MM5 Pre- and Post-processing Programs' Update

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1. INTRODUCTION

The current release for most pre- and post-processing programs is 3.5, released in December 2001. The version number for the two newer programs, INTERPB and RIP, is 3.1. Recently we have also adapted an MM5-to-GrADS program that was developed by George Bryan of Penn State to be one of our supported programs. A complete description of the changes made in V3.5 can be found at *http://www.mmm.ucar.edu/mm5/mm5v3/changes-v3.html*. In this report, we are going to summarize what was new in V3.5, and say a few words on user support.

2. NEW CAPABILITY IN V3.5

a. TERRAIN

The soil category data was upgraded from 1 degree to 5 minutes resolution (from UN-FAO) over much of the globe, except for continental US where 30 second US data was used. The six-resolution data we provide are a combination of these two data sets. In addition, we have also begun to supply the soil category data at two soil layers (0 - 30 cm, and 30 - 100 cm) instead of one as was done previously. A consequence of this is that the soil data we provide now are different from what we had previously for US, which was created based on 0-70 cm layer soil data.

Another upgrade in V3.5 TERRAIN was the update of the USGS vegetation and landuse datasets at all six resolutions using the Version 2.0 source from USGS (*http://edcdaac.usgs.gov/glcc/glcc.html*). There are some improvements in this USGS dataset over some parts of the globe.

b. REGRID

One significant upgrade of REGRID is the capability of doing tropical storm bogussing. This was based on initial development work done by Low-Nam and Davis (2001). TC bogussing can be done with specification of a few key parameters in the namelist file, such as the location of the storm, and the minimum sea-level pressure. The bogussing procedure removes the pre-existing vortex in the first-guess near the observed storm center, and plants a Rankin vortex in the observed location. Since only the old vortex was removed and the planted vortex is added to the background, the new vortex will not be completely symmetric. Even though the procedure is easy to use, users are advised to understand the assumptions behind the procedure and carefully examine the outcome of the new analysis. A few more controllable parameters will be added to give a user a greater flexibility to do bogusing.

REGRID/regridder now can process intermediate files generated by INTERPB. This allows a user to change map projections to go from one domain to another, and add new TERRAIN input. REGRID/regridder is also able to process any 2-D and 3-D fields that are present in the intermediate files. This allows fields like cloud and rain water fields to be used to initialize the MM5 model.

c. RAWINS

RAWINS can also pass any 2D and 3D fields to the next program. Its limit to process only 50 time periods is increased to 500.

d. LITTLE_R

The capability of doing asynoptic time surface analysis (similar to that in RAWINS) has been added. This upgrade brings LITTLE_R's function to that comparable with RAWINS. In addition, two plotting utility programs were added. One of them can plot either the quality-controlled or non-quality-controlled soundings from the LITTLE_R output files. The other plots observations on analysis levels with error-checked ones marked with different colors. This can be very useful to visually view what data have been thrown out by the quality controls.

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e. INTERPF

The major change in this program is to be able to generate 'non-standard' input fields in MMINPUT file and compute lateral boundary conditions from them if these fields are present in the input. The 'non-standard' fields refer to 3-D arrays like cloud/rain water fields, for example. The program processes input fields and calculates boundary conditions for those prognostic fields available in MM5.

f. NESTDOWN

This program can now add (or subtract) vertical levels when generating finer horizontal input files for one-way nesting run in MM5. A new set of vertical sigma levels can be specified in the namelist.

** The National Center for Atmospheric Research is sponsored of the National Science Foundation.*

g. INTERPB

In addition to generating pressure level data for graphic purposes or input to RAWINS/LITTLE_R for reanalysis, INTERPB can generate data in intermediate format as an input for regridder. This will allow a user to turn MM5 model output data from one MM5 grid as input to another MM5 grid. For example, a user may choose to use MM5 hemispheric data as the input to a regional run with a different map projection.

h. GRAPH

Some upgrades of the program include 1) being able to plot INTERPB pressure-level data, 2) using newer NCAR Graphic mapping database in version 4.2 (which improves the resolution of country and coastlines over many parts of the world), and 3) removing the limit of 10 input files in one GRAPH run.

i. RIP

There are a number of changes made in RIP in its 3.1 release. The program can now process up to 999 output times. It can plot vertical profiles for alternative vertical coordinate (in addition to *p*) and in vertical windows. A new global observing station list is now provided. For polar atmosphere, a special routine is added for plotting skew-T diagrams for very cold temperatures. For those who view a subdomain in MM5 hemispheric model can now rotate the window according to user specification.

3. NEW IN USER SUPPORT

- *IBM SUPPORT*

Along with V3.5 release, many job decks, and utility programs have been ported to support running jobs on NCAR's IBM. We hope to maintain the level of support that was provided for the Cray to users on the IBM.

- *MM5-to-GrADS CONVERSION PROGRAM*

This utility program was developed by George Bryan of Penn State, and is now adopted by mesouser as one of our supported programs. GrADS is free graphical software that can be downloaded from the Web, and it provides an alternative to using NCAR Graphics.

- *MM5 MODELING SYSTEM ONLINE TUTORIAL*

INTERPB, RIP and MM5-to-GrADS have recently been added to the online self-teaching tutorial pages. All pages are updated and improved to provide more information about the modeling system. The tutorial lecture material (PowerPoint files) has also been provided on the online tutorial page. In the near future, we are hoping to bring the complete tutorial notes/user guide online (in html format).

4. SUMMARY

With recent release of V3.5, the capability of pre- and post-processing programs for MM5 model is fairly complete. We will continue to provide user support, fix any problem that may exist in the current codes, but do not foresee any major development at this time.

REFERENCE

Low-Nam, S. and C. Davis, 2001: Development of a tropical cyclone bogussing scheme for the MM5 system. *Preprint for the Eleventh PSU/NCAR MM5 Users' Workshop*, Boulder, Colorado, 130-134.