

Welcome to the 2016 NMMB Online Practical Session Guide!

Background

The end-to-end NEMS/NMMB system code used in the practical session consists of four components: NPS, NEMS, UPP (post processing), and graphic tools (NCL utilities). In order to run NMMB, the first three components need to be built and positioned into the top of your working directory tree. Details will be provided below.

Since compiling the first three components takes a considerable amount of time, we have pre-compiled these components for this practical session. The graphics tool (NCL) is built into the computer system, and thus there is no need to re-build for this exercise. Please use the pre-compiled code for the exercise, as this will ensure that you get the most from the practical session.

The practical session exercise is fairly straight forward and will be run on NCAR's supercomputer, Yellowstone.

Test case

This exercise consists of running NMMB and post-processing. We will test a 24-hour cold-start run from November 4, 2013. The background data needed for the test is provided within the directory tree.

Documentation

The NMMB user's guide can be found on the [DTC NMMB User Tutorial](#) website under **Related Information**.

Logging on and running NPS jobs on the NCAR Yellowstone supercomputer

Logging in to yellowstone.ucar.edu

You will want to open at least two login windows on Yellowstone. One for editing files and a second for running jobs. Start by opening two terminals on your machine. This can be done as follows:

Linux: Select *open terminal* from the right mouse button menu.

OS X: Start the *Terminal* and *XQuartz* applications from the */Applications/Utilities* folder.

Windows: Start the application *XSession* from the *Start* menu and then *Putty*.

Start by opening an X enabled window to a login node.

1. Plug your Key card into your computer's USB slot.
2. Log in to the NCAR supercomputer Yellowstone by typing:
 - `ssh -X ncar_user_name@yellowstone.ucar.edu`
 - NOTE: Your *ncar_user_name* is the username provided with your Key card. Your *ncar_user_name* will be used again when running practical session.
3. At the prompt, enter your 4-digit pin.
4. Press the gold disk on your Key card until the prompt returns.
5. Remove the Key card and place it in a safe place.

This procedure logs you into Yellowstone with an X-windows enabled window. If you want to use a visual editor such as *emacs* or *nedit*, launch it from this Yellowstone window.

Once you logged in to Yellowstone, you will be placed in a directory called `/glade/u/home/ncar_user_name`. The *ncar_user_name* is your login name, however, the practical exercise should be done in `/glade/scratch/jbeck/NMMB_Tutorial/`.

The **TOP_DIR** is set to `/glade/scratch/jbeck/NMMB_Tutorial`.

`cd /glade/scratch/jbeck/NMMB_Tutorial`, and run

`mkdir ncar_user_name` (this will be your top level working directory, all work will be done under your *ncar_user_name*)

`cd ncar_user_name`

Running NPS jobs

NPS consists of four steps: **geogrid** to set up domain, **ungrib**, **metgrid**, and **nemsinterp**.

Start by entering your own directory,
cd \${TOP_DIR}/ncar_user_name/

and copy the npsprd directory from ../test

```
cp -r ../test/npsprd .  
cd npsprd
```

You will be working in directory **\${TOP_DIR}/ncar_user_name/npsprd**.

Run geogrid

The script **run_geogrid.csh** and executable **geogrid.exe** are used to generate geographical data. All information needed for users is defined in **run_geogrid.csh**.

Check the npsprd directory and make sure all the following files or links exist:

```
> ls -l  
lrwxrwxrwx geogrid.exe -> /glade/scratch/jbeck/NMMB_Tutorial/NPS/geogrid.exe  
lrwxrwxrwx GEOGRID.TBL ->  
/glade/scratch/jbeck/NMMB_Tutorial/static/GEOGRID.TBL  
-rwxrwxr-x link_grib.csh  
lrwxrwxrwx metgrid.exe -> /glade/scratch/jbeck/NMMB_Tutorial/NPS/metgrid.exe  
lrwxrwxrwx METGRID.TBL ->  
/glade/scratch/jbeck/NMMB_Tutorial/static/METGRID.TBL  
-rw-rw-r-- namelist.nps  
lrwxrwxrwx nemsinterp.exe ->  
/glade/scratch/jbeck/NMMB_Tutorial/NPS/nemsinterp.exe  
-rw-rw-r-- run_geogrid.csh  
-rw-rw-r-- run_metgrid.csh  
-rw-rw-r-- run_nemsinterp.csh  
-rw-rw-r-- run_ungrib.csh  
lrwxrwxrwx ungrib.exe -> /glade/scratch/jbeck/NMMB_Tutorial/NPS/ungrib.exe  
lrwxrwxrwx Vtable -> /glade/scratch/jbeck/NMMB_Tutorial/static/Vtable.GFS
```

Submit **run_geogrid.csh** with the following command:

```
bsub < run_geogrid.csh
```

To monitor job execution, use the command: **bjobs -u username**

If the script completed successfully, the following four files were created: **geo_nmb.d01.dio**, **geogrid.log**, **geogrid.out**, and **geogrid.err**. Check for the following message toward the end of the **geogrid.out** file.

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!  
! Successful completion of geogrid. !  
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

If the message was not produced, check **geogrid.err** for information.

Run ungrib

The script **run_ungrib.csh** and executable **ungrib.exe** are used to extract meteorological fields from GRIB formatted files and to write these fields to intermediate files.

cd \${TOP_DIR}/ncar_user_name/npsprd. (you should be still in the npsprd directory)

Link the background model (GFS is used) by running the following command:

```
./link_grib.csh ../../GFS/gfs*
```

Submit the **run_ungrib.csh** job with the following command:

```
bsub < run_ungrib.csh
```

To monitor job execution, use the command: **bjobs -u username**

If the script completed successfully, intermediate files of the form **GFS:YYYY-MM-DD_HH** were created in the directory **npsprd**. Here, YYYY-MM-DD_HH refers to the date in each file. The following three files should have been created as well: **ungrib.out**, **ungrib.err**, **ungrib.log**. Check for the following message toward the end of the **ungrib.out** file.

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!  
! Successful completion of ungrib. !  
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

If the message was not produced, check **ungrib.err** for information.

Run metgrid

The script **run_metgrid.csh** and executable **metgrid.exe** are used to horizontally interpolate the meteorological fields extracted by **ungrib.ksh** to the model domain grid defined by **geogrid.ksh**

Submit the **run_metgrid.csh** job with the following command:


```
cd /glade/scratch/jbeck/NMMB_Tutorial
cd ncar_user_name
cp -r ../test/nemsprd .
Entering the nemsprd directory:
cd nemsprd
```

Now the working directory is `${TOP_DIR}/ncar_user_name/nemsprd`.

Running NEMS.x

The script `run_nems.csh` and executable `NEMS.x` are used to generate the forecast. All information needed for users is defined in `run_nems.csh`.

Check the nemsprd directory first. There should be two files:

```
> ls -l
-rw-rw-r-- 1 configure_file_01
if this file doesn't exist, run the following command:
"cp /glade/scratch/jbeck/NMMB_Tutorial/static/configure_file_01 ."
-rwxr-xr-x 1 run_nems.csh
```

Link the following files:

```
In -sf configure_file_01 model_configure
In -sf ../npsprd/input_domain_01* .
In -sf ../npsprd/boco.00* .
In -sf /glade/scratch/jbeck/NMMB_Tutorial/NEMS/exe/NEMS.x .
In -sf /glade/scratch/jbeck/NMMB_Tutorial/static/TABLES/* .
In -sf /glade/scratch/jbeck/NMMB_Tutorial/static/solver_state.txt .
In -sf /glade/scratch/jbeck/NMMB_Tutorial/static/atmos.configure .
In -sf /glade/scratch/jbeck/NMMB_Tutorial/static/ocean.configure .
In -sf /glade/scratch/jbeck/NMMB_Tutorial/static/nests.txt .
```

After linking all the files, run

ls -l

to make sure all the files exists. Otherwise, NEMX.x won't run

Submit the `run_nems.csh` script with the following command:

```
bsub < run_nems.csh
```

To monitor job execution, use the command: `bjobs -u username`

If the script completed successfully, the following files
`nmmb_hst_01_nio_00HHh_00m_00.00s.ctl` and

nmmmb_hst_01_nio_00HHh_00m_00.00s

were created in directory `${TOP_DIR}/ncar_user_name/nemsprd/` where **HH** denotes the forecast hour.

If these files were not produced, check `nems.err` for information.

Congratulations! You have successfully completed running NEMS-NMMB.

If you want to re-run `NEMS.x`, clean up the directory first by doing the following:

`cd nemsprd` (if you are not in the directory)

`cp /glade/scratch/jbeck/NMMB_Tutorial/bin/clean_nmmb_rundir.csh .`

`./clean_nmmb_rundir.csh` to remove all output files.

Running Post-processor on `yellowstone.ucar.edu`

TOP_DIR is set to `/glade/scratch/jbeck/NMMB_Tutorial`.

```
cd /glade/scratch/jbeck/NMMB_Tutorial
```

```
cd ncar_user_name
```

```
cp -r ../test/postprd .
```

Entering the `postprd` directory

```
cd postprd
```

Now the working directory is `${TOP_DIR}/ncar_user_name/postprd`.

Running UPP (Post-processor)

Check the `postprd` directory first. There should be two files:

```
> ls -l
```

```
-rw-rw-r-- 1 post.ksh
```

```
-rw-rw-r-- 1 run_post.ksh
```

The scripts **run_post.ksh** and **post.ksh** are used to process the forecast data.

Open the file `run_post.ksh` with a text editor and change `ncar_user_name` to your own username in the following line in **run_post.ksh**:

```
export MOAD_DATAROOT=/glade/scratch/jbeck/NMMB_Tutorial/ncar_user_name
```

Submit `run_post.ksh` with the following command:

bsub < run_post.ksh

If the script completed successfully, the following files (nmbnat_**.tm00, nmbprs_**.tm00, nmbprt_**.tm00, and nmbtwo_**.tm00) were created in the directory **postprd**, where ** denotes the forecast hours.

If these files were not produced, check post.err and post.out for information.

Congratulations! You have successfully processed the forecast data.

If you want to re-run post, clean up the directory first by doing the following:

cd postprd (if you are not in the directory)

cp /glade/scratch/jbeck/NMMB_Tutorial/bin/clean_post_rundir.csh .

./clean_post_rundir.csh to remove all output files.

Visualization of results

TOP_DIR is set to /glade/scratch/jbeck/NMMB_Tutorial.

```
cd /glade/scratch/jbeck/NMMB_Tutorial
```

```
cd ncar_user_name
```

```
cp -r ../test/nclprd .
```

Enter the nclprd directory:

```
cd nclprd
```

Now the working directory is **nclprd**.

Running NCL scripts

The script **run_ncl.ksh** is used to produce two sample 3-h forecast plots: 2-m temperature and 1-km derived reflectivity valid at 11/4/2013 03:00.

Check the nclprd directory first. There should be three files:

```
> ls -l
```

```
-rw-rw-r-- 1 2m_temp.ncl
```

```
-rw-rw-r-- 1 onekmref.ncl
```

```
-rw-rw-r-- 1 run_ncl.ksh
```

Submit the run_ncl.ksh script with the following command:

bsub < run_ncl.ksh

If the script ran successfully, there will be two png files, 2m_temp.png and onekmref.png in the directory.

Run “display” to check both.

display 2m_temp.png

display onekmref.png

Congratulations! You have successfully completed running the NMMB practical exercise.