



International Civil Aviation Organization

**EIGHTEENTH MEETING OF THE METEOROLOGY
SUB-GROUP (MET SG/18) OF APANPIRG**

ICAO Regional Sub-Office, Beijing, China
18 – 21 August 2014

Agenda Item 7: Research, development and implementation issues in the MET field

7.4 Advisories and warnings

**ENHANCED CAPABILITY TO SUPPORT THE ISSUANCE OF REGIONAL
HAZARDOUS WEATHER ADVISORY**

(Presented by China)

SUMMARY

This paper presents China's enhanced capability to support the issuance of regional hazardous weather advisories. Action by the meeting is in paragraph 3.

1. Introduction

1.1 Since the successful hosting of SIGMET advisory trial in Asia in 2011, China continues our work on SIGMET-related issues, including continue cooperating with Cambodia and issuing SIGMETs for the Phnom Penh (VDPP) FIR, providing on - job training for forecasters from the State Secretariat of Civil Aviation (SSCA) of Cambodia, arranging VCP training courses of WMO to help to develop the knowledge in the issuance of SIGMETs and etc.

1.2 At the meantime, effort has also been continuously made to enhance our capability to improve the meteorological services for international air navigation in China, especially to support the issuance of Regional Hazardous Weather Advisory (RHWA).

2. Discussion

2.1 Enhanced capability to support the issuance of RHWA

2.1.1 High-resolution numerical weather prediction model products

2.1.1.1 China Aviation Numerical Forecast Systems (CANFS) have been deployed in Beijing, Shanghai and Guangzhou by ATMB of CAAC. With the horizontal resolution of 36km, update cycle of 3 hours, validity period of 72 hours (outer domain) and the coverage area of 60⁰N,60⁰E to 20⁰S,150⁰E, the systems can be used to support the preparation of SIGMET advisories in Asian region.

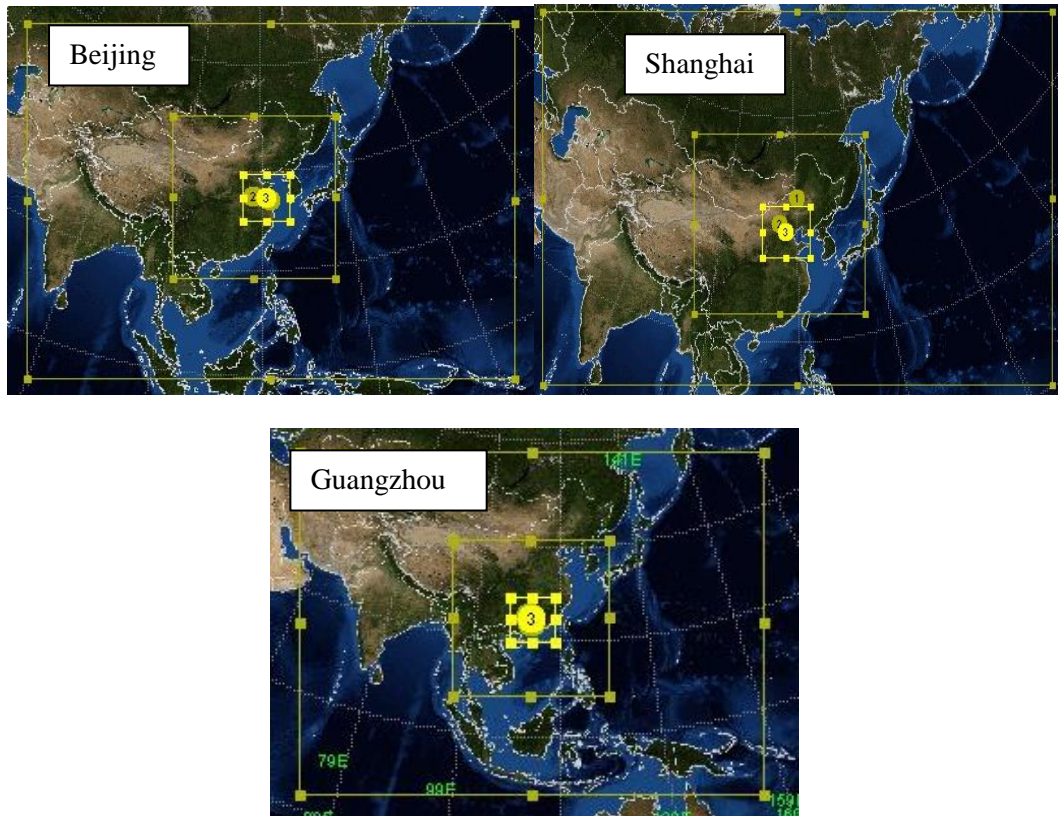


Fig. 1 Coverage area of CANFS products

2.1.1.2 The WMO Severe Weather Forecasting Demonstration Project in Southeast Asia (SWFDP-SeA) hosted by National Meteorological Center of China Meteorological Administration, has set up its website (<http://eng.weather.gov.cn/swfdp/>). From July 2012, products of disaster weather monitoring and forecast, which are based on CMA's global numerical weather prediction system and FY2 stationary satellite, have been published and provided through the website to four Southeast Asian recipient countries.

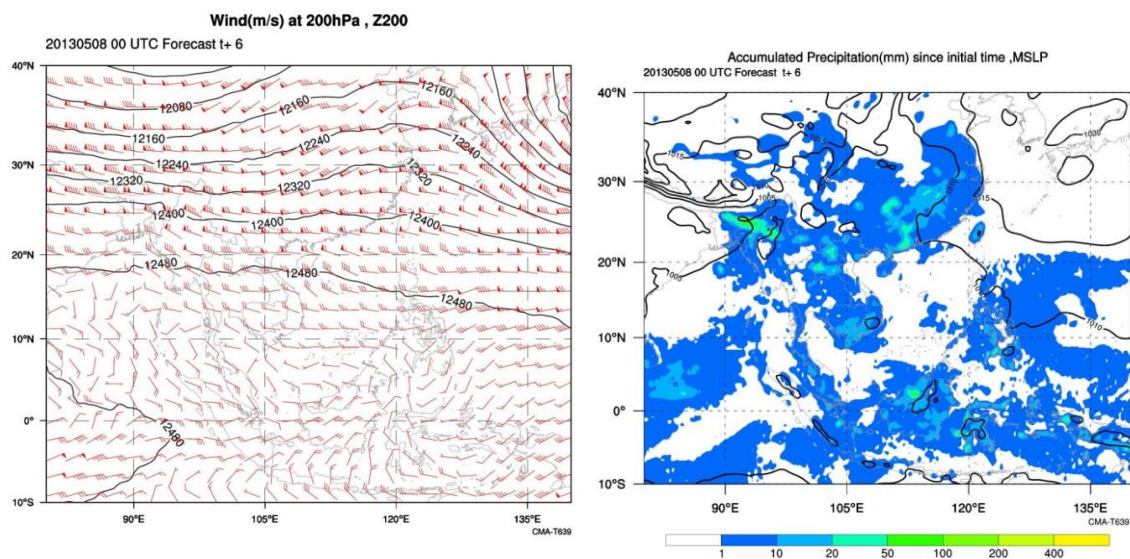


Fig. 2 SWFDP-SeA Products

2.1.1.3 GRAPES_Meso Numerical Forecast Systems

The operational GRAPES_Meso is a non-hydrostatic grid point model with 15km horizontal resolution and 31 levels in the vertical. The domain of the model integration covers the whole East Asia, and the forecast range is up to 72hrs. The specification of GRAPES_Meso is given below:

- Equations: Fully compressible and non-hydrostatical equations with shallow atmosphere approximation.
- Variables: Zonal wind u , meridional wind v , vertical velocity w , potential temperature θ , specific humidity $q(n)$ and Exner pressure π .
- Numerical technique: 2-time level semi-implicit and semi-Lagrangian method for time-space discretization; 3D vectored trajectory scheme used in computation of the Lagrangian trajectory; Piece-wise Rational Method (PRM) for scalar advection.
- Horizontal staggered grid: Arawaka C-grid.
- Time step: 90s.
- Vertical grid: Height-based terrain-following vertical coordinate with Charney-Phillipps variable arrangement in vertical.
- Physics: RRTM LW/ Fouquart & Bonnel SW, Betts-Miller-Janjic cumulus, WSM-6 microphysics, MRF vertical diffusion, NOAA land surface.

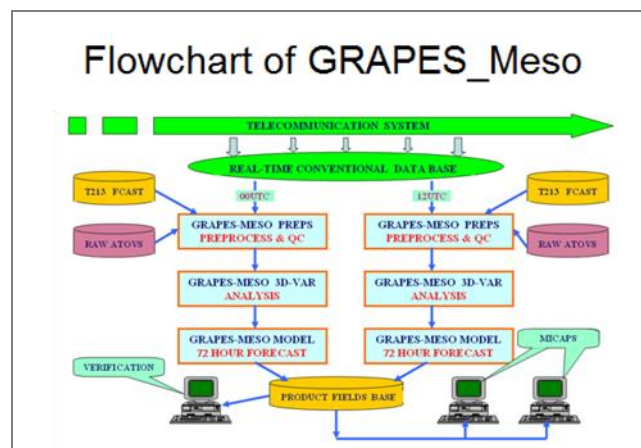


Fig. 3 Flowchart of GRAPES_Meso

2.1.1.4 GRAPES_RAFS Numerical Forecast Systems

In June 2010, Grapes Rapid Analysis and Forecast System (RAFS) were put into the quasi-operational run with a horizontal resolution of 15 km and 31 vertical levels. The prediction domain is from 70°E to 145°E and from 15°N to 65°N and the grid space is 502×330. This system updates its data assimilation every 3 hours in China domain and provides 24-hour forecasting products every 3 hours. The system uses T639 real-time field database to provide its background, while the observations include real-time GTS data (radiosondes, AIREP/AMDAR reports, GMS derived winds, SHIP and SYNOP data, etc.) , GPS/PW data, FY_2E cloud derived wind data and real-time radar VAD data

processed by NMC. The products for making assimilation analysis for such variables as wind, temperature, pressure, humidity, and the products on severe convection weather potential forecast (CAPE, K index, et al) were made available in such 3 formats: Grads, MICAPS, and GIF.

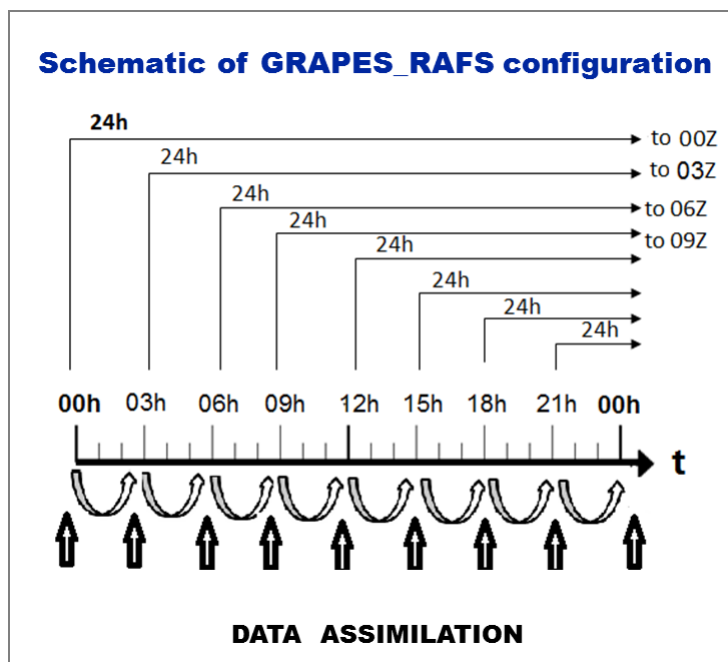


Fig. 4 Schematic of GRAPES_RAFS configuration

2.1.1.5 Severe Weather Automatic Nowcast System (SWAN)

SWAN is a Severe Weather Automatic Nowcast System developed by CMA, which can meet the requirements of monitoring, warning and warning issued for the severe weather.

The automatic monitoring module of SWAN can analyse the radar and automatic station data. Meanwhile, for the probable severe weather, it can automatic monitor and alarm it. The data analysis module of SWAN can provide multi-point, multiple profile contrastive analysis based on radar data, as well as single point time sequence, statistics and contour analysis of multi-factors observed by automatic station. The nowcast module of SWAN can provide the radar reflectivity forecast within 1 hour, the quantitative precipitation forecast(QPF) and storm nowcast products such by using the technique of TITAN and SCIT.

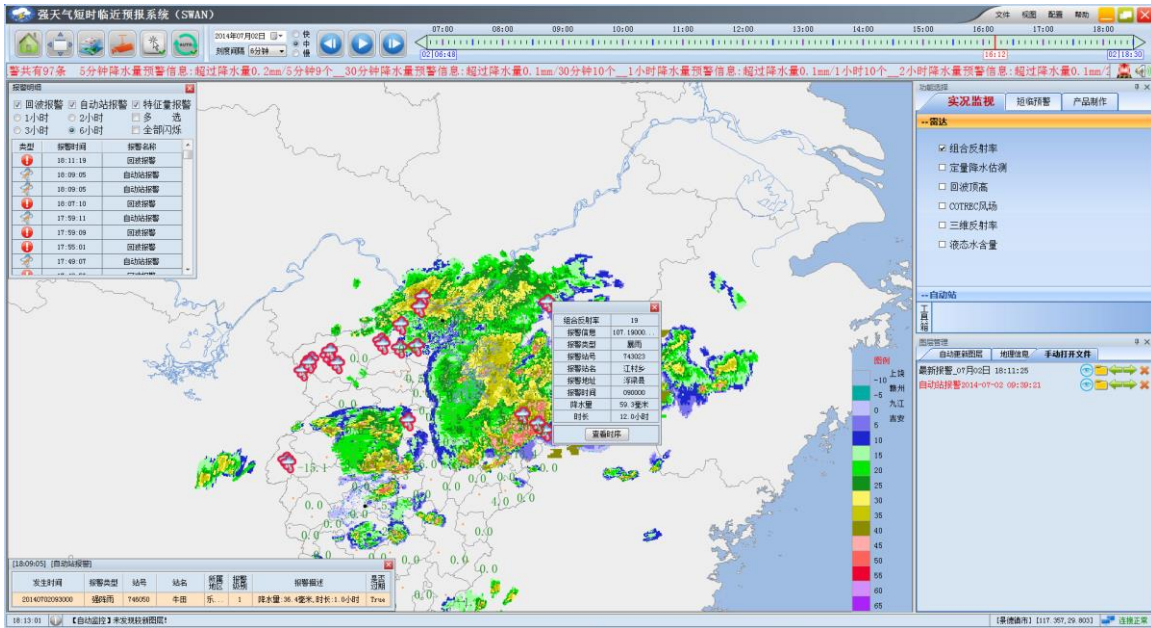


Fig. 5 SWAN Monitoring and Warning

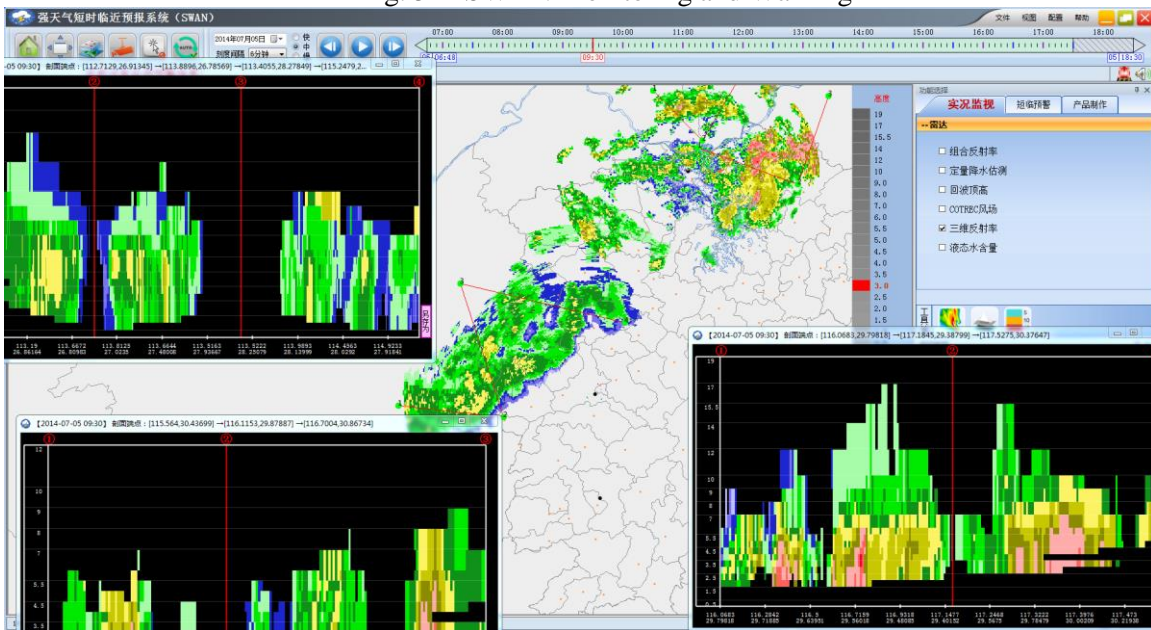


Fig. 6 SWAN Multi-points Radar Reflectivity Cross-section

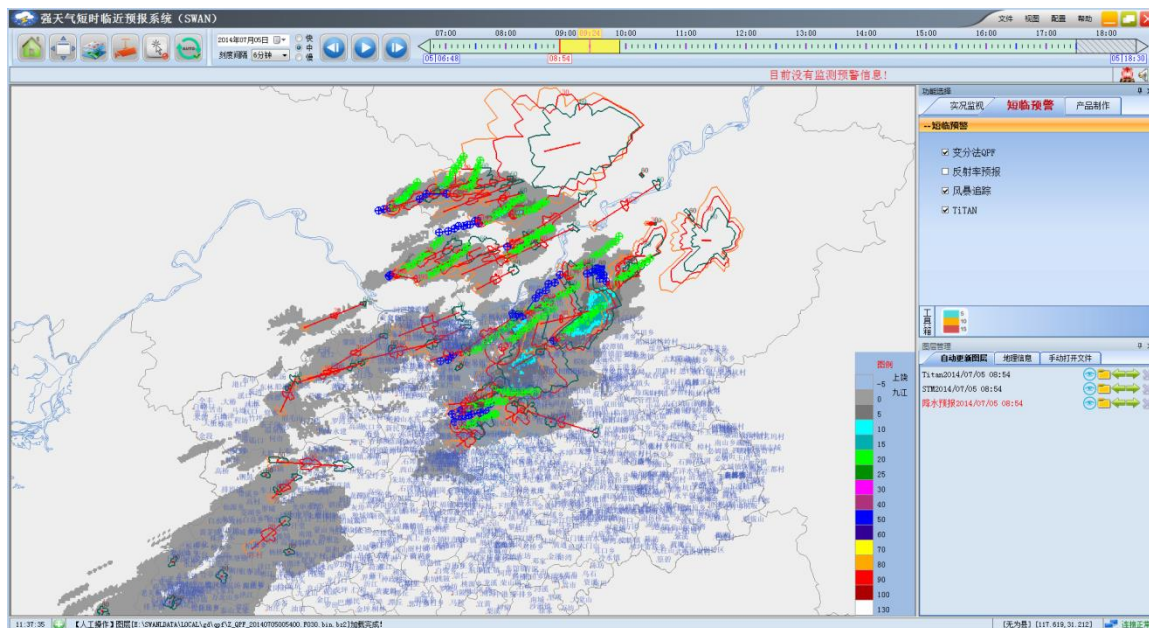


Fig. 6 SWAN Nowcasting Products

2.1.2 Data available for RHWA issuance

Real-time satellite data, METAR/SPECI, special air-reports, AMDAR data, surface observations (SYNOP) and upper-air observations including radiosonde, wind profiler, satellite winds, etc., and WAFS forecasts are routinely available and in real-time visualization. Several systems in operation can rapid scan the satellite data and show kinds of satellite images.

2.1.3 System for SIGMET advisory issuance

The system which was successfully used for the preparation and issuance of SIGMET advisories during the SIGMET advisory trial in Asia in 2011, can be well used for real-time visualization of the meteorological observations and forecasts, and for the preparation, issuance and dissemination of both textual and graphical SIGMET advisory automatically or by human through the man-machine interface in the system.

2.1.4 Website for dissemination

The Asian Aeronautical Meteorology Service website (<http://www.aamets.org/>) established by China for the WMO RA II Pilot Project to develop support for developing countries has been fully operationally used from November 2010 and allows access to all authorized users. The website provides flight meteorological documentation, guidance material for TAF, convective parameters, synoptic analysis, dust storm, composite radar image, FY-2C satellite product, etc. It was also used to disseminate the SIGMET advisories during the SIGMET advisory trial.

2.1.5 Quality management And competency management

In 2007, ISO9001- quality management system was introduced to ATMB of CAAC, and then combined with safety management system in 2011, namely quality and safety management system (QSMS). Till the end of 2013, 44 major aerodrome meteorological offices of CAAC had finished basic establishment of QSMS - completing related documentation and passing required audit.

Competency management system for aeronautical meteorological personnel (AMP) in China has also been established, ensuring that the competency of AMP meet the requirements of aeronautical meteorological service. The competency management provisions are strictly carried out for new personnel employment, pre-job training, license management, and competency assessment. Similar to air traffic controllers, AMP must hold one or more types of aeronautical meteorological licenses to work as observers, forecasters or equipment technicians. To obtain or maintain an aeronautical meteorological license, AMP must participate in routine operational training and pass specific competency test periodically.

2.1.6 VCP training course

In recent years, several VCP training courses of WMO were organized by China in Beijing, to develop the knowledge about the SIGMET Advisory Trial in Asia, SIGMET issuance, nowcasting methods and meteorological service for terminal area, aviation meteorological personnel competency assessment, and WMO CAeM priorities and future Aeronautical Meteorological services. The recent VCP training course was held in Beijing in 2014. During the two-week training course, nearly 40 forecasters from 28 states from Asia, Africa, America and Europe, got the chance to meet and improve their knowledge on the issuance of SIGMET, WMO aviation meteorological personnel competency assessment, nowcasting technology, and etc.

2.1.7 Links with the MWOs

Close contact with some participating MWOs by telephone or email was established during the SIGMET advisory trial, especially with the MWOs that are identified to have SIGMET deficiencies, which made the communication easier and more effective to discuss and improve the SIGMET and SIGMET advisory issuance and the application of SIGMET advisory. The links are kept and updated, especially via the VCP training courses and would be useful for future contact.

2.2 Comments on future development of Regional Hazardous Weather Advisory

2.2.1 As a region with consisted SIGMET deficiency in several states for many years, it is urgent for Asian/Pacific region to take on actions to address the issue.

2.2.2 To facilitate the development of RHWA, states should be encouraged to share their capabilities, technology, experiences and all other information that will help the development of RHWA in this region.

2.2.3 Guidance materials of the developments of RHWA, including the select criteria of the regional RHWA centers, the work arrangement between regional RHWA centers and related MWOs, and other important issues, should be developed expeditiously. The select of the regional RHWA centers, should take into account local capability and expertise, experience and feasibility of cooperation with those states with SIGMET-deficiency problem, balance and effectiveness of the developments of regional/global centers in Asian/Pacific region.

3. Action by the Meeting

3.1 The meeting is invited to:

- a) note the information contained in this paper; and
- b) discuss any relevant matters as appropriate.
