

Chapter 3

Installation and Testing

This chapter is written to help new users to install and test the GMI code. We provide specific instructions on how to obtain the code, to properly set environment variables, to select the model configuration, to choose a particular platform, to compile the code and to perform basic test runs. The focus of the document is for the installation and execution of the GMI code on `discover`, and `explore`. The same procedures can easily be applied to any platform.

To get and install the GMI code, the following system software is needed:

- CVS (see Chapter 8 for instruction)
- F90/95 (ideally *ifort* for intel)
- C (ideally *icc* for intel)
- MPI needed only if running the message passing version of the code
- netCDF (version 3.4 or higher). The location of netCDF should be provided in the files *Config/gem_config.h* and *Config/compiler.mk* before compiling the code (see Section 3.3 for details).
- make
- makedepend (generally in `/usr/bin/X11`)
- perl
- a debugger (if possible)

During this process of installing and testing the code, it is assumed that *Cshell* is the default shell employed by the user. In fact, the GMI environment variables required for these procedures are set up using *Cshell*.

3.1 Getting the Code

To obtain the GMI code,

- Select the directory where you want to install the GMI model, say *MYGMI/*
- Get the latest version of the model from the cvs repository at *sourcemotel* by typing the command lines:

```
%setenv CVS_RSH ssh
%cvs -d usrid@sourcemotel.gsfc.nasa.gov:/cvsroot/gmi co -P gmi_gsfc
```

Here *usrid* is your login name on *sourcemotel*. You will be asked to provide your password on *sourcemotel*. The directory *gmi_gsfc/*, which is the main GMI directory, will then appear.

3.2 Model Files and Directory Structure

Move into *gmi_gsfc/*

```
%cd gmi_gsfc
%ls
```

You will find (in *gmi_gsfc/*) the files and directories:

Applications/	Config/	README.first	Shared/	login.gmi
CVS/	Documents/	README.install	cshrc.gmi	
Components/	Makefile	README.notice	gem/	

The top directory of the GMI code is *gmi_gsfc/* which contains sub-directories presented in Chapter 2.

3.3 Setting Environment Variables

In the directory *gmi_gsfc*, read all the README files by starting with *README.first* file that guides a new user to take the required steps for installing and running the GMI code. The top portions of the files *cshrc.gmi* and *login.gmi* (both also located in *Shared/GmiScripts/*) include instructions for setting up the environment variables which are discussed in this section.

Edit the file *cshrc.gmi*

- Select the chemistry mechanism you want to consider by setting the variable *CHEM-CASE*. Currently four mechanisms are available: *troposphere*, *aerosol*, *micro_aerosol*, *gocart_aerosol*, *stratosphere*, and *strat_trop* (for the combined stratosphere/troposphere). If you want to have *troposphere* for instance, uncomment the corresponding line to have

```
setenv CHEMCASE strat_trop
```

- For the platform you want the GMI model to run on, update the variables *GMIHOME* (location of the main model directory) and *GMI_DATA* (directory where the input data to test the installation are located - not really necessary):

```
setenv GEMHOME ~/MYGMI/gmi_gsfc
setenv GMI_DATA ~/MYGMI/gmi_gsfc
```

Copy the files *shrc.gmi* and *login.gmi* to your home directory

```
%cp shrc.gmi ~/.shrc.gmi
%cp login.gmi ~/.login.gmi
```

Go to the directory *Config/* and edit the file *gem_sys_options.h*. Modify the line

```
#define ARCH_OPTION ARCH_XXXX
```

to select the architecture you want to run the code on. For instance, *XXXX* is *INTEL* for *discover* or *explore*. In this case, you also need to set

```
#define HOST_MACH YYYYY
```

where *YYYYY* is either *DISCOVER* or *PALM* (for *explore*)

In addition, set the variable *MSG_OPTION* to determine if you want a single processor version of the code

```
#define MSG_OPTION MSG_NONE
```

or a multiple processor version (using MPI) of the code

```
#define MSG_OPTION MSG_MPI
```

You may also choose to edit the file *gem_options.h* to select debugging, optimization, or profiling options. If necessary, provide the paths to MPI and netCDF include files and libraries in the files *gem_config.h* and *libraries.mk*. Some compilation options may have to be changed in the files *gem_config.h* and *compiler.mk*. Go to your home directory and edit the file *.shrc*

```
%cd ~/
%vi .shrc
```

Include the lines

```
setenv CVS_RSH ssh
setenv ARCHITECTURE ARCH_XXXX
if (-e ~/.shrc.gmi) then
    source ~/.shrc.gmi
endif
```

You can also edit the *.login* file and add the lines

```
if (-e ~/.login.gmi) then
    source ~/.login.gmi
endif
```

Update the changes made in the files *.cshrc* and *.login* by typing

```
%source .cshrc
%source .login
```

The setting of the environment variables ended with the previous two commands. The setting automatically creates aliases that allow the user to easily access the code directories and to execute scripts (see Chapter 7). For instance, by typing:

- `cd gmi` or `cd $GMIHOME`, you will get to the code main directory.
- `cd phot`, you will move to the directory containing the Photolysis component package (*gmi_gsfc/Components/GmiChemistry/photolysis/*).
- `cd emiss`, you will move to the directory containing the Emission component package (*gmi_gsfc/Components/GmiEmission/*).
- `seabf my_words`, you will search through all the GMI ".F90" files for the string *my_words*.

3.4 Code Installation and Basic Test Run

Go back to the working directory *MYGMI/gmi_gsfc/*:

```
%cd gmi
```

3.4.1 Compiling the model

To compile the code, use the commands:

```
%gmake all
```

The *gmake* command compiles and links the code. ".f90", ".o", ".mod" and ".a" files are created and executable named *gmi.x* is placed in the directory *Applications/GmiBin/*.

3.4.2 Testing the Executable

To test the executable, we will use a sample namelist file coming with the code. For each platform, we show examples of job script files (named *gmitest.job*) to test the executable. On *explore* and *discover* you need to have your sponsor code account (type the command *getsponsor* to obtain it).

It is assumed that the user wants to test the model from the directory */explore/nobackup/usrid* on *explore* and */discover/nobackup/usrid* on *discover*.

```

runGmi_ExploreTest
#PBS -S /bin/csh
#PBS -N gmiCombo
##      -N sets job's name
#PBS -l ncpus=64
#PBS -l walltime=00:35:00
#PBS -A a930b
##      -A sets the sponsor code account
#PBS -V
#PBS -e gmiCombo.err
#PBS -o gmiCombo.out
#
setenv workDir /explore/nobackup/usrid
setenv CHEMCASE strat_trop
setenv GmiBinDir ~/MYGMI/gmi_gsfc/Applications/GmiBin

cd $workDir
#
mpirun -np 64 $GmiBinDir/gmi.x -d comboNamelistFile.in

runGmi_DiscoverTest
#PBS -S /bin/csh
#PBS -N gmiCombo
###      -N sets job's name
#PBS -l select=16:ncpus=4
###      choose 16 nodes and 4 processors per node
#PBS -l walltime=00:35:00
#PBS -W a930b
###      -W sets the sponsor code account
#PBS -V
#PBS -e gmiCombo.err
#PBS -o gmiCombo.out
#
setenv workDir /discover/nobackup/usrid
setenv CHEMCASE strat_trop
setenv GmiBinDir ~/MYGMI/gmi_gsfc/Applications/GmiBin

cd $workDir
#
limit stacksize unlimited
mpirun -np 64 $GmiBinDir/gmi.x -d comboNamelistFile.in

```

Remark 1 *Replace a930b in the above script files with your sponsor code account. Here usrid is the user's login name.*

To submit the job script, do the following

```
On explore and discover
%qsub runGmi_ExploreTest
%qsub runGmi_DiscoverTest
```

3.5 Summary of the Necessary Steps

In this section, we give the list of steps needed to obtain, install and run the GMI code on any platform.

1. Obtain the code (*gmi_gsfc* release) from the cvs repository.
2. Move to the GMI working directory (*gmi_gsfc/*).
3. Edit the file *cshrc.gmi* to update the variables `GMIHOME`, `GMI_DATA` (not necessary) and `CHEMCASE`.
4. Copy the files *cshrc.gmi* and *login.gmi* to *.cshrc.gmi* and *.login.gmi* in your home directory.
5. Go to the directory *Config/* to edit the files *gem_sys_options.h*, *gem_config.h*, *compiler.mk*, *libraries.mk* to select the architecture and to update the compilation options and paths.
6. Go to your home directory to edit and source the files *.cshrc* and *.login*.
7. Type `cd gmi` and compile the code by typing `gmake all`.
8. Write a job script file and submit the job to run the executable.