A Graphical User Interface for MM5v3

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The workbench provides GUIs to the following components of the MM5v3 modeling system: TERRAIN, REGRID, INTERPF, and MM5. The workbench uses the Globus toolkit to enable remote job submission. The workbench greatly simplifies the process of running MM5 by allowing the user to enter the data (and enter it once!) used to define: the domain(s) used by the model; the reanalysis or GCM output data from which the initial and boundary conditions are computed; the physics options used by MM5; the starting and ending time for the simulation, time step size, and output frequency. This is a great simplification of the normal process, which requires the user to edit a number of shell scripts and a namelist file. Use of the remote job submission capabilities of Globus allows the user to run the workbench on a desktop platform, and run the components of the MM5 system on remote platforms accessible via Globus.

Grid Computing and Globus

A *computational grid* is a hardware and software infrastructure capable of providing dependable, consistent, pervasive, and inexpensive access to high-end computational resources [1]. *Grid computing* is the execution of grid-friendly applications on a computational grid. Globus [2] is a software system that enables grid computing by providing the following services: resource (*i.e.,* processing power) management, data management, online instrumentation, security, executable staging and remote I/O, and selection of remote platform.

System Requirements

The workbench requires the following things of the system(s) on which it is to be used: a java interpreter; Globus and the Globus toolkit; executables of the MM5v3 preprocessors TERRAIN, REGRID, and INTERPF; an MM5v3 executable, compiled with MPP plug-ins, and configured with physics options that allow maximum flexibility.

The Graphical User Interface

The Graphical User Interface has five different panels: DATA, LOCATION, PHYSICS options, TIME SPAN, and MODEL. These panels are listed on a toolbar across the top of the GUI. The panels guide the user through the process of configuring MM5 and its preprocessors TERRAIN, REGRID, and INTERPF.

The DATA panel (Figure 1) offers the user a choice of options for reanalysis or GCM data used to compute initial and lateral boundary conditions for MM5. Three options are currently supported: NCAR/NCEP reanalysis project (NNRP) data, National Center for Environmental Prediction reanalysis data (NCEP), and output from the University of Wisconsin/Argonne National Laboratory Fast Ocean-Atmosphere Model (FOAM). The scrollable window lists individual data files labeled by year and month.

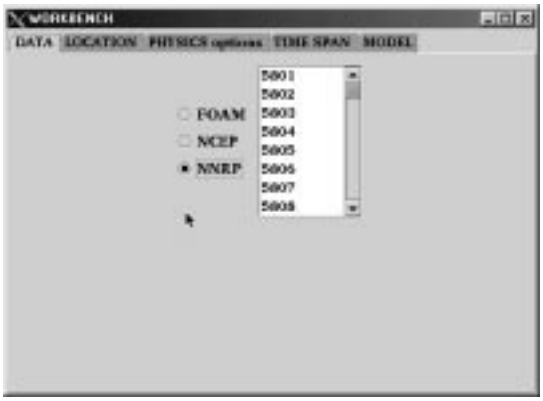

Figure 1

The LOCATION panel (Figure 2) is used to define the domain(s) for the simulation. This is the information one normally places in the shell script for TERRAIN.

Figure 2

The physics options for MM5 are being input from the "Physics" panel (Figure 3). Here the user would be able to change such parameters as IMPHYS, MPHYSTBL, ICUPA, IBLTYP and others. The change in the values of these parameters would usually require the re-compilation of MM5 itself. It is not the case for this software. The 'master' executable has been compiled with all possible physical options and is supplied with the software. This is especially convenient for physics sensitivity experiments when there is the need to run MM5 several times

Figure 3

while changing just one physics option (no need to recompile!).

The "Time Span" panel (Figure 4) allows user to select the desired time interval for the simulation, time step size, and output frequency.

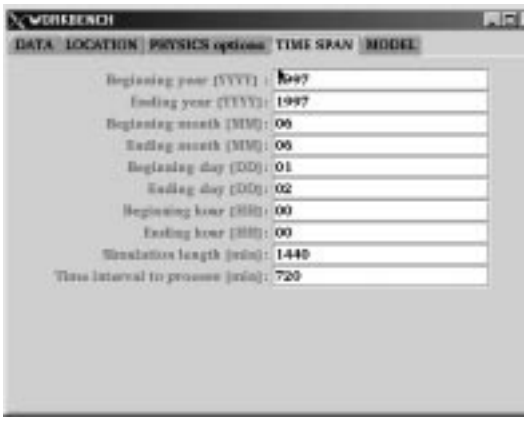

Figure 4

The Model Panel (Figure 5) guides the user through the final step – job submission. The user chooses the remote system his job would be running on from the menu – and submits the job. As soon as the "START" button is pressed – the whole process is starting. First – the necessary data is transferred to user's directory (only if its not there initially). Then – the Terrain, Pregrid, Regridder and Interpf applications execute on the remote platform. After all preprocessors have finished successfully – MM5 starts.
If FOAM (CCM) input data is requested, FOAM is run first, then the RCM preprocessor (written by John Michalakes, NCAR) prepares the data for MM5 run, and then MM5 runs.

Figure 5

References:

1.Foster, I., and Kesselman, C., eds., *The Grid: Blueprint for a New Computing Infrastructure ,* Morgan Kaufman Publishers, 550 pp, 1998

2.http://www.globus.org