

Tutorial for Running WRF

This document provides basic Unix commands and steps for compiling WRF and WPS.

[Notes: I will update this document recursively. If you have questions, please [Email](#) me.]

Basic Unix Commands

Before running WRF, you need to know basic commands as follows:

<code>cd ../</code>	#return to the parent directory
<code>mkdir</code>	#creat a directory
<code>nano .bashrc</code>	#to edit the batch file that works for loading libraries (e.g., netcdf library, gcc, and libpng). #Once it is done, you can use “ <code>ctrl+x</code> ” to save the edited file
<code>vi .bashrc</code>	#once it is done, press “ <code>esc</code> ” and type: “ <code>q!</code> ” and then press “ <code>Enter</code> ”
<code>ls</code>	#to see all files, but it does not show executable files
<code>ls -lrt</code>	#to see all files including executable files
<code>ls -al</code>	#list all files in a long listing (detailed) format
<code>pwd</code>	#dispaly the present working directory
<code>rm file</code>	#remove (delete) files
<code>rm -r directory</code>	#Remove the directory and its contents recursively
<code>rm -f file</code>	#Force removal of files without prompting for confirmation
<code>rmdir</code>	#delete a file of files
<code>cp file1 file2</code>	#copy file1 to file2
<code>cp -r source_directory destination</code>	# Copy source_directory recursively to destination. If destination exists, copy source_directory into destination, otherwise create destination with the contents of source_directory.
<code>mv file1 file2</code>	#Rename or move file1 to file2. If file2 is an existing directory, move file1 into directory file2
<code>ftp</code>	# file transfer program
<code>Tftp</code>	# Trivial shell file transfer program
<code>Sftp</code>	# secure shell file transfer program
<code>Rcp</code>	#remote file copy
<code>Scp</code>	#secure shell remote file copy
<code>wget</code>	#non-interactive network downloader
<code>telnet</code>	#make terminal connection to another host

Ssh	#secure shell terminal or command connection
rlogin	#Remote login to a Linux host
Rsh	#Remote shell
curl	#transfer data from a url
chmod +rwx	# modify the permission
tar -xf archive.tar.gz	#unzip file

For more commands, please check more [Unix Online](#).

Edit .bashrc

```
#WRFV4.5.1-----
module load zlib/1.2.12
module load libpng/1.6.37
module load jasper/1.900.29
module unload gcc
module load gcc/10.1.0
module load ucx/1.13.1
module load openmpi/4.1.4
module load szip/2.1.1
module load netcdf/4.7.2
module load netcdf-fortran/4.5.2
### ncl-----
module load ncl/6.2.1
```

Compile WRF

You can use the following commands to compile WRF, which will take around 10 to 15 minutes. So, be patient!

```
./clean -a #clean configuration
./configure
choose option 34(parallel) followed by option 1
./compile -j 4 em_real
```

If the compiling process is successful, you will see the following

```

ln -sf ../../run/ETAMPNEW_DATA_DBL ETAMPNEW_DATA ; \
ln -sf ../../run/ETAMPNEW_DATA.expanded_rain_DBL ETAMPNEW_DATA.exp
ln -sf ../../run/RRTM_DATA_DBL RTTM_DATA ; \
ln -sf ../../run/RRTMG_LW_DATA_DBL RRTMG_LW_DATA ; \
ln -sf ../../run/RRTMG_SW_DATA_DBL RRTMG_SW_DATA ; \
fi )
( cd test/em_real ; if test -d ../../run/SBM_input_33 ; then
ln -sf ../../run/SBM_input_33 . ;
ln -sf ../../run/scattering_tables_2layer_high_quad_1dT_1%fw_110 . ;
fi )
( cd test/em_real ; /bin/rm -f GENPARAM.TBL ; ln -s ../../run/GENPARAM.TBL . )
( cd test/em_real ; /bin/rm -f LANDUSE.TBL ; ln -s ../../run/LANDUSE.TBL . )
( cd test/em_real ; /bin/rm -f SOILPARAM.TBL ; ln -s ../../run/SOILPARAM.TBL . )
( cd test/em_real ; /bin/rm -f URBPARAM.TBL ; ln -s ../../run/URBPARAM.TBL . )
( cd test/em_real ; /bin/rm -f URBPARAM_LCZ.TBL ; ln -s ../../run/URBPARAM_LCZ.TBL . )
( cd test/em_real ; /bin/rm -f VEGPARAM.TBL ; ln -s ../../run/VEGPARAM.TBL . )
( cd test/em_real ; /bin/rm -f MPTABLE.TBL ; ln -s ../../run/MPTABLE.TBL . )
( cd test/em_real ; /bin/rm -f tr49t67 ; ln -s ../../run/tr49t67 . )
( cd test/em_real ; /bin/rm -f tr49t85 ; ln -s ../../run/tr49t85 . )
( cd test/em_real ; /bin/rm -f tr67t85 ; ln -s ../../run/tr67t85 . )
( cd test/em_real ; /bin/rm -f gribmap.txt ; ln -s ../../run/gribmap.txt . )
( cd test/em_real ; /bin/rm -f grib2map.tbl ; ln -s ../../run/grib2map.tbl . )
( cd run ; /bin/rm -f real.exe ; ln -s ../main/real.exe . )
( cd run ; /bin/rm -f tc.exe ; ln -s ../main/tc.exe . )
( cd run ; /bin/rm -f ndown.exe ; ln -s ../main/ndown.exe . )
( cd run ; if test -f namelist.input ; then \
/bin/cp -f namelist.input namelist.input.backup.`date +%Y-%m-%d_%H_%M_%S`
/bin/rm -f namelist.input ; cp ../test/em_real/namelist.input . )

=====
build started: Mon Sep 25 19:26:25 EDT 2023
build completed: Mon Sep 25 19:43:57 EDT 2023

---> Executables successfully built <---

-rwxr-xr-x 1 xic23015 domain users 47258360 Sep 25 19:43 main/ndown.exe
-rwxr-xr-x 1 xic23015 domain users 47319840 Sep 25 19:43 main/real.exe
-rwxr-xr-x 1 xic23015 domain users 46549968 Sep 25 19:43 main/tc.exe
-rwxr-xr-x 1 xic23015 domain users 55402632 Sep 25 19:42 main/wrf.exe
=====

```

Set Domain

You can use “WRFDomainWizard” to relocate your study area.

For example, you can select the corn belt and record the longitude and latitude from the interface. **The recommended approach is to place the "WRFDomainWizard" at the same directory level as the "WRF folder."**

Compile WPS

Before compiling WPS, **the WRF should be compiled successfully first!** The WPS directory should be at the same level as WRF folder.

```

cd WPS/
rm -f GRIDFILE* met_em*
rm -f GRIB* FILE*

```

```

nano .bashrc

#add the following to
module load zlib/1.2.12
module load libpng/1.6.37
module load jasper/1.900.29
module unload gcc
module load gcc/10.1.0
module load ucx/1.13.1
module load openmpi/4.1.4

```

```
module load  szip/2.1.1
module load  netcdf/4.7.2
module load  netcdf-fortran/4.5.2
### ncl-----
module load  ncl/6.2.1
```

```
source .bashrc #update bashrc file
```

```
./clean -a #delete previous configurations
./configure #generate configure.wps file
```

```
cp /scratch/ria08001/ria08001/configure.wps-good configure.wps
export WRF_DIR=./WRFV4.5.1
./compile # if the compilation is successful, then you will find three executable files
(ungird.exe, geogrid.exe, metgrid.exe)
```

```
cp /scratch/ria08001/ria08001/namelist.wps-anyah namelist.wps
./geogrid.exe
```

```
ln -s ungrid/Variable_Tables/Vtable.GFS-New Vtable
rm -f Vtable
```

```
./link_grib.csh /scratch/ria08001/ria08001/WRF-DATA/GFSOGNL/2000-06/JUNE-21/fnl*
```

```
./ungrid.exe #running ungrid
./metgrid.exe #running metgrid
```

Run WRF

```
cd WRFV4.5.1/run
ln -s ../../WPS_directory/met_em* .
nano namelist.input #modify the file and change the domain that should be the
same as namelist.wps
./real.exe
./wrf.exe # "mpirun -np 8 ./wrf.exe" would be fine
```

Informal Reference

Introduction to Climate Dynamics and Climate Modeling (Goosse H., P.Y. Barriat, W. Lefebvre, M.F. Loutre and V. Zunz): <http://www.climate.be/textbook/>

Optional Resources:

- Numerical Weather and Climate Prediction (by Warner, Cambridge University Press)

- The Climate Modelling Primer (by McGuffie & Henderson-Sellers, Wiley BlackWell).
- Climate System Dynamics and Modelling (by Goosse , Cambridge University Press)

https://www2.mmm.ucar.edu/wrf/users/wrf_users_guide/build/html/compiling.html#netcdf

https://www.youtube.com/watch?v=wzSu-343b-0&list=PLJ_1sjucSSZCTNBRM4D3BfEak-XT7TKJo