictions, monitoring the global climate system, researching climate variability and developing

climate information applications.

The total volume of JRA-25 dataset is supposed to be around 13 terabytes, when all the analyzed physical elements are served with original spatial (T106L40: 320x160x40 grids) and temporal (6 hourly) resolution. However, publicly-supplied version will be provided with coarser resolution with 2.5-degree lat-lon grids (144x73) and 23 pressure levels in GRIB format, which are easier to be handled with freely distributed software, like GrADS and GRIB decoder. In this format, one file size is around 2 megabytes, which includes 6-hourly data for one month, one element and one vertical level. More information is available at the official website of JRA-25 (<http://www.jreap.org/download/howto-e.html>), and after signing up, you may download data from <http://www.jreap.org/download/download-e.html>.

### **3. A new global surface temperature analysis scheme for monitoring the Global Warming**

CPD/JMA began to analyze the monthly global average surface temperature anomalies using temperature observations over land as well as sea surface temperatures from the beginning of 2006. Until then, JMA analyzed the global surface temperature only from temperature observations over land. The JMA's original long-term sea surface temperature analysis dataset, called COBE-SST<sup>1</sup>, is used to analyze the combined global surface temperature analysis over land and ocean since the late 19<sup>th</sup> century.

Comparison with the existing global surface temperature analyses at NCDC/NOAA, GISS/NASA, HadC/UKMO and CRU/UK confirmed that this new data set is fairly consistent with those analyses.

### **4. Activities of Tokyo Climate Center (TCC)**

TCC continues to provide the NMHS users with advanced climate information and products, such as the timely diagnosis of extreme climate events in the Asia/Pacific region, through TCC website (<http://okdk.kishou.go.jp/>). The global average surface temperature anomaly for each month will soon appear on the website. The JRA-25 GPVs and the long-term hindcast GPVs for monthly /seasonal prediction will be provided in the near future.

The JMA's Global Data-Processing and Forecasting System was upgraded on 1 March 2006. The computing speed of the new super-computer system is about 36 times as fast as that of the previous one. This enables us to implement the JCDAS and the new SST analysis (COBE-SST).

With the improvement of the computer system, the number of ensemble members of the ensemble one-month forecast was increased from 26 to 50. These changes are expected to help improve the probability distribution of the one-month forecast.

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<sup>1</sup> Centennial in-situ Observation-Based Estimates of the variability of SSTs and marine meteorological variables