Research into Operation in NMC/CMA

ZHANG Xiaoling

National Meteorological Center, Chinese Meteorological Administration

18 November 2013

国家气象中心
NATIONAL METEOROLOGICAL CENTER

Outline

1. Goals

2. Research and transition platform

3. R2O: Transition experiments in 2012 and 2013

4. O2R: Joint discussion and research in 2013
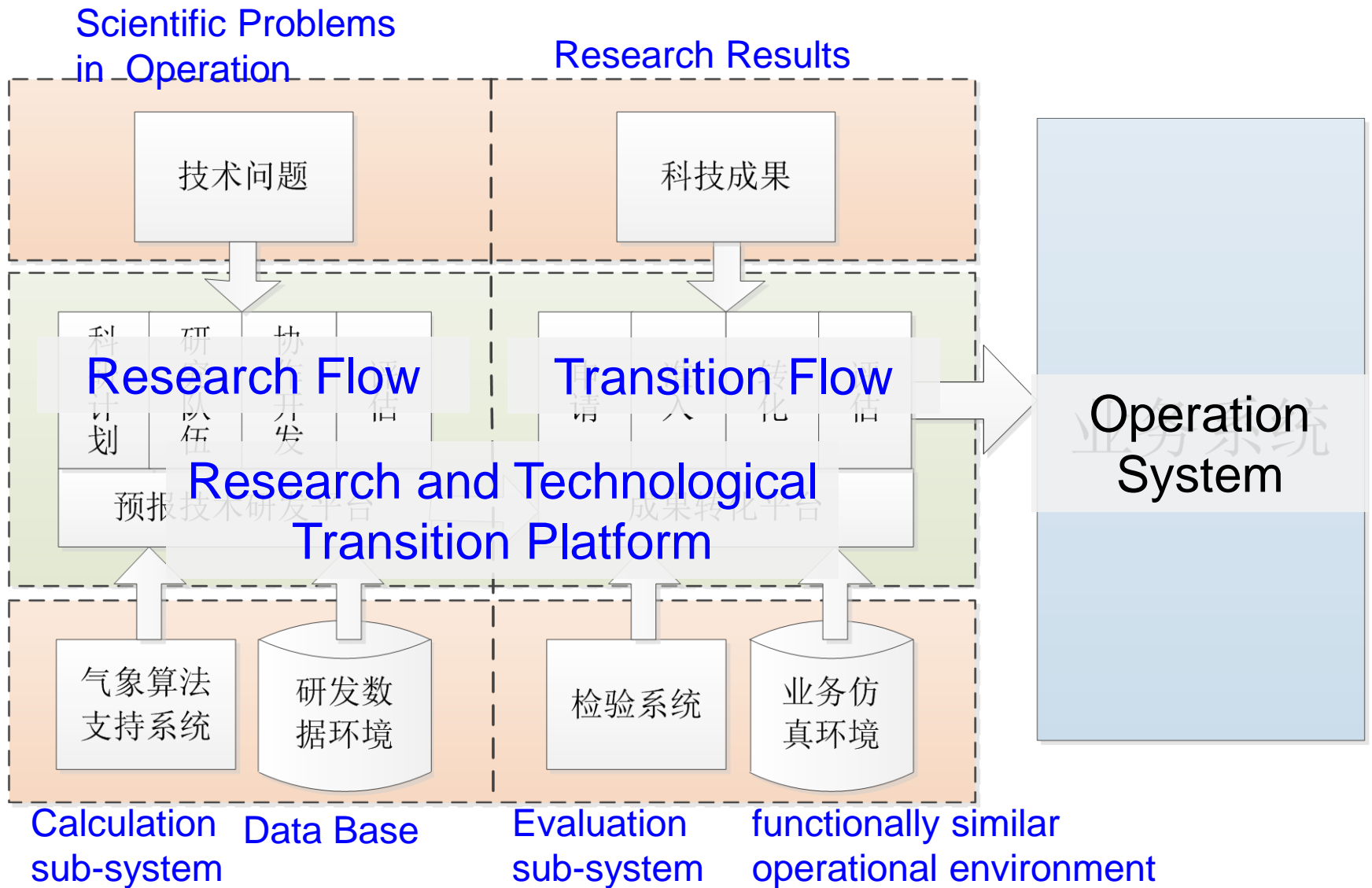
5. Challenges

6. Future plans

国家气象中心
NATIONAL METEOROLOGICAL CENTER

Goals

The mission of the Testbed in NMC is to buid a bridge between operation and research.

- To transfer more rapidly and smoothly new technology, research results from universities, academic community and other groups into severe weather analysis and prediction in NMC.

- To promote the forecasters in NMC to grasp advanced technological skill and theories knowledge.

- To offer convenient facilities for scientists to understand the operation needs.

国家气象中心
NATIONAL METEOROLOGICAL CENTER

Research and transition platform

Scientific Problems in Operation

Research Results

技术问题

科技成果

Research Flow

Transition Flow

Operation System

Research and Technological Transition Platform

科研计划   研发队伍   协同开发   评估   预报

请入   化   估

气象算法支持系统   研发数据环境   检验系统   业务仿真环境

业务系统

Calculation sub-system   Data Base   Evaluation sub-system   functionally similar operational environment

❑ Hardware

- fixed the hardware which can support the small technology which needs less space and slower calculation speed to run

❑ Software and environments

- built the real-time functionally similar operational data and forecast platform

- Designed and be making the evaluation systems, referenced the MET,R and the NMC operational verification system

- Making a meteorological observed and NWP database , easy to access and easy to use data archives

国家气象中心
NATIONAL METEOROLOGICAL CENTER

functionally similar Operation Environments

◆ functionally similar operation data

Real-time supporting all observed and NWP data used in operations

◆ functionally similar operational forecast platform

Deploying the MICAPS, SWAN in the testbed platform which can support five to seven forecasters and scientists to test the transited products.

国家气象中心
NATIONAL METEOROLOGICAL CENTER

Testbed platform in NMC

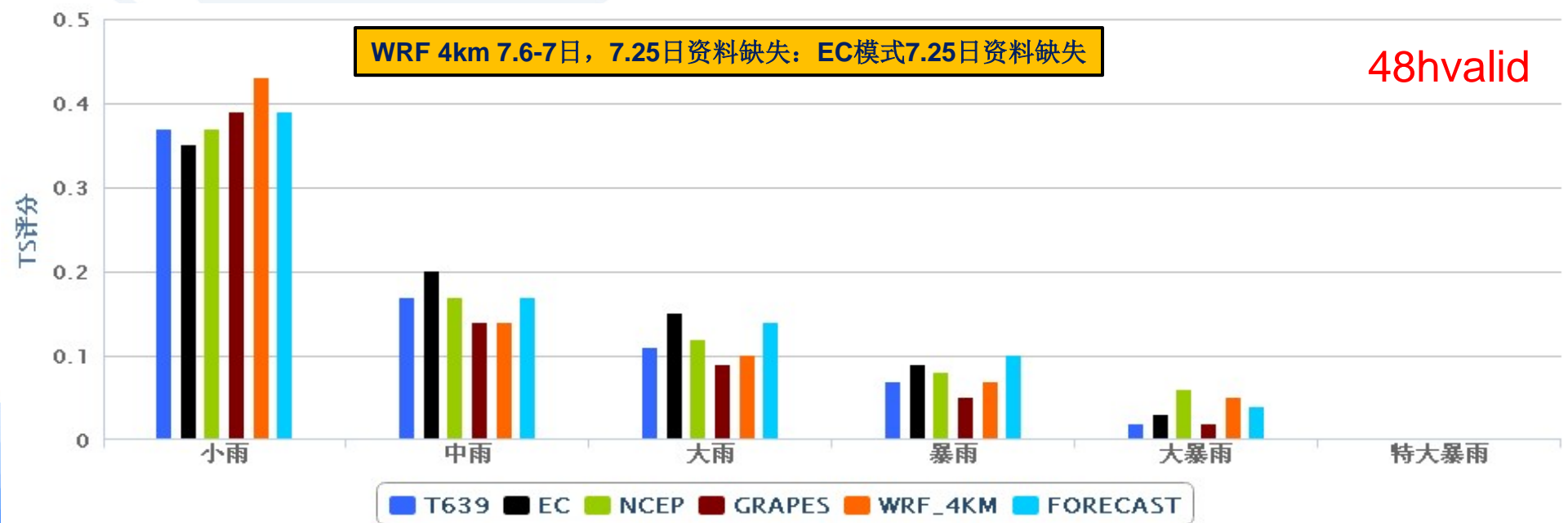**Radar wind retrieval technology from CAMS**

SWAP f rom NSMC,CMA

R2O: Transition experiments in 2012 and 2013

R2O transition by performing testing & evaluation of advanced technologies of severe convective weather analysis and forecasting in a functionally similar operational environment

Transition Mechanism

Focus on the objective forecast technology which will be integrated into the main forecast systems, such as MICAPS, SWAN…

◆ To build a standard transition work flow

◆ To establish management and policy for R2O

◆ By testing 2~3 technologies in the transition platform

国家气象中心
NATIONAL METEOROLOGICAL CENTER

Transition experiments in 2012

- One QPF technology from NMC. It is used to test the transition platform and get a coarse testing work flow.

- One satellite data analysis platform from NSMC, CMA

- One short-range and nowcasting system for typhoon wind and rain forecast from Nanjing University.
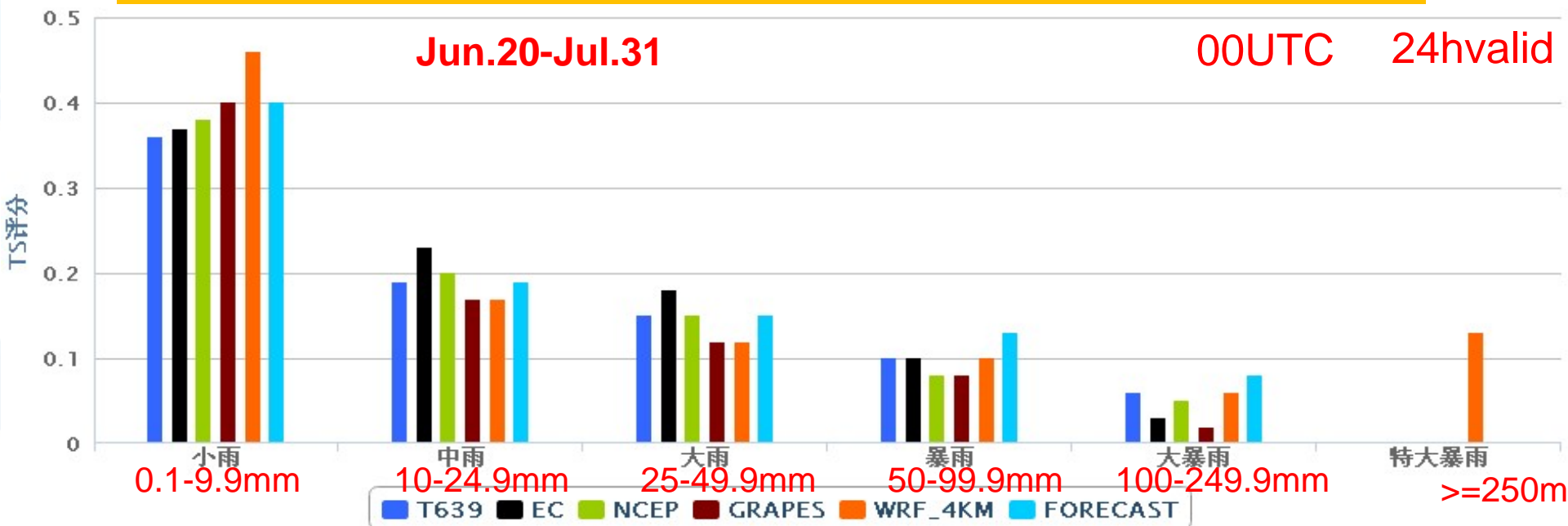
国家气象中心
NATIONAL METEOROLOGICAL CENTER
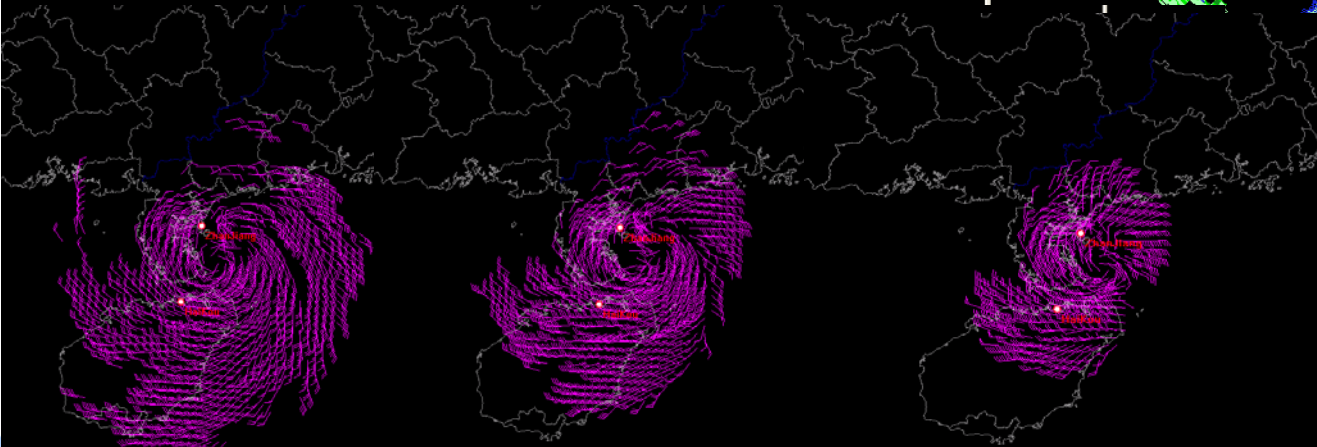
transition work flow
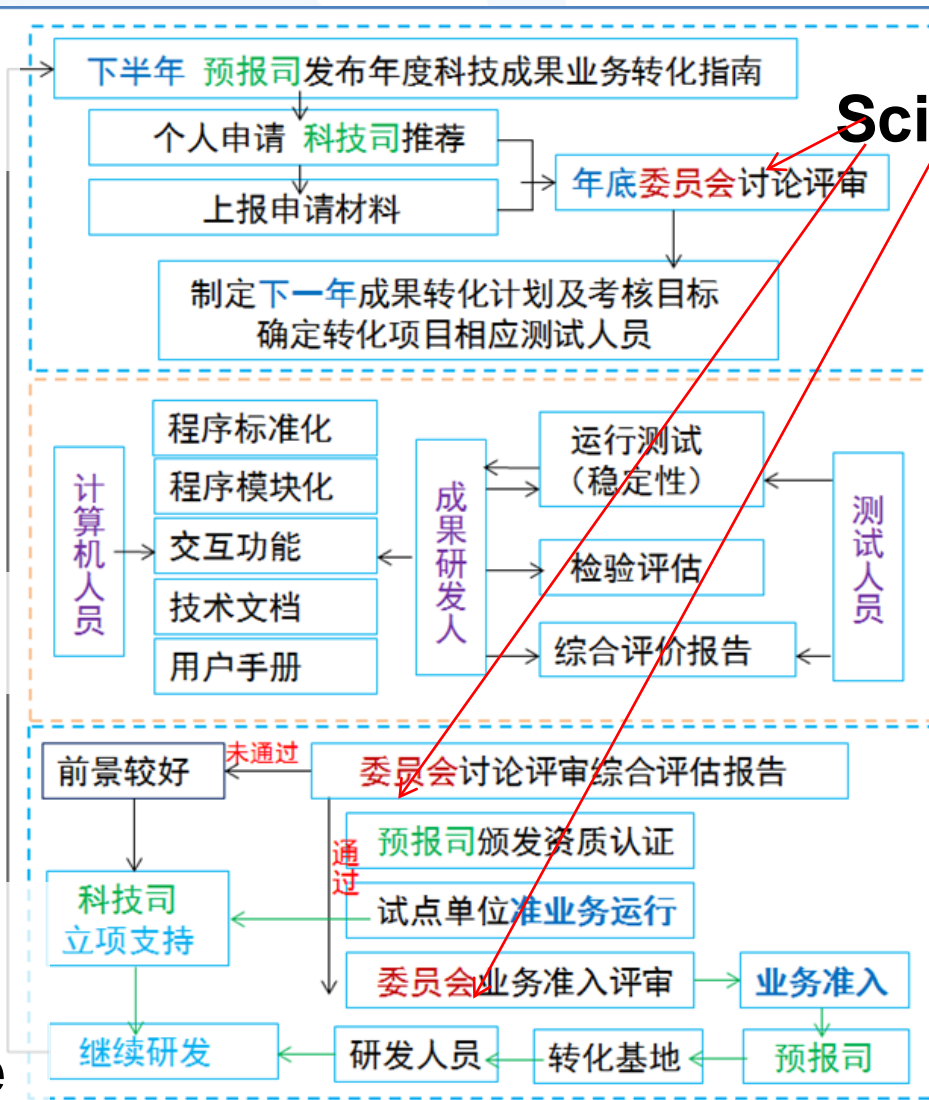
Transition experiments in 2013

Supporting community	model/technology	resolution	Accessing and testing aim and key points
NWP Center, CMA	GRAPES-MESO	15 km	1) Regional model in operation 2) Assess performance for severe weather and QPF by Parallel testing with 4km WRF
Nanjing University	WRF	4 km	1) Verification of storm-scale model for severe weather & QPF 2) Demonstration of real-time QPF verification for mesoscale model
CAMS	Radar wind retrieval technology (step-velocity volume processing)	10min	1）Assess performance of the retrieval wind field for mesoscale severe weather analysis 2）Integrate into MICAPS/SWAN
NSMC, CMA	SWAP	30/15min	1) Assess performance of MCS identification and tracking by satellite data for severe weather analysis and QPE 2) Verification of real-time QPE

国家气象中心
NATIONAL METEOROLOGICAL CENTER

GRAPES-MESO、4km WRF precipitation verification

Jun.20-Jul.31   00UTC   24hvalid

0.1-9.9mm   10-24.9mm   25-49.9mm   50-99.9mm   100-249.9mm   >=250m

T639   EC   NCEP   GRAPES   WRF_4KM   FORECAST

WRF 4km 7.6-7日，7.25日资料缺失：EC模式7.25日资料缺失

48hvalid

T639   EC   NCEP   GRAPES   WRF_4KM   FORECAST

RADAR WIND RETRIEVAL TECHNOLOGY   FROM CAMS

1306" 温比亚"

Jul.2/02:00
radar echo & 500 hPa retrieval wind
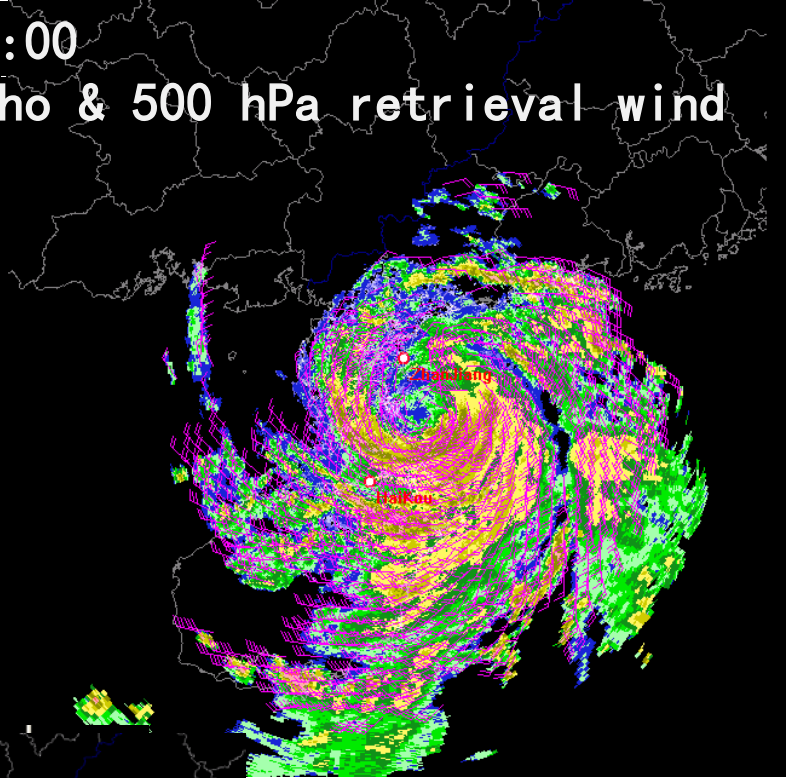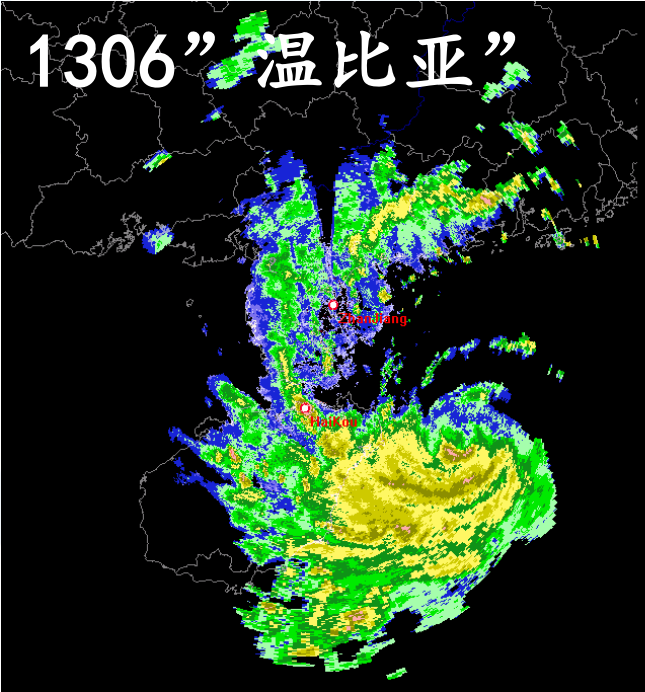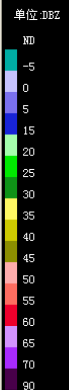
500hPa   700hPa   850hPa
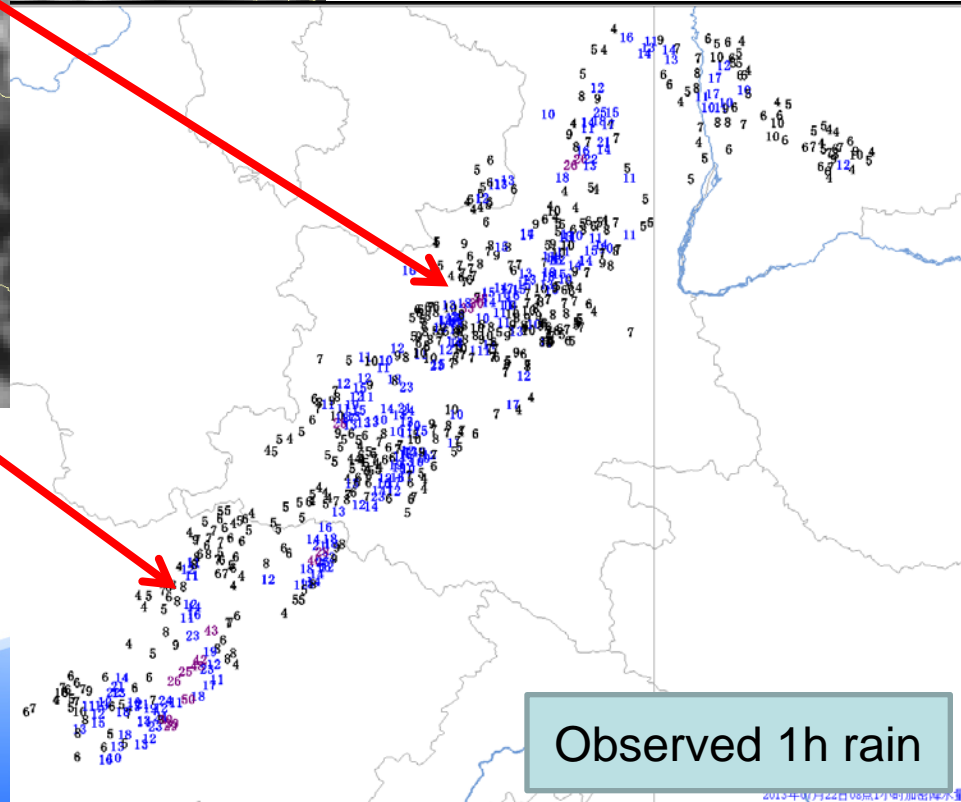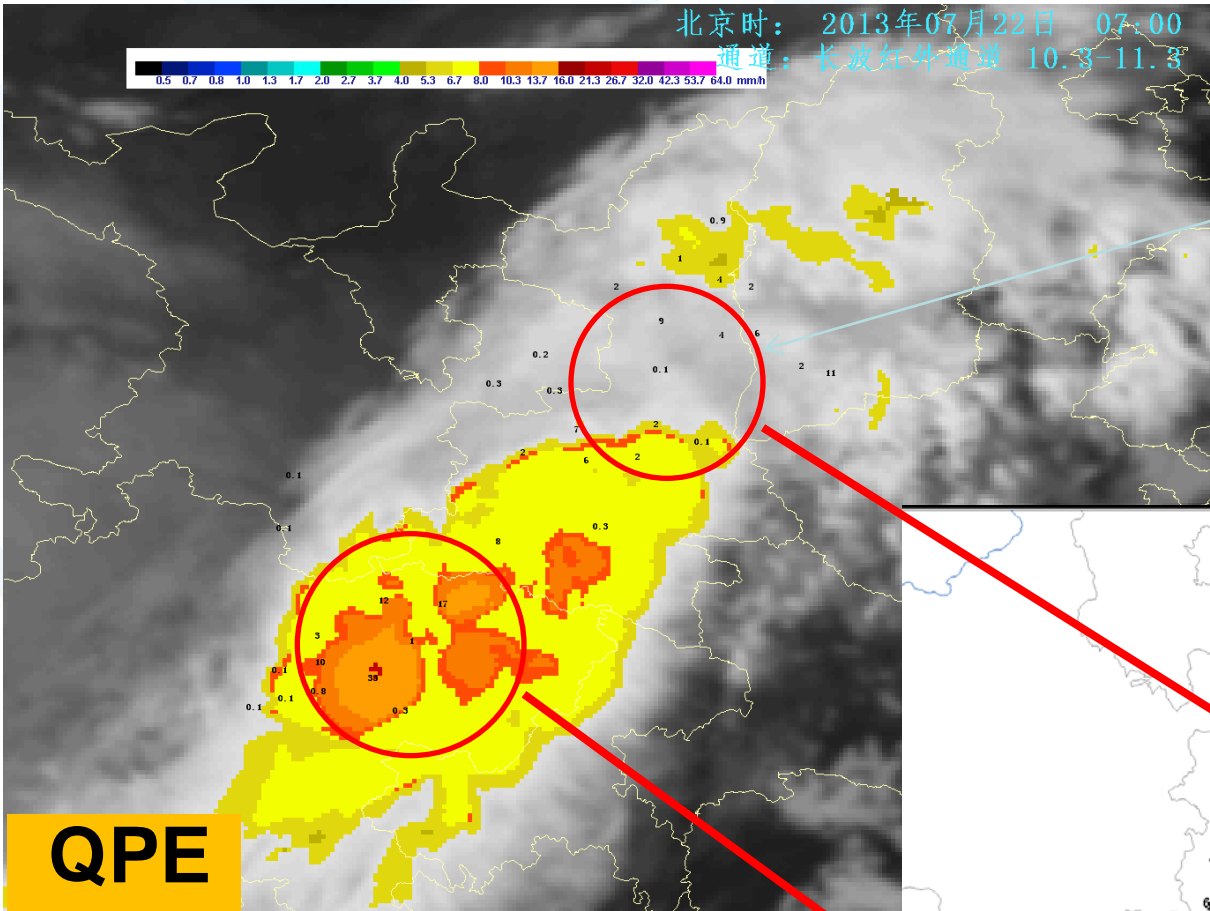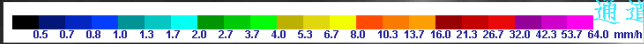
O2R: Joint discussion and research in 2013

O2R transition by joint discussion and research on the severe convective weather and meso-scale intense precipitation

A jointed group consisting of forecasters from NMC, scientists from Nanjing University, Institute of Atmospheric Physics (IAP) of Chinese Academy of Sciences (CAS) and State Key Laboratory of Severe Weather (LASW) of Chinese Academy of Meteorological Sciences (CAMS)

- Discussed the severe weather events (severe convective weather, heavy rainfall) in every Friday morning during June to July
- Proposed the joint research points from the discussed questions
- Was Solving the problems by divided into three joint research team

Routine discussion in warm season

Weekly severe weather review in every Friday morning

- **face to face interview between forecasters and scientists：the forecasters in NMC review the weekly severe weather and the performance of the tested techniques, scientists commented the forecasting difficult and doubtful points.**

- **38 scientists from LASW/CAMS,IAP/CAS, Nanjing University, Peking University, Chinese meteorological Training Center, Chinese Satellite Meteorological Center**

- **～300 Forecasters from NMC, Beijing Meteorological Office, Tianjin Meteorological Office**

国家气象中心
NATIONAL METEOROLOGICAL CENTER
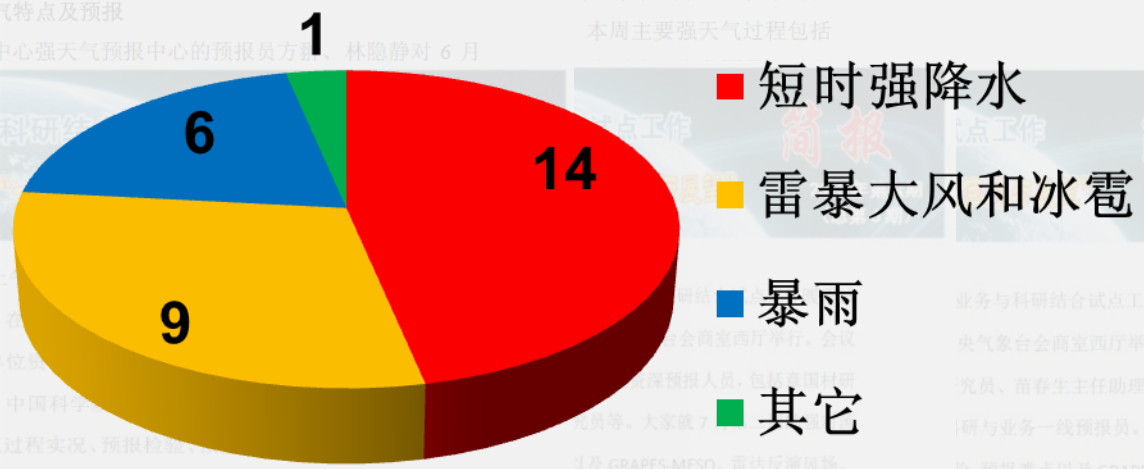
joint scientists

forecasters

Invited scientists and leader forecasters

Discussion Results

■ weekly newsletters with news on the severe convective weather and heavy rainfall events, performance of the tested techniques in the recent week, , ideas in severe convective weather forecasting

■ 30 questions about severe convective weather and meso-scale heavy rainfall forecasting and physical mechanism

■ Brought 2 academic lectures about how to use NWP.

■ facilitated the information sharing of mesoscale model and advanced verification methods.

■ Proposed research ideas about the SCW/intense precipitation-producing MCSs.

国家气象中心
NATIONAL METEOROLOGICAL CENTER

- **Jun.20，Ming XUE, storm-scale ensemble forecasting**
- **Aug.9，Dalin ZHANG：**the limitations of convective parameterizations in NWP

Storm-Scale Ensemble Forecasting for NOAA Hazardous Weather Testbed Spring Experiments
NOAA灾害性天气实验平台春季实验及其对流尺度集合预报
薛明
Center for Analysis and Prediction of Storms (CAPS) and
School of Meteorology
University of Oklahoma
南京大学中尺度灾害性天气教育部重点实验室
mxue@ou.edu

积**云参数**化在数**值天气**预报**中的局限性**

Da-Lin Zhang

Department of Atmospheric and Oceanic Science, University of Maryland, College Park, Maryland 20742

References
Zhang, D.-L., E.-Y. Hsie and M.W. Moncrieff, 1988: A comparison of explicit and implicit predictions of convective and stratiform precipitating weather systems with a meso-b scale numerical model. *Quar. J. Royal Meteor. Soc.,* **114**, 31-60.
Zhang, D.-L., J.S. Kain, J.M. Fritsch and K. Gao, 1994: Comments on:

- **Jul.19，邓莲堂：operational GRAPES_Meso**

- **Jul.26，李应林：verification method: Neighborhood**

  Jul.26，陈法敬：verification method: SEEPS

国家气象中心
NATIONAL METEOROLOGICAL CENTER

Joint research

■ To solve key problems proposed in the warm season discussion

● Team one, consisted with professors from Nanjing University and forecasters from NMC, focus on new observation data applying

● Team two, consisted with scientists from IAP/CAS and forecasters from NMC, focus on severe convective weather physical mechanism and forecasting methods

● Team three, consisted with scientists from LAWS/CAMS and forecasters from NMC, focus on physical mechanism and forecasting methods of heavy rainfall in warm regions

challenges

– How to attract more scientists: Effective R2O requires strong partnership & active participation of academia, operational centers. Active participation of academia in R2O activities need to be supported – perhaps, through a joint program supported by CMA.

– How to find more applying technologies for operational severe convective weather forecasting

– How to objectively verify the advanced technologies.

…

国家气象中心
NATIONAL METEOROLOGICAL CENTER

Future plans in 2014-2015

To 2015, construct a research and transition base for weather forecast in NMC

- Regular SCW and heavy rainfall events discussion every two weeks in May-July.

- Joint research on the ideas proposed from the warm season discussion in 2013 and 2014

- Continue Testing the 4km WRF and GRAPES-MESO models, the radar and satellite applying technologies

国家气象中心
NATIONAL METEOROLOGICAL CENTER