

Nowcasting of Severe Convective Weather in CMA

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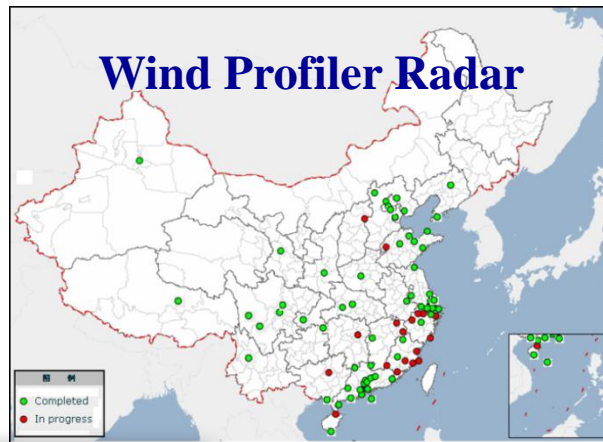
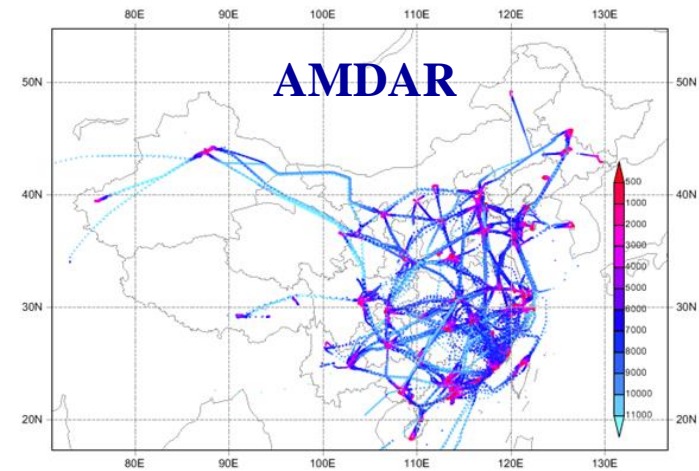
Aug., 18, 2014



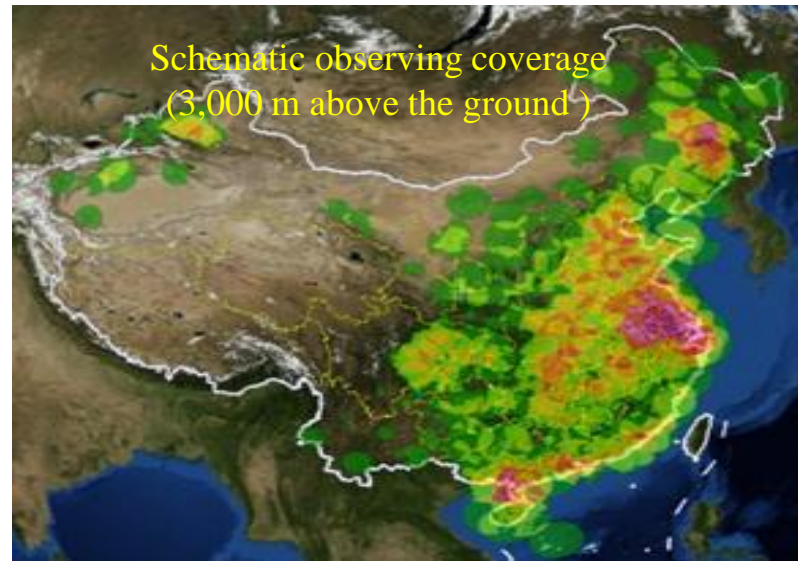
Surface Observing System



Upper-air Observing System

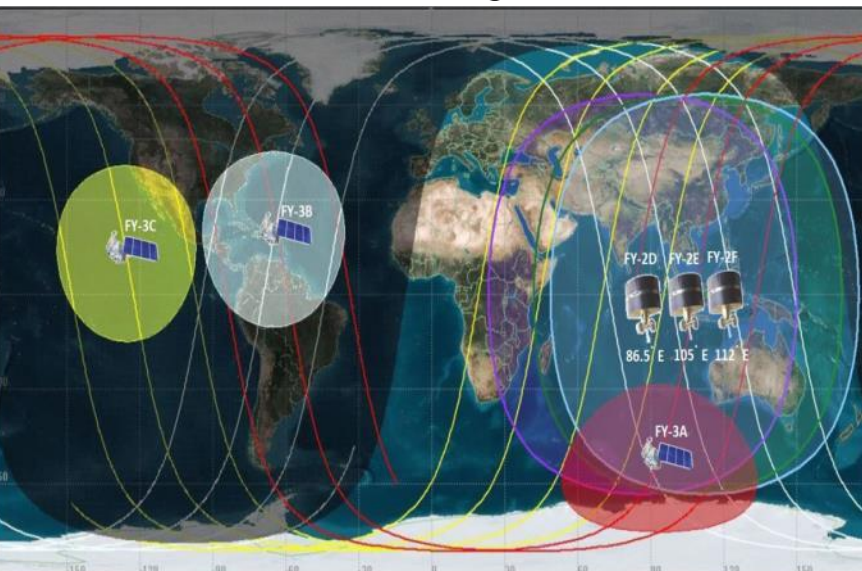


Weather Radar Observing System



FENGYUN Meteorological Satellites

- Successfully launched 12 FY satellites
- Currently 8 on orbit
 - 5 in operation
 - 1 in-orbit commission test
 - 2 in decommission backup
- Ground receiving stations: 1+4+1
- Number of users: exceed 2500 in more than 70 countries and regions

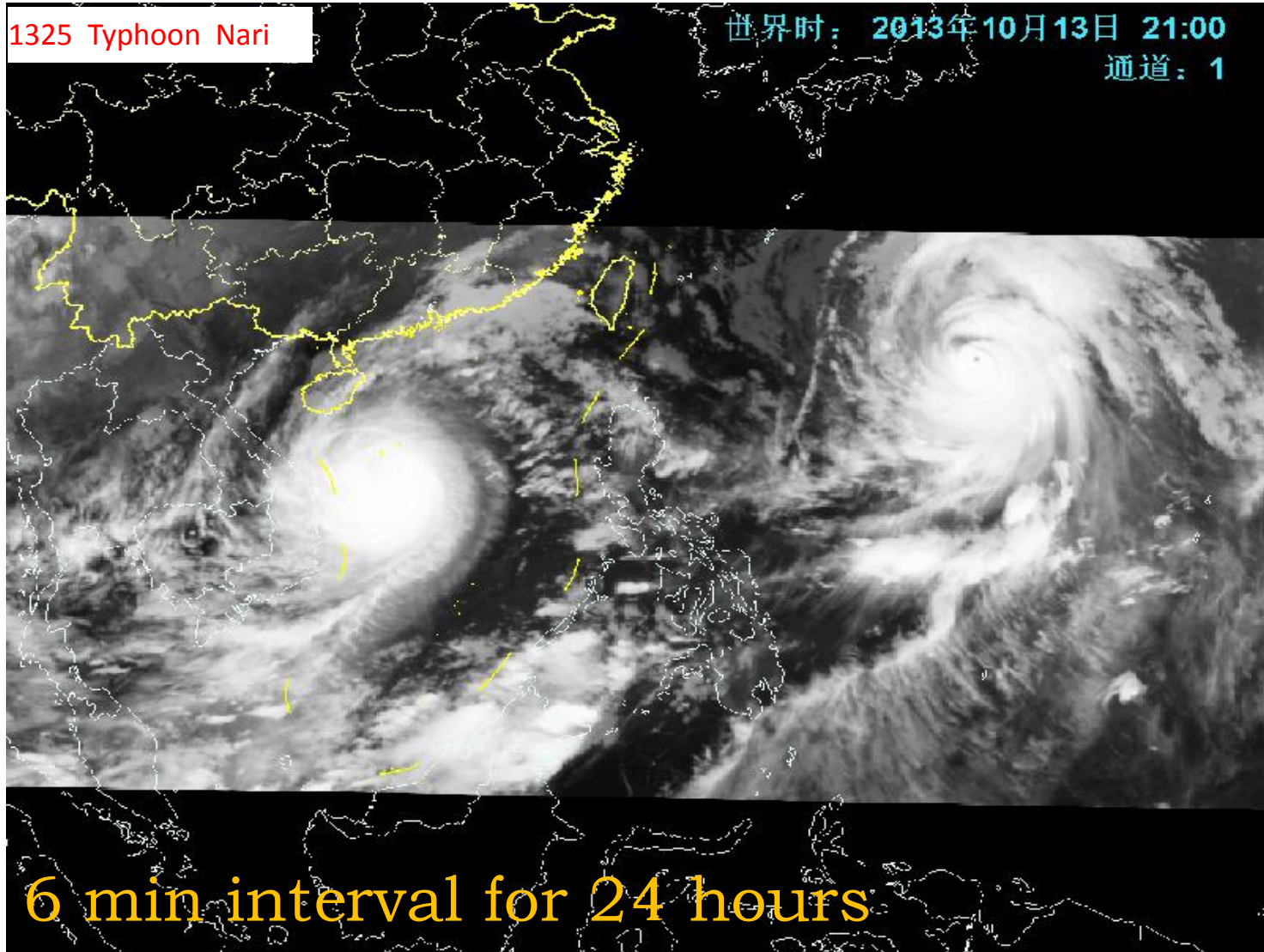


FY2F Satellite Monitoring Animation

1325 Typhoon Nari

世界时：2013年10月13日 21:00

通道：1



6 min interval for 24 hours

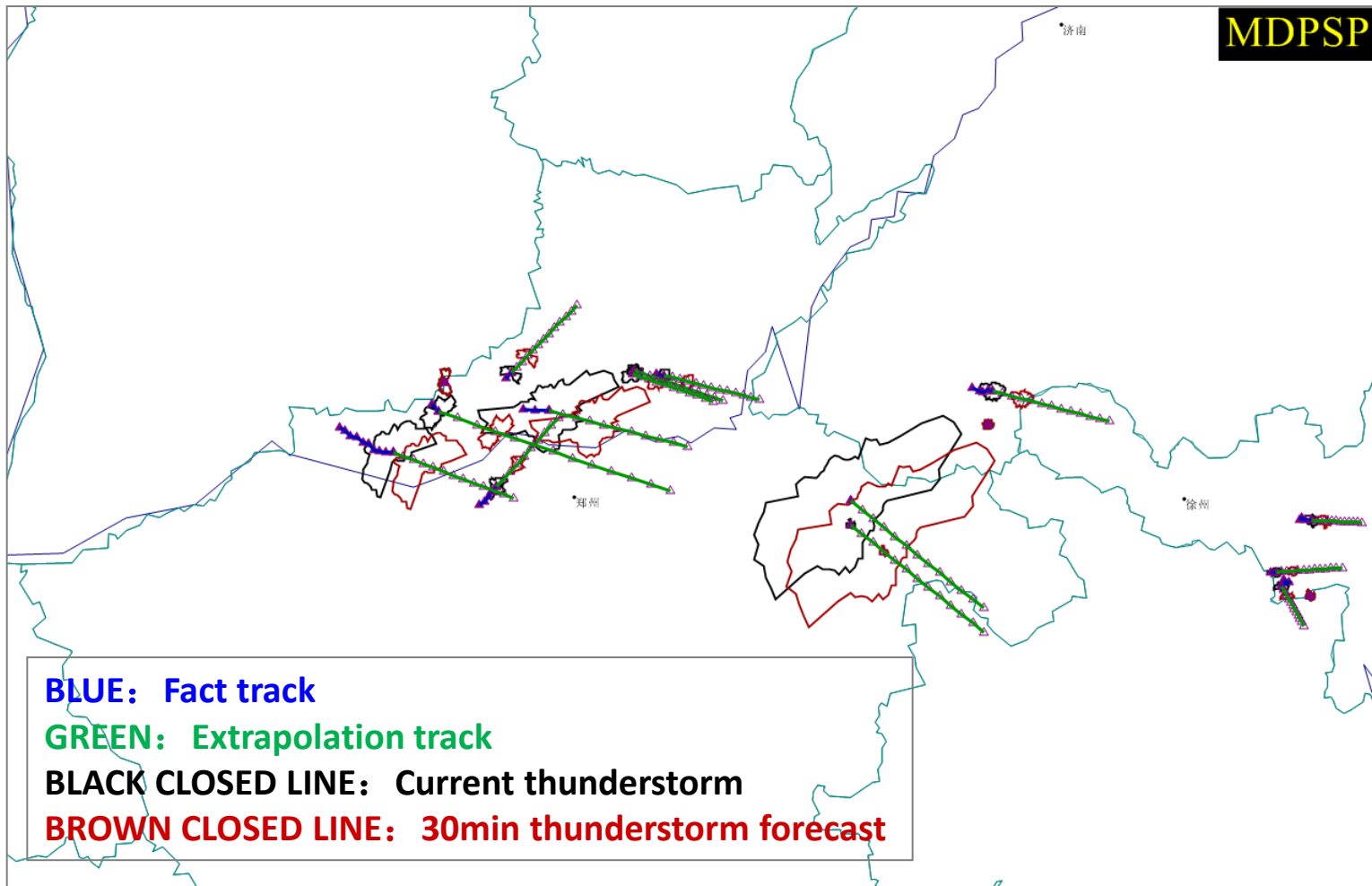
TITAN

Thunderstorm **I**dentification, **T**racking, **A**nalysis and **N**owcasting

- A algorithm for thunderstorm identification , tracking, analysis and nowcasting system
- Based on **national radar mosaic**, 10min interval
- Support **multi-threshold** processing
- Support **extrapolation** for 10,20,30,40,50,60min
- Support **accumulation** for 1,3,6,12,24h
- Support **real-time run and post-processing**

TITAN Tracking and Extrapolation

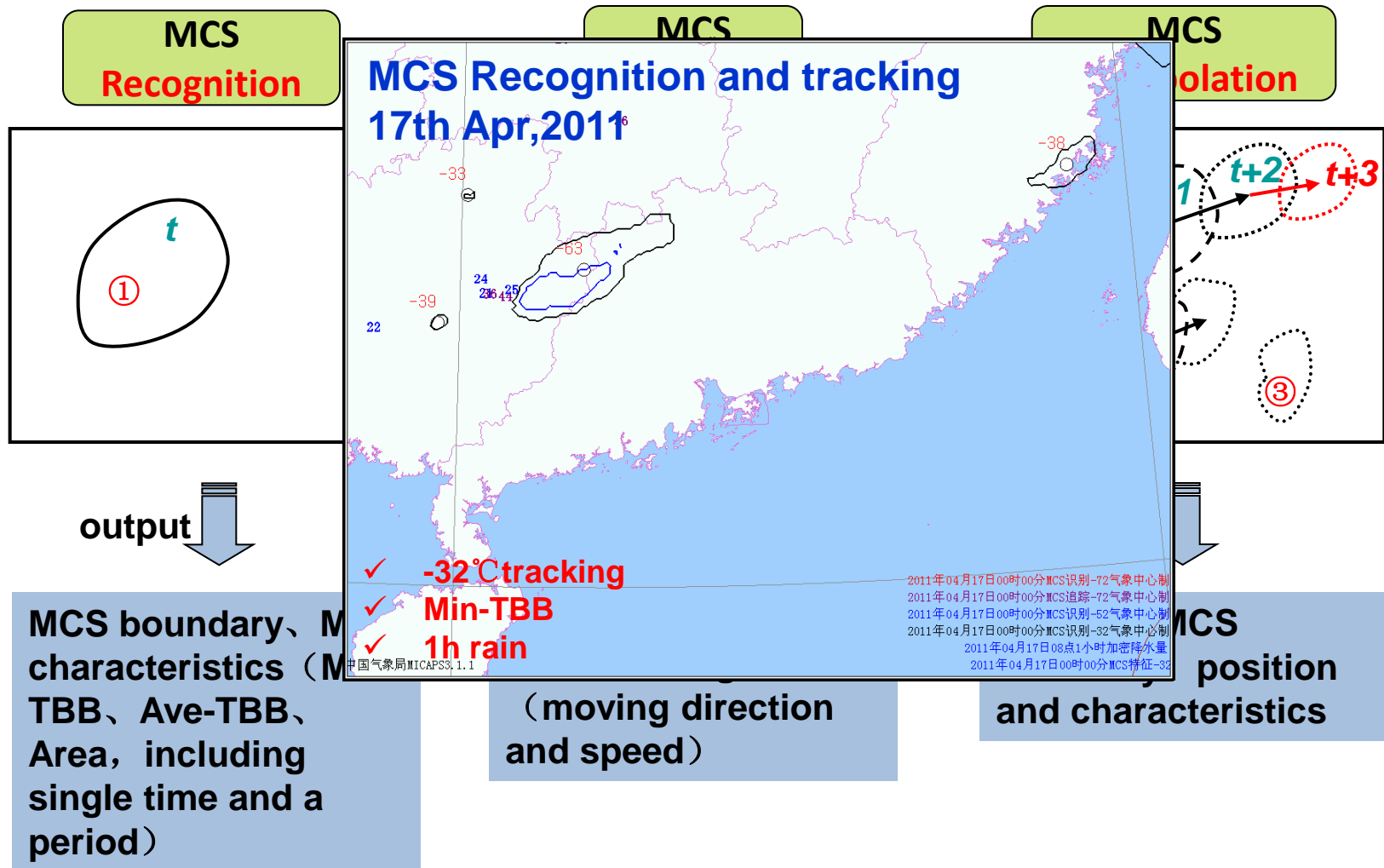
2100, 3rd Jun 2009



Satellite Data Application

Single threshold

Recognition and tracking of MCS (Meso-Scale Convective System)



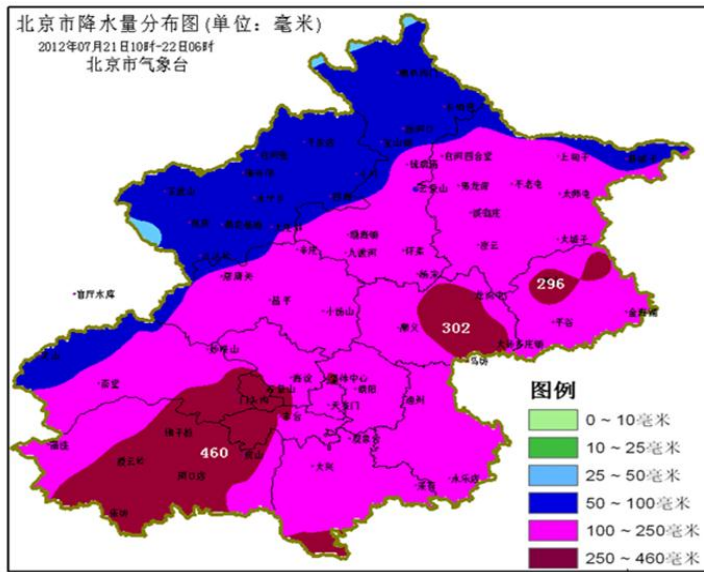
NWP in CMA

| | Global Spectral Model (T _L 639L60) | Meso Scale Model (GRAPES_Meso) | 10day Ensemble (T213L31) | Typhoon deterministic & Ensemble forecast |
|--|--|---|---|--|
| Forecast range | Medium-range (10day) | Rainfall forecast Short-range forecast | 10day forecast | Typhoon forecast |
| Forecast domain | Global | East Asia (8340km x 5480km) | Global | |
| Horizontal resolution | T _L 639(0.28125 deg) | 15km | T213(0.5625 deg) | |
| Vertical levels / Top | 60 0.1 hPa | 31 10hPa | 31 10 hPa | |
| Forecast Hours (Initial time) | 240 hours (00, 12 UTC) 84 hours (06, 18UTC) | 72 hours (00, 12UTC) | 240 hours (00, 12 UTC) 15 members | 120 hours (00, 06, 12, 18 UTC) 120 hours (00, 12 UTC) 15 members |
| Initial Condition | Global Analysis (NCEP GSI) | GRAPES_3DVA R | NCEP SSI + Vortex relocation and Intensity adjustment with ensemble perturbations Perturbations are produced by Breeding-method | |

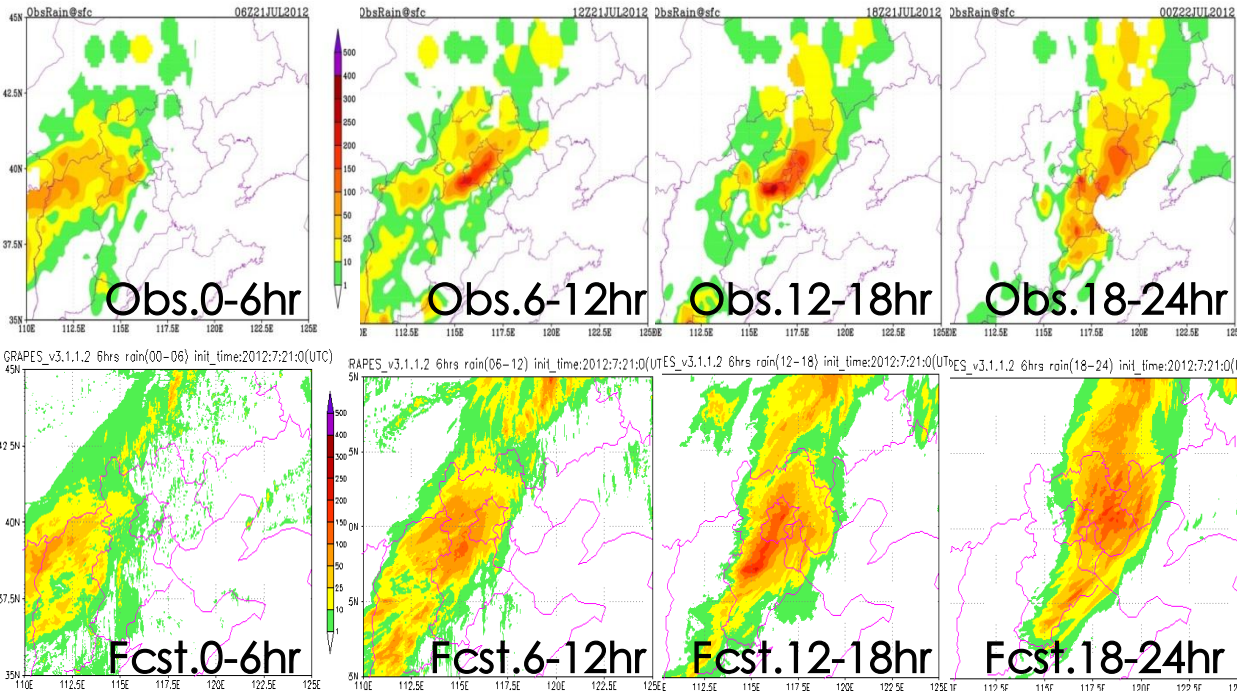
(1) GRAPES_Meso meso-scale forecast system

- **GRAPES_Meso 3.3: 72 hour forecast (00,12UTC)**
over East Asia
 - **GRAPES_Meso 15km L31 with model top at 10 hPa**
 - **GRAPES_3DVAR 15km, model grid space, incremental analysis**
 - **Assimilated Obs.**
 - GTS conventional data 89 + other 31 radio-sonde
 - 2400 surface obs.

Accumulated rainfall in mm from OBS



Comparison on 6h accumulated precipitation of heavy rainfall event on Jul.21/2012 Beijing



From 3km GRAPES-Meso experimental system

(2) GRAPES_RAFS/RUC

RApid updated Forecast System

■ Basic configuration

(Domain) : East Asia

(Resolution) : horizontal 15km , vertical 31 levels top to 10hPa

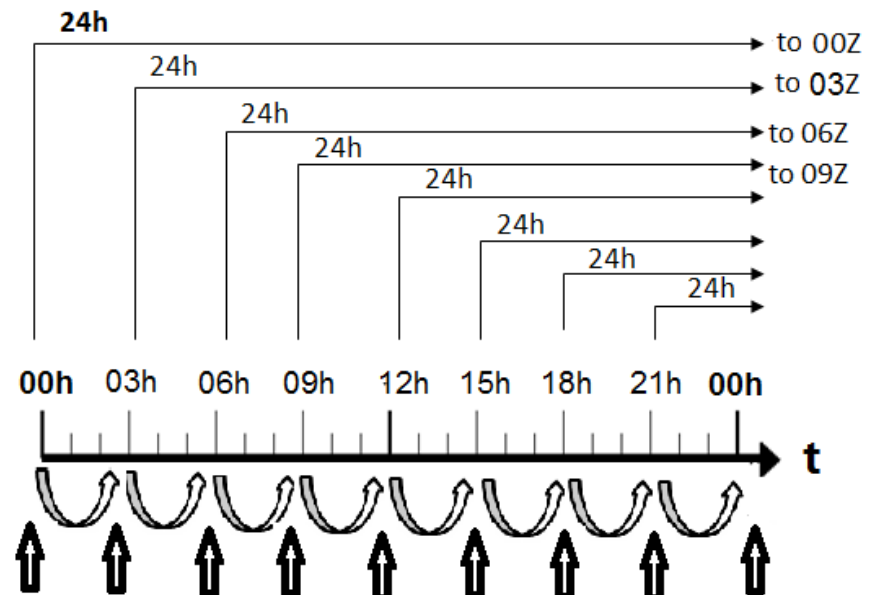
■ Data assimilation (GRAPES M3DVAR)

- Background: T639 12h forecast
- Analysis grid: 0.15°

■ GRAPES obs data in 3h window;

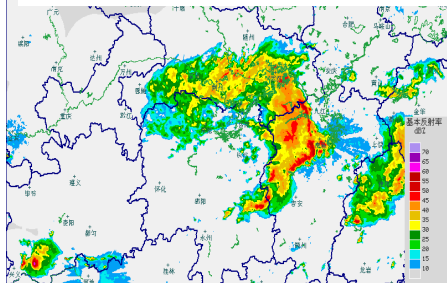
| Data Type | ~Number/3hr |
|----------------------|-------------|
| Radio-sonde (00/12h) | ~120 |
| Surface/PS | ~2300 |
| Buoy/ship(Ps,T) | ~20 |
| Aircraft (V,temp) | 1600-7000 |
| cloud winds | 200-400 |
| Radar VAD winds | 35-50 |
| GPS precip water | 400-600 |
| GPS /RO | 4-17 |
| Surface/RH | ~600 |

■ Schematic of GRAPES_RAFS configuration

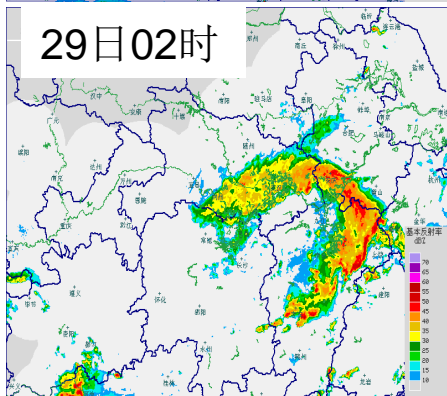


DATA ASSIMILATION

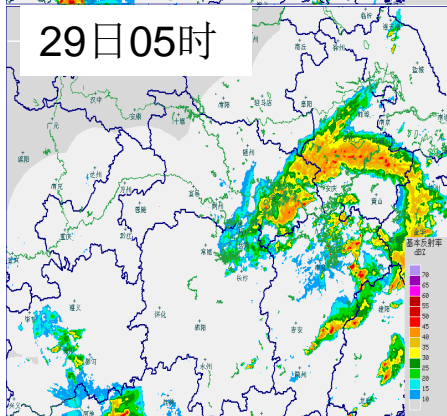
2014年3月
28日23时 (BJT)



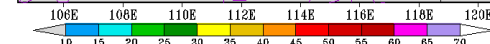
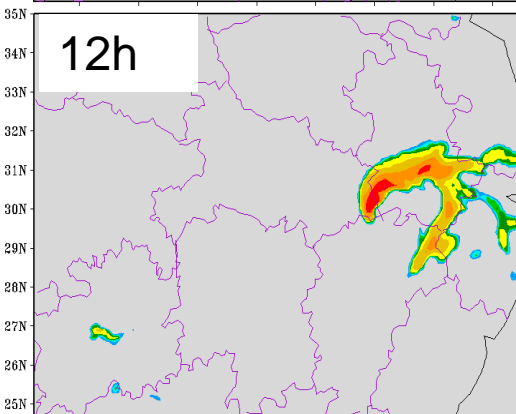
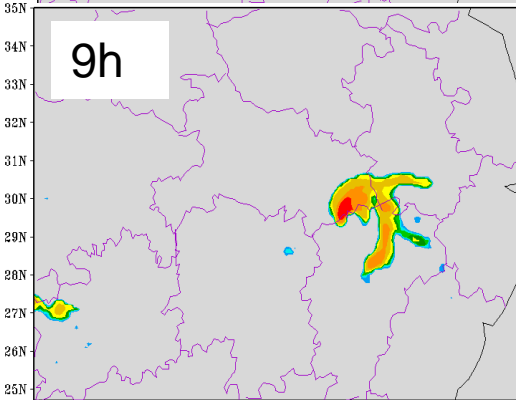
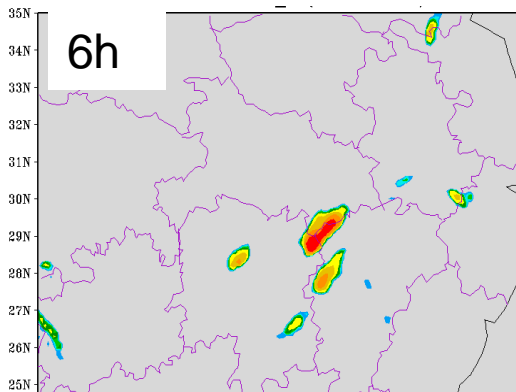
29日02时



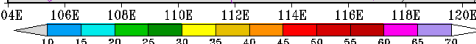
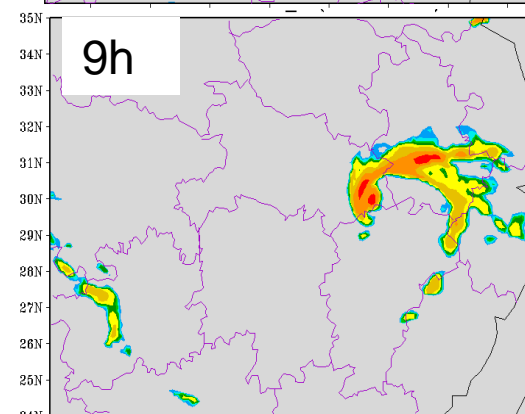
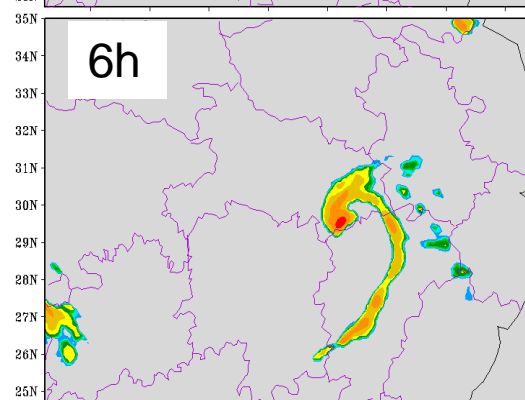
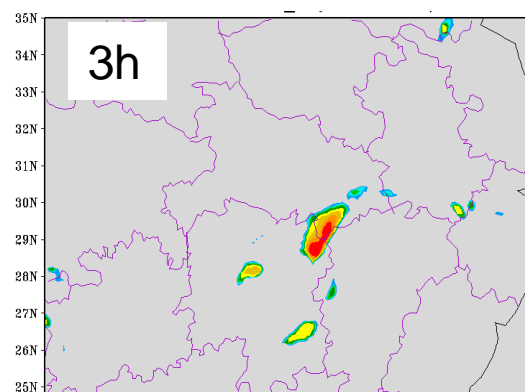
29日05时



Radar
OBS



Initiation time:
2014/03/28/17 BJT



Initiation time:
2014/03/28/20 BJT

Flow chart of the short-term (0-6 h) QPF based on blending of BJ-ANC with BJ-RUC

Short-term (0-6 h) QPF of BJ-RUC

Phase corrected for QPF by the NWP

1st step: Corrected QPF roughly by FFT
2nd step: Corrected QPF by multi-scale optical flow

Nowcasting (0-1 h) Radar echo of BJ-ANC

Short-term (0-6 h) forecast technology of Radar echo

Extend the Radar echo forecast from 1 h to 6 h

Short-term (0-6 h) QPF of BJ-RUC

Intensity corrected for QPF by the NWP

Adjust the QPF by NWP and the QPE by Radar. Make them meet the weibull distribution

Short-term (0-6 h) Radar echo forecast of BJ-ANC

Transform the Radar echo forecast into the QPF

Real-time transformation and adjustment of local Z-R relationship

Short-term (0-6 h) QPF of BJ-RUC

Short-term (0-6 h) QPF of BJ-ANC

Hyperbolic tangent weighting distribution within the 6 h blending window

Short-term (0-6 h) QPF based on blending of BJ-ANC with BJ-RUC

SWAN-Severe Weather Auto-Nowcasting

- Severe Convective Weather Auto-Nowcasting system for **monitoring, analysis, nowcasting** and **warning issuance**.
- As an operational system, it was put into operation in **2010** as V0.0, till now it has been updated for **V1.6**.

■ Main Interface of SWAN V1.6

强天气短时临近预报系统 (SWAN)

2014年07月05日 快 中 慢 07:00 08:00 09:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 刻度间隔 6分钟 05|06:48 09:12 05|18:30

最近1小时内_回波报警共有9条_自动站报警共有15条 5分钟降水量预警信息:超过降水量0.2mm/5分钟9个_30分钟降水量预警信息:超过降水量0.1mm/30分

Main Function

Special Tools

实况监视 短临预警 产品制作

报警明细

| 数据\时间 | 17:30 | 17:24 | 17:18 | 17:12 | 17:06 | 17:00 | 16:54 | 16:48 | 16:42 | 16:36 | 16:30 |
|--------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| 自动站 | <-60 | <-60 | <-60 | <-60 | <-60 | <-60 | <-60 | <-60 | <-60 | <-60 | <-60 |
| 组合反射率 | -7 | -9 | -13 | | | | | -9 | -9 | -9 | -8 |
| 定量降水估计 | -7 | -9 | -13 | | | | | -9 | -9 | -9 | -8 |
| 回波顶高 | -7 | -9 | -13 | | | | | -9 | -9 | -9 | -8 |
| 风场 | | -11 | | | | | | -11 | -11 | -11 | -11 |
| 风暴追踪 | | -11 | | | | | | -11 | -11 | -11 | -11 |
| 三维反射率 | -7 | -9 | -13 | | | | | -9 | -9 | -9 | -8 |
| 液态水含量 | -7 | -9 | -13 | | | | | -9 | -9 | -9 | -8 |
| 变分法QPF | | -12 | | | | | | -12 | -12 | -12 | -12 |
| 反射率预报 | | -11 | | | | | | -11 | -11 | -11 | -11 |
| TITAN | -11 | -13 | -14 | | | | | -13 | -13 | -12 | -12 |

报警明细

回波报警 自动站报警 特征量报警

1小时 2小时 多 选

3小时 6小时 全部闪烁

| 类型 | 报警时间 | 报警名称 |
|----|----------|-------|
| | 18:20:15 | 自动站报警 |
| | 18:19:05 | 自动站报警 |
| | 18:17:29 | 回波报警 |
| | 18:11:19 | 回波报警 |
| | 18:09:05 | 自动站报警 |
| | 18:09:05 | 自动站报警 |
| | 18:07:10 | 回波报警 |
| | 17:59:11 | 自动站报警 |

[18:19:05] [自动站报警]

| 发生时间 | 报警类型 | 站号 | 站名 | 所属地区 | 报警级别 | 报警描述 | 是否过期 |
|----------------|------|--------|-----|------|------|----------------------|------|
| 20140702094000 | 暴雨 | 741041 | 杭口 | 修... | 1 | 降水量:93.2毫米,时长:12.0小时 | True |
| 20140702094000 | 暴雨 | 741043 | 茶子岗 | 修... | 1 | 降水量:66.5毫米,时长:12.0小时 | True |
| 20140702094000 | 暴雨 | 741051 | 杨洲 | 武... | 1 | 降水量:60.3毫米,时长:12.0小时 | True |
| 20140702094000 | 暴雨 | 741053 | 源口 | 武... | 1 | 降水量:54.9毫米,时长:12.0小时 | True |

18:23:22 图层(E:\SWAN\DATA\LOCAL\swan\warning\2_SWAN_AH_HEAVYRAIN_20140702101905_ALM.TXT_bz2)加载完成!

[乐平市] [117.309, 29.161] 连接正常

(1) Real-time Monitoring and Auto-Alarm

Updated monitoring and Auto-alarm information

强天气短时临近预报系统 (SWAN)

2014年07月02日 07:00 08:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00

警共有97条 5分钟降水量预警信息:超过降水量0.2mm/5分钟9个_30分钟降水量预警信息:超过降水量0.1mm/30分钟10个_1小时降水量预警信息:超过降水量0.1mm/1小时10个_2小时降水量预警信息:超过降水量0.1mm/2

报警明细

| 类型 | 报警时间 | 报警名称 |
|----|----------|-------|
| ! | 18:11:19 | 回波报警 |
| ! | 18:09:05 | 自动站报警 |
| ! | 18:09:05 | 自动站报警 |
| ! | 18:07:10 | 回波报警 |
| ! | 17:59:11 | 自动站报警 |
| ! | 17:59:09 | 回波报警 |
| ! | 17:55:01 | 回波报警 |
| ! | 17:49:07 | 自动站报警 |

Updated Alarm Info: Flash+Sound

Info for Single Alarm

| | |
|-------|--------------|
| 组合反射率 | 19 |
| 报警信息 | 107.19000... |
| 报警类型 | 暴雨 |
| 报警站号 | 743023 |
| 报警站名 | 江村乡 |
| 报警地址 | 浮梁县 |
| 报警时间 | 090000 |
| 降水量 | 59.3毫米 |
| 时长 | 12.0小时 |

Auto-Alarm List

Details for the above list

| 发生时间 | 报警类型 | 站号 | 站名 | 所属地区 | 报警级别 | 报警描述 | 是否过期 |
|----------------|------|--------|----|------|------|---------------------|------|
| 20140702093000 | 强降雨 | 746050 | 牛田 | 乐... | 1 | 降水量:36.4毫米,时长:1.0小时 | True |

Sound Alarm

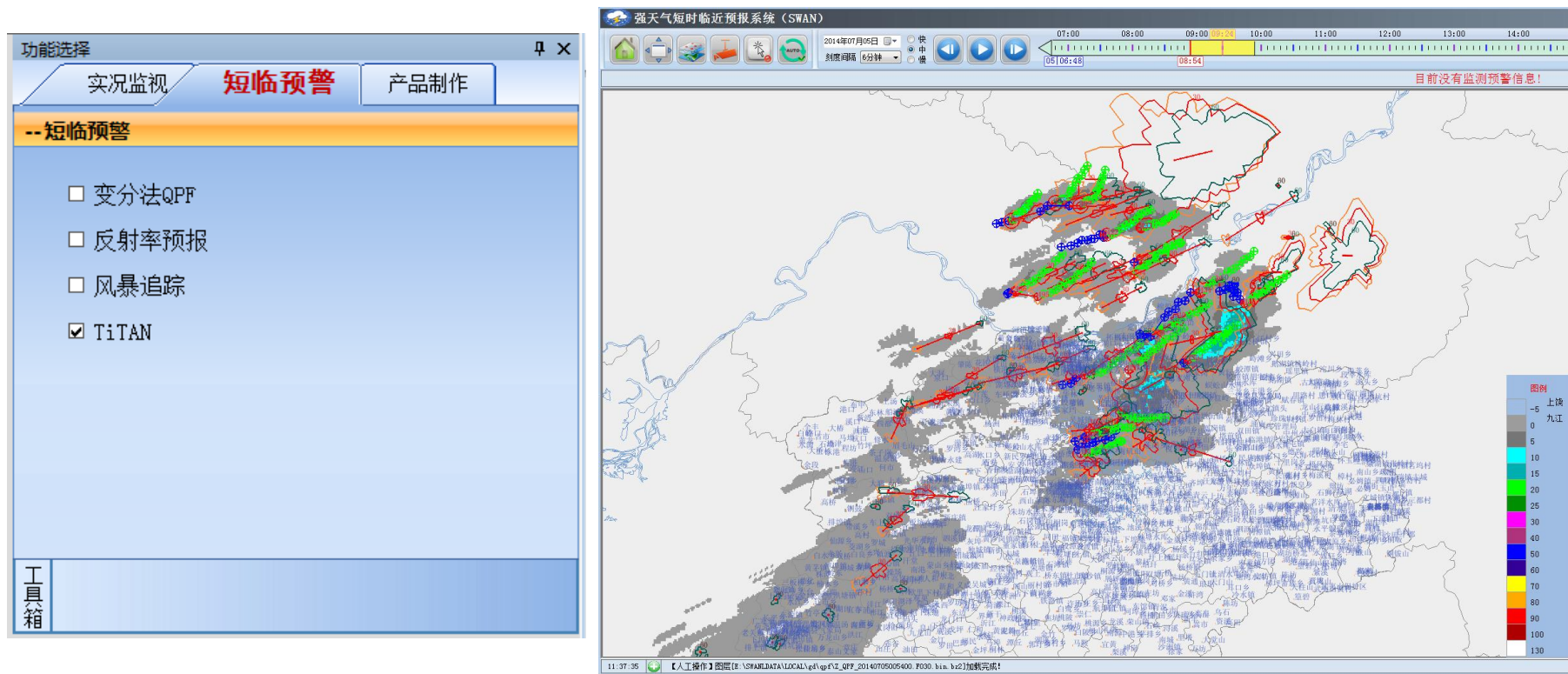
图例

- 10 上饶
- 5 赣州
- 0 九江
- 5 吉安
- 10
- 15
- 20
- 25
- 30
- 35
- 40
- 45
- 50
- 55
- 60
- 65

最新报警_07月02日 18:11:25
自动站报警2014-07-02 09:39:21

18:13:01 【自动监控】未发现最新图层! [景德镇市] [117.357, 29.803] 连接正常

■ (2) Nowcasting Products



■ (3) Warning Signals Production and Dissemination

强天气短时临近预报系统 (SWAN)

2014年07月05日 05:06:48

目前还没有监测预警信息!

创建

气象灾害预警信号

江西省气象局 2014年07月31日13时32分 **暴雨橙色**

影响范围

省域

市区 崇仁县, 丰城市, 广昌县, 贵溪市, 吉安县, 吉水县, 金溪县, 乐安县, 黎川县, 临川市, 南城县, 南丰县, 宁都县, 瑞金市, 石城县, 泰和县, 峡江县, 新干县, 兴国县, 宜黄县, 永丰县, 于都县, 资溪县

预警详情 预计雷雨天气将持续, 3小时内本市 地区的降雨量将达25毫米以上。

防范措施 1. 暴雨区的政府及相关部门做好暴雨的预防和应急准备工作; 2. 根据路况在强降雨路段采取交通管制措施, 在积水路段实行交通引导; 3. 学校、幼儿园采取应急措施, 保证学生和幼儿安全; 4. 驾驶人员注意路滑和塌方, 确保行车安全; 5. 适时转移地质灾害危险地带的人员和危房居民; 6. 切断有危险的室外电源, 暂停户外作业; 7. 收盖露天晾晒物品, 转移低洼易涝地区物资; 8. 做好城市

预报员

Warning Signals Type

Warning Signals Products

确定 取消

13:31:59 【自动监控】未发现较新图层! [宁都县] [116.066, 26.831] 连接正常

**Thanks for
your attention!**

www.nmc.gov.cn

maody@cma.gov.cn