

## **The WRF model application in NMC/CMA**

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### **ABSTRACT**

The Weather Research and Forecast (WRF) model is a new model development effort undertaken jointly by the NCAR, NOAA, and a number of collaborating institutions and university scientists. The WRF model version 1.3, which still is at research stage in NMC/CMA, was installed on ShenWei Cluster machine in 2004. It ingests the global model T213 fields as initial field and boundary conditions every 6 hours. The WRF-3DVAR was used, which was expected to promote the model performance. The comparison the different horizontal resolution between 20km and 5km shows that the model running with high horizontal resolution can catch much more mesoscale features. But the verification results show that performance of the 24 hours precipitation forecast is not good. The system is not better than other operational system in NMC/CMA.

### **1. INTRODUCTION**

The Weather Research and Forecast (WRF) model is a new model development effort undertaken jointly by the NCAR, NOAA, and a number of collaborating institutions and university scientists. The WRF model can be applied to real weather simulations, as well as idealized studies. Here, we designed a Test Cycle System based on the WRF model. The implement is described in details in section 2. The impact of different horizontal resolution is presented in section 3. Section 4 gave the 24 hours precipitation verification result of the WRF model and the other operational model. The conclusion is given in section 5.

### **2. DESIGN OF THE TEST CYCLE SYSTEM**

The test cycle system in NMC/CMA installed on the super performance computer system, ShenWei Cluster in 2002. The OS platform is LINUX system. The peripheral software for the test cycle system are installed, which include Perl, C compiler and Fortran compiler, NETCDF, GrADS, LoadLeveler etc.

The test cycle system uses the global model T213 to provide the initial field and the boundary condition field, as depicted in Fig. 1. The executable program "readt213.exe" ingests the T213 data to provide the input fields to SI. In the SI section, the domain creating, horizontal interpolating and vertical interpolating has been done. The executable program indexes the required fields to produce the model input files for the model running. In the test cycle system, we use the WRF3DVAR program to assimilate the model input files with 6 hours observation. Basing on the assimilation result, the WRF model integrates 24 hours. We provide three types product in MICAPS format, VIS5D

format and GrADS format. Using the GrADS format result, the rainfall verification can be done.

The new scheme of running the test cycle system also is implemented, which is much easier to be operated.

### 3. CASE STUDY OF DIFFERENT HORIZONTAL RESOLUTION

The impact of different horizontal resolution can be illustrated by Fig.2. Fig.2(a) is the 24hours total precipitation in 20km resolution, while Fig.2(b) is the 24 hours total precipitation in 5km resolution. Fig.2(c) shows the comparison the 24 hour precipitation between the observation (red isoline) and the fine

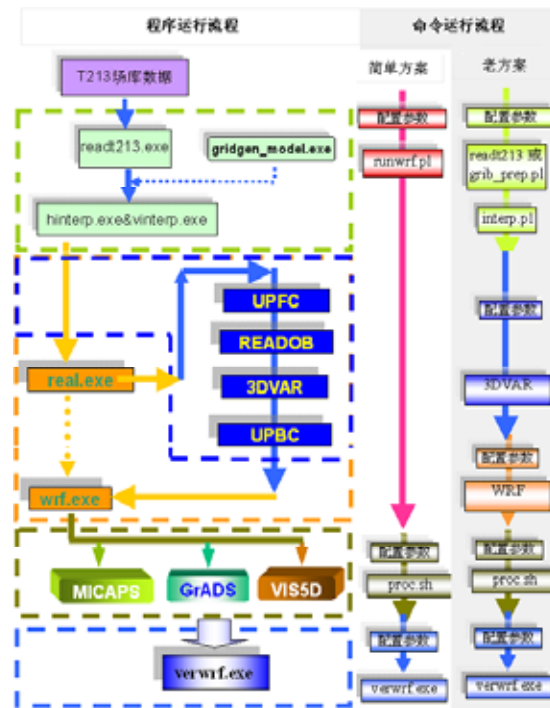


Fig.1 Flow chart of the test cycle system

resolution (shaded). It is obviously that the fine horizontal resolution can catch much more mesoscale features.

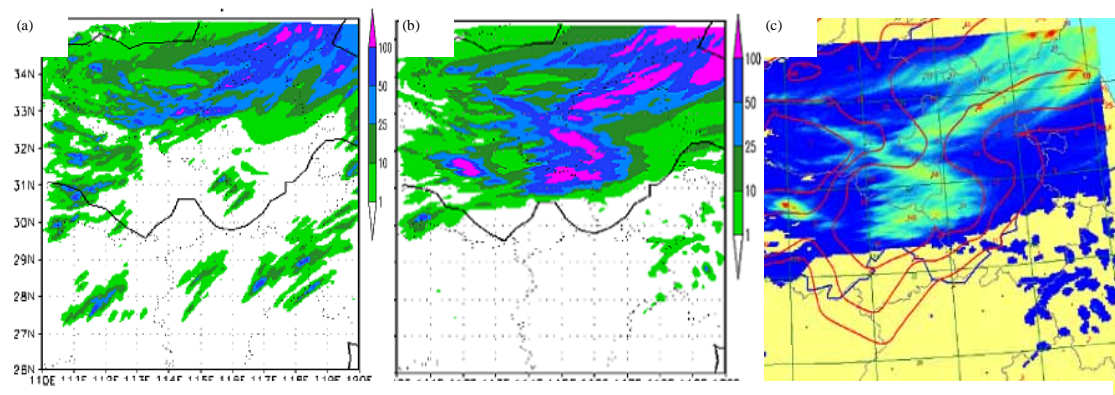


Fig.2 Total precipitation of 24 hours

(a) forecast result in 20 km resolution (b) forecast result in 5 km resolution (c) comparison between observation(red isoline) and 5km resolution.

### 4. VERIFICATION RESULT

Fig.3 shows the verification result of the 24 hours precipitation in Jun. 23-Jul. 18, 2004. Fig.3(a) is the Thresh Score, Fig.3(b) is the Bias value, Fig.3(c) is the Miss event, and the Fig.3(d) is the False alarm. Form the Fig.3, we can know that the Thresh Score is the smallest among all the models, while the Bias value is the best one.

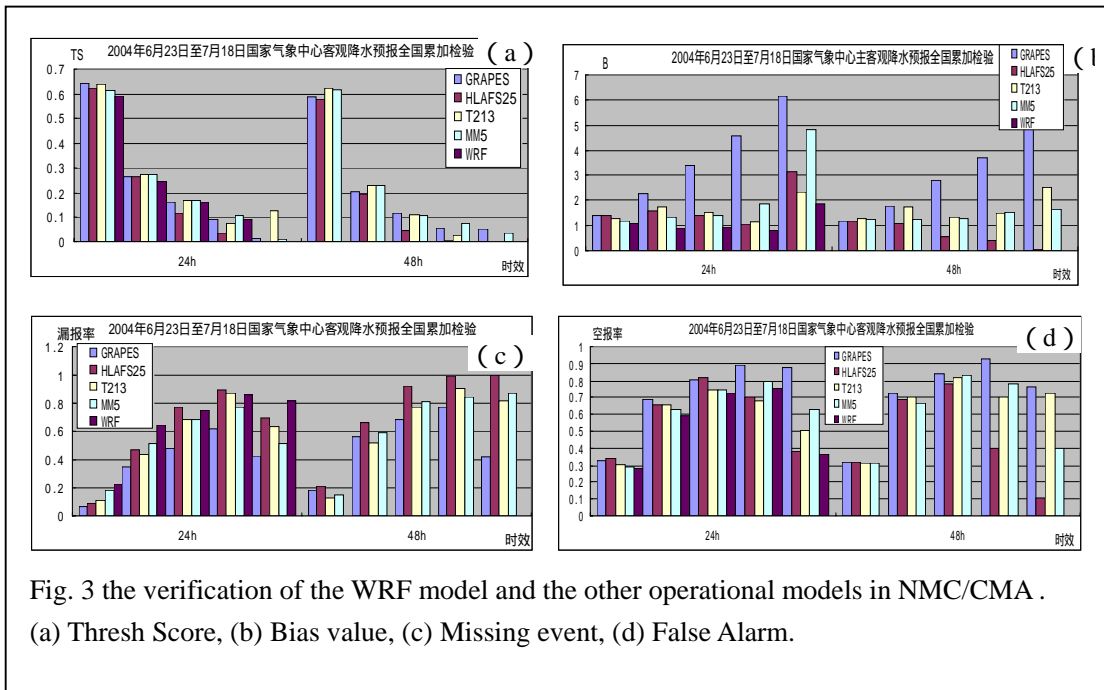


Fig. 3 the verification of the WRF model and the other operational models in NMC/CMA .  
(a) Thresh Score, (b) Bias value, (c) Missing event, (d) False Alarm.

## 5. CONCLUSION

The WRF model version 1.3, which still is at research stage in NMC/CMA, was installed on ShenWei Cluster machine in 2004. It ingests the global model T213 fields as initial field and boundary conditions every 6 hours. The WRF-3DVAR was used, which was expected to promote the model performance. The new running scheme is implemented. The comparison the different horizontal resolution between 20km and 5km shows that the model running with high horizontal resolution can catch much more mesoscale features. But the verification results show that performance of the 24 hours precipitation forecast is not good.