MM5 Pre- and Post-processing Programs in Version 3.4 and 3.5

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1. INTRODUCTION

The current release for most pre- and post-processing programs is 3.4. There are two new additions to the suite: INTERPB and RIP. RIP became available last October, and a beta-version of INTERPB was released in March. In this report, we are going to highlight what new functions and capabilities are in V3.4, and what we plan to do for release V3.5. A more complete description of the changes can be found in Wang (2000).

2. NEW IN V3.4

a. TERRAIN

We have recreated global terrain elevation data at five resolutions (1 degree, 30, 10, 5, and 2 minutes) using the USGS 30 second dataset in V3.4. This replaced the old dataset which came from several different sources, and some had occasional errors. The advantage of doing this is obvious: we now have a consistent dataset at all resolutions. The lower resolution terrain data are created by doing a simple arithmetic mean of all data points found in the grid box.

In the current release, we have also added a 2-minute data resolution option (*NTYPE=5*). This will serve users who do simulations at a few kilometers resolution. It has the advantage of getting the higher resolution data and at the same time not needing the extremely large memory if the 30 second data were used. The 30-second data option is now activated by setting *NTYPE = 6*.

b. REGRID

REGRID and other pre-processor programs now allow water temperature to be SST or SKINTEMP. This is because most datasets we support provide skin temperature over water. While this temperature may be ok to use for water temperature in the model, interpolating such a field from the original data to an MM5 grid over a land-water boundary can create problems. If an input dataset provides SST, program INTERPF will create time-varying SST in LOWBDY file for potential use in MM5 model to allow SST to vary during a (long) model integration. If an input dataset has only skin temperature, program INTERPF will average this field and provide a single water temperature field in LOWBDY.

Based on some modifications made by Oren Duer from Hebrew University of Jerusalem, Israel, pregrid now can handle thinned GRIB data such as those provided by WAFS. This may offer some help to users who struggle to download large dataset from internet for their real-time applications.

c. INTERPF

If an input dataset provides SST, snow cover and sea ice fields, INTERPF will output the time-varying SST, snow cover and sea ice fields in the LOWBDY file. The time-varying SST, snow cover and sea ice fields may be used in MM5 model to update these fields during a long simulation. SKINTEMP is not used for time-varying SST.

3. INTERPB

INTERPB is the last missing component of MM5 Version 3 modeling system. A beta version was released in March. Since then we have fixed a couple of small problems, and the tar file has been updated.

The basic function of INTERPB is to generate pressure level datasets from MM5 model output data. There are two basic functions provided in the current beta release. First, it produces model output on a set of user-specified pressure levels. This dataset can be used in program such as GRAPH and RIP. The second function of INTERPB is to generate pressure-level data that are the same as the output from REGRID. This data may be used in programs like RAWINS/ LITTLE_R and INTERPF.

Another function that INTERPB will provide in the next release is to 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.

4. PLANNED IMPROVEMENTS IN V3.5

- *TERRAIN*

The current resolution for soil category data is 1 degree global and 30 second US. The six-resolution data we provide were a combination of these two data sets. We now have a global 5-minute soil-category dataset available, and hence we will be recreating all six resolution data from 1 degree to 30 second from a combination of the global 5-minute data and US 30-second data at two soil layers (0 - 30 cm, and 30 - 100 cm). The new data will be made available in V3.5.

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Another change planned for V3.5 TERRAIN is to update the USGS global 30 second vegetation dataset with the Version 2.0 source from USGS (*http://edcdaac.usgs.gov/glcc/glcc.html*). There are some improvements in this release. For the use in TERRAIN, we will be updating all vegetation and landuse (derived from the vegetation data) at all six resolutions.

A monthly climatological SST field is considered to be processed by TERRAIN at a later release. This would work similarly to the vegetation fraction data in the modeling system to allow update during long MM5 runs.

- *REGRID*

In the upcoming release, pregrid will be able to process and output data at an interval less than 1 hour.

- *RAWINS*

An update planned for RAWINS is to remove the processing time limit currently hardwired in the program (50 time periods). This will allow users to run RAWINS for a long period of time.

In addition, we are looking into allowing any fields to be passed along in all preprocessing programs. This will enable a user to pass fields like cloud water into the model's initial condition.

- *LITTLE_R*

At a later release, we plan to add the capability of doing 3-hourly surface analysis in LITTLE_R, and outputting it in the form that can be used in surface analysis FDDA in MM5.

- *NESTDOWN*

The program NESTDOWN has been used exclusively for horizontal interpolation to create MM5 input files at a finer resolution. In release 3.5, we plan to add the capability to allow increasing vertical resolution as well. This will be controlled by new namelist variables to define a new set of sigma values.

5. MM5-to-WRF CONVERSION PROGRAM

To help MM5 users to begin experimenting with the newly developed Weather Research and Forecasting (WRF) model, a conversion program is developed to convert MM5 input data to WRF input data. To do this, one needs to generate MMINPUT and LOWBDY file for all time periods interested, and these files as the input for the conversion program. The program is available from the WRF download site. For information on WRF, please visit *http://www.wrf-model.org*.

REFERENCE

Wang, W., 2000: Status report on MM5 pre- and post-processing programs in Version 3. *Preprint for the Tenth PSU/NCAR MM5 Users' Workshop*, Boulder, Colorado, 9-10.