A Brief Introduction of B08FDP for Beijing 2008 Olympics

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1. BACKGROUND

The 29th Olympic Games will be held in Beijing from Aug.8 to 24, 2008. It's a major international event in which weather can have a significant impact. Weather services are required to support planning and coordination of the B08 activities.

A WWRP endorsed and coordinated international Forecast Demonstration Project (FDP) undertaken concurrently with a Research and Development Project (RDP) are being organized by the China Meteorological Administration (CMA). The FDP (B08FDP), was endorsed by WWRP/SSC 7th Session as a five-years (2005-2009) international forecast demonstration project, with participants from Australia, Canada, Hong Kong, China and United States, will employ state-of-the-art nowcasting systems using observation techniques, numerical weather prediction to support Beijing 2008 Olympics weather service. All FDP participating systems are now successfully installed in Beijing Meteorological Bureau(BMB), CMA.

The overall mission of the B08FDP is to "through international collaboration build, demonstrate and quantify the benefits during the B08 Olympics period of an end-to-end nowcasting weather service focused on high impact weather and based on latest science and technology". B08FDP focuses on 0 to 6 hour thunderstorm forecasting. B08FDP nowcasts will be generated automatically and made available in a timely manner to BMB/CMA forecasters. Forecast products generated by participating nowcasting systems will be inter-compared, benchmarked for skill, and assessed relatively to official BMB/CMA products for added value and impact. Pre-determined nowcasting products will be made available to end users for evaluation, including an assessment of their impact upon the decision-making processes as well as the associated social and societal benefits.

A trial demonstration phase was conducted firstly during July to August, 2006. Another trail run will take place during July to August, 2007. The formal FDP will be conducted in Beijing 2008 Olympics and the Paralympics period.

2. PRIMARY OBJECTIVES AND PLAN

From the historical statistics, the high impact weather climate probability at Beijing 2008 Olympics time of period is shown as Table 1.

High Impact Weather	**Climate Probability**
Thunderstorm	25.1%
Heavy Rain	6.5%

Heavy Fog	7.1%
Mugginess	4.1%
High Temperature	0.4%
Hails	0.4%

Table 1. High Impact WeatherClimate Probability

At the period of Beijing Olympics, weather will be a significant factor on the success of the 2008 Beijing Olympic Games. Based on the successful experience of S2000 FDP project, CMA suggested to implement B08FDP as a part of the weather services in support of the Olympic Games.

The goals of B08 Project are to demonstrate how the state-of-the-art nowcasts and mesoscale ensemble systems can provide an improved weather service. Also, B08FDP products need to meet High Impact Weather and OG service requirements and should link with the BMB Olympic weather service requirements. So, after the First Workshop of B08FDP/RDP (March 2005), many works have been set up or deployed, many of them are finished and some of them still need to be improved in this summer's trial run.

1) The implementation plan was built, include: Overall mission, the specific goals, preliminary participating systems, basic working mechanisms, time schedule etc.

2) International B08FDP SSC was agreed upon member's names, terms of reference for the SSC.

3) CMA's supporting was clarified like Observation data, financial support items, supporting organization & teams etc.

3. PROGRESS SINCE 2006

Data Preparation and Participating Systems

Significant progress in the implementation of the B08FDP has been made in 2006. The first trial run has achieved its goals successfully. Before the first trial, BMB/CMA set up the enhanced B08FDP network (Figure.1) with shareable databases. A remote working environment was created. Real-time, high temporal- and spatial-resolution data were provided. The "B08FDP local data manual" was completed and provided to all participants.

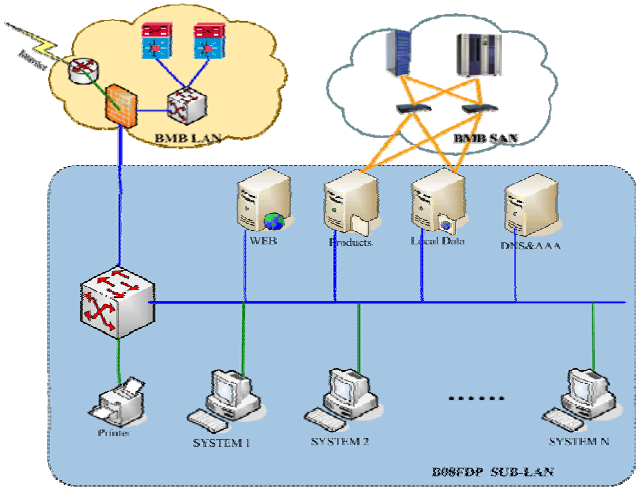

Figure 1. BMB Network Layout

All B08FDP systems were successfully installed in BMB. Among which, The Canadian Radar Processing and Decision System (CARDS) generating multi radar and enhanced nowcasting guidance information; The Short-range Warnings of Intense Rainstorms in Localized Systems (SWIRLS, from HKO) providing extensive nowcasting guidance capability; The very short range NWP Short Term Ensemble Prediction System (STEPS) employing probabilistic nowcasting techniques; The NCAR NIWOT system blending observational and extrapolation techniques; The BMRC Real time verification of nowcasting systems (RTFV) verifying the products from all participants by comparing products with observation; The CMA high resolution deterministic rapid update analyses and NWP system for longer periods (4 hours +) i.e. the Next Generation NWP System (GRAPES); and also from BMRC, TIFS (the Thunderstorm Interactive Forecast System) and nowcast server that provides a range of severe weather, rainfall estimation and visualization applications. All the systems were able to successfully ingest real-time local data.

In August, severe local weather will be the first consideration in B08FDP, so more observations from different advanced observation systems will be included in the project. As new radars put into operation, there will be 4 Doppler radars available for all participants, the time interval is limited in 6 minutes. Also, there will be 104 AWSs in (50) and around (54) Beijing area.

The RTFV (BMRC, using IDL) was installed and localized in BMB successfully in trial period. SEIA(Social and Economic Impact Assessment) project also made good progress, and basic public and BOCOG requirement from polls has been analyzed, and more works will be done in the second trial period this year.

Radar Synchronization

To minimize the difference of each scan for radars in Beijing area, issue about the radar synchronization was brought forward by participants in the FDP group. To support this, MetStar, which is the company of the WSR98D (one of CINRAD system), provides a solution for this issue. The objective is to make all radars running in time-sync manner and collect base data from different radar in a real time mode.

By this, for all radars in the network, each volume scan can start at the same time and all volume scans are limited in 6 minutes. That is to say, one volume scan, for example in VCP21 scan strategy, can be accquired accurately every 6 minutes. Because there is still a slight difference between different radar system, so a reasonable VCP cycle time, for example, 360 seconds for VCP21 was chosen. It makes sure all radars can do a whole VCP21 within 360s by adjusting the uppermost 3 elevations with a little faster scan strategy. The network layout for the radar synchronization system is shown as Figure 2.

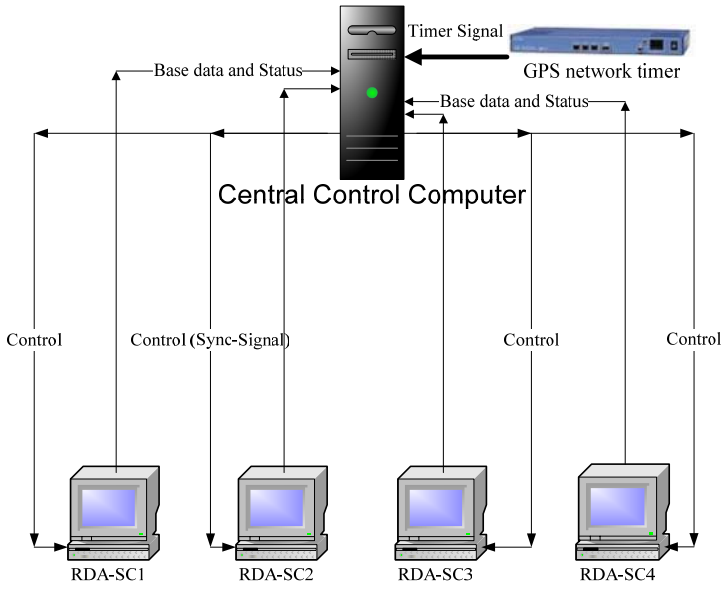

Figure 2. Network layout for radar synchronization system

As shown in Figure 2, all radars connect to Central Control Computer directly via communication links, and a GPS network timer server will be used as a time standard in the network to provide a standard time signal for the whole network, then the Central Control Computer can collects base data at real time and controls radars in the network to start a volume scan at the same time when the scan strategy is the same for all radars.

For base data collecting, data is prepared set by set (a set equals 10 radials or less) in real time at RDA, and each set size is about 24320 bytes. Base data will then be transmitted to Control Center set by set. Also, base data will be compressed on line before transmission and be uncompressed after arrival.

Radar AP and Mosaic

Radar return from AP clutter is an unpredictable event that often contaminates the precipitation measurement and other radar products. An AP mitigation system was developed by CMA, in which, the reflectivity, radial and spectrum width and their spatial variations for ground clutter and different precipitation are examined to determine the membership functions in fuzzy-logical based AP detection algorithm.

The relationships between AP echo and the ground surface altitude are analyzed. The stepped approach for ground clutter detection is developed in this paper based on the method developed by Kessinger. In this algorithm, the thresholds are adjusted in the regions near the distinguished clutter and precipitation points with strict standards, considering the range folding of velocity data and clutter distributions in radial direction. The detection results and contributions of reflectivity, radial and spectrum width data to ground clutter detection are analyzed by using the radar data for AP cases and precipitation cases. The results showed that most of AP clutters is detected by the algorithm. The radial velocity and spectrum width data are key factors for AP clutter detection.

The stepped approach has obvious effects in AP detection.

The AP detection system by CMA will be used before the data can be used by all the participants. Corrected and uncorrected data in CINRAD volumes with flags denoting where correction has occurred will be provided at the same time for the trial run in 2007.

For the 4 Doppler radar systems used for B08FDP, a 3D Mosaic system developed by CMA will also be used. It includes QC of radar raw data; AP remove, noise filter and reflectivity bias correction of radar network; Radar raw data remap to Cartesian coordinate; Regional radar data Mosaic. The operational 3-D mosaic software will be run at the same machine for the radar data synchronization.

5. TRAINING AND FEEDBACK

From April 1, 2007, there was a 20-days FDP training conducted in BMB. The purpose of B08FDP training is to make the B08 weather forecasters familiar with all the participating systems and their products. The content of the training course consists of lectures and practice. An introduction of each system was given in lectures concerning the system major functions, basic principals based on which the systems are developed, and the products provided by the systems. In practice part, the trainees were taught to operate the systems, to learn the major functions and product generation process.

About 32 B08 forecasters and 3 system assistants are selected to participate in the training course. After the lectures for all people in the group, 6 people among the weather forecasters responsible for nowcasting and 3 people from the team for system maintenance and technical assistance were selected to participate in the practice.

From the 20 days training, forecasters from different part of China get a basic knowledge of the advanced systems from the FDP participants and especially how to use the products. They will be the main source for the next year’s weather service in Beijing.

Also, feedbacks for the performance of the participant systems showed that theirs products will play a very important role in the coming 2008. And the key issues are more understanding of the products and used it for the local weather and with the observation facilities..

6. CONCLUSION

Because it’s still in the rainy season for Beijing 2008 Olympics and weather is one of the key issues behind the success of the Games. With the successful implementation of B08FDP, state-of-the-art nowcasting systems from participants have been successfully installed in BMB from August 2006. The first trial run in 2006 was successfully completed. The second trial run will be carried out in August 2007. And the formal run will be conducted during the B08 Olympics and Paralympics.

The nowcasting products and services from the FDP are expected to improve the weather forecasts for the Game and contribute a lot to an enhanced public weather service. Also, the future weather service, especially nowcasting will be benefited a lot from the work of B08FDP. It is also expected that the B08 project will also greatly help the development of the weather nowcasting systems in Developing countries.

7.REFERENCE

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[3] The Implementation Plan For WWRP/B08FDP First System Trial, 2006,Beijing,China

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8. ACKNOWLEDGEMENT

Many people from different part of the world have great contributions to the successful implementation of B08FDP, here we would like to acknowledge the following people for their time and experience and all excellent works:Tom Keenan (BOM/Australia), Z.C.Lei(WMO), Jim Wilson (NCAR/US), Paul Joe (MSC/Canada), John Bally (BOM/Australia), M.C.Wong, HonyinYeung (HKO/Hong Kong, China), Bill Kuo (NCAR/USA), Alan Seed (BOM/Australia), Kurt Hondl (NSSL/US), Barbara Brown (NCAR/US) and Linda J. Anderson-Berry (BOM/Australia), as well as the following from CMA, China: Pu Xie, Xiaoding Yu , Qian Ye, Yingchun Wang, Liping Liu, Jianyun Zhang, Chian Zhang, Li Bo, D.C.Yu, Yiwen Dou, Yuxiao Duan, Mingxuan Chen.