MM5 MODEL STATUS AND PLANS

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1. INTRODUCTION

MM5 version 3.6 was released in December 2002, and was described in last year's workshop. In March 2003, we released version 3.6.1, which was also described last year. Here the changes for release 3.6.2 in August 2003 and 3.6.3 in February 2004 will be summarized.

The plans for MM5's final version, 3.7, will also be described. With the transition of all our development work to WRF, formal MM5 development is being stopped after version 3.7 is released. This will occur later this year.

2. RECENT CHANGES

Two minor sets of changes were added in the MM5 model after version 3.6.1. We thank various users for pointing out, and in some cases solving these problems. More can be found on the MM5 Web site and in the *CHANGES* file in the MM5 directory.

2.1 Version 3.6.2 (August 2003)

Several corrections were made for the use of sea-ice fraction, which is part of the new Polar Physics, in nested runs.

The Reisner 2 microphysics scheme had an important correction to the cloud autoconversion parameterization, and the snow to graupel conversion was also modified.

The Pleim-Xiu-Chang land-surface model and PBL also had some changes in this release.

2.2 Version 3.6.3 (February 2004)

A problem with running two nests at the same level in conjunction with the Noah LSM was fixed.

The *IFSNOW=2* simple snow-cover prediction had an OpenMP correction for shared-memory parallel applications.

The Kain-Fritsch convective parameterization scheme had minor changes to prevent occasional blow-ups on Linux platforms.

3. FUTURE PLANS

3.1 Version 3.7

Later in 2004, we will release a final version of MM5. Several loose ends will be tied up, and we will additionally make available some code provided to us by Guenther Zaengl (University of Munich) that improves MM5 results in regions of complex topography, particularly with fine grids (e.g. dx < 5 km). These changes will be described in more detail by Bruyere and Zaengl (2004, in this workshop). They are (i) a more sophisticated horizontal diffusion that behaves better in narrow valleys (Zaengl 2002), (ii) a modification to solar radiation that accounts for surface slope, (iii) a generalization of the vertical coordinate (Zaengl 2003) that makes the coordinate surfaces nearly horizontal at some level below the model top, allowing better upper-air structures, and (iv) an improvement to the upper radiative boundary condition for use in nests. (i) and (ii) will be put into the standard code as options, while currently we are planning to provide a separate MM5 tar file with (iii) and (iv) as a contributed code, because these two changes are pervasive and may not parallelize easily.

Other changes are also planned for 3.7. The MRF PBL will be made compatible with the Polar Physics, particularly sea-ice fraction. Up till now only the Eta PBL can be used with sea-ice fraction. This change is already in a special release (3.6.2+) provided to AFWA.

We also want to make available a PBL height from the Eta PBL option. This is useful for diagnostics and off-line air quality models. The PBL height output from the MRF PBL scheme will also be modified to more accurately represent the true PBL height, rather than the one it uses internally which is a little higher. This would not affect MRF PBL results, only the PBL height output, which is a diagnostic field.

Another modification in the MRF PBL will reduce the effect of surface friction during the daytime, and should help to alleviate a low-wind-speed bias. We will also modify how the convective velocity is computed so that it follows Beljaars' formulation. These are changes from Yubao Liu (NCAR/RAP) based on surface verification studies.

If there is time, we will also couple the Gayno-Seaman PBL to the Noah LSM, possibly as a joint effort with Penn State.

The Grell cumulus parameterization scheme will be called after the boundary-layer schemes to be consistent with Georg Grell's desired use of the PBL tendencies as part of the scheme's large-scale forcing terms. This is the way the scheme has been running in other models, such as RUC, for many years.

Another contributed code that may be made available is from Shuhua Chen (U C Davis). This is a generalized version of a code developed to handle the transport and diffusion of an arbitrary number of tracers, including their transport within the MRF PBL scheme and the Kain-Fritsch cumulus scheme.

3.2 THE FUTURE OF MM5

As stated, 3.7 will be the last formal release of MM5 as we transition to WRF. Version 2.0 of WRF, released in May 2004, includes nesting capabilities and many of MM5's applications can be replaced by using WRF. In 2005, it is hoped that remaining capabilities such as FDDA by nudging, and the flexibility of MM5's data pre-processing system, will also be available as part of the WRF system, so users on long-term projects are strongly encouraged to migrate their efforts towards WRF.

MM5 support will continue, but will be limited to answering e-mail questions. MM5 tutorials for new users will be replaced by WRF tutorials, starting in 2005. Future workshops at NCAR will encourage papers from both models, as this year.

4. REFERENCES

Zaengl, G., 2002: An improved method for computing horizontal diffusion in a sigma-coordinate model and its application to simulations over mountainous topography. Mon. Wea. Rev., 130, 1423-1432.

Zaengl, G., 2003: A generalized sigma coordinate system for the MM5. Mon. Wea. Rev., f 131, 2875-2884.