

NU-WRF

NASA Unified Weather Research and Forecasting Model

Tutorial – 1 NUWRF simple workflow

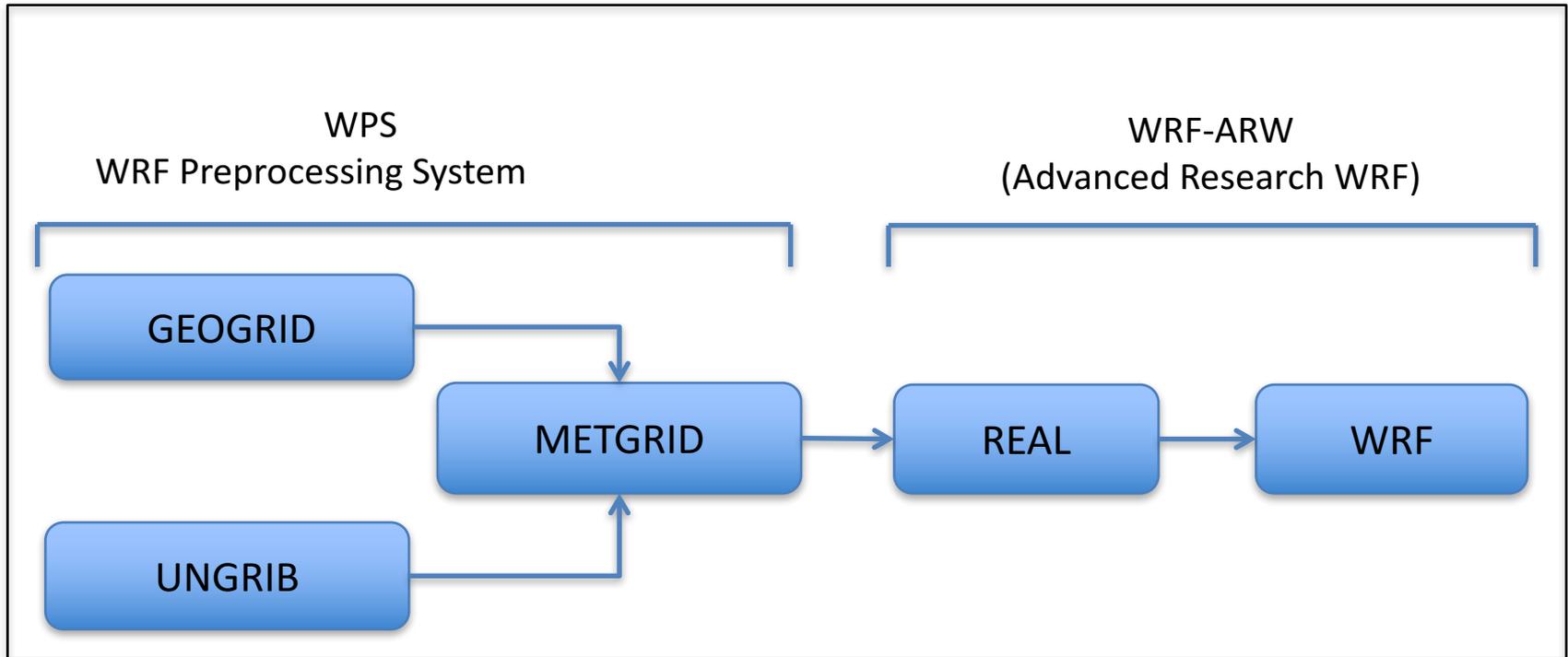
Jossy P. Jacob, Eric Kemp

Jun 5, 2015

NU-WRF userguide: https://nuwrf.gsfc.nasa.gov/sites/default/files/users/nuwrf_userguide.pdf

NU-WRF website: <https://nuwrf.gsfc.nasa.gov>

NU-WRF simple workflow (Similar to WRF ARW)



How to run NU-WRF simple workflow

- Download the code
- Compile
- Model setup
- Run components
- Post processing

Download the code

Tar files are available to NCCS and NAS s0942 group members.

On Discover:

- `/discover/nobackup/projects/nu-wrf/releases/stable/nu-wrf_v7lis7-3.5.1-p2.tar.bz2`
- `/discover/nobackup/projects/nu-wrf/releases/stable/nu-wrf_v7lis7-3.5.1-p2.tgz`

On Pleiades:

- `/nobackupp8/nuwrf/releases/stable/nu-wrf_v7lis7-3.5.1-p2.tar.bz2`
- `/nobackupp8/nuwrf/releases/stable/nu-wrf_v7lis7-3.5.1-p2.tgz`
- To untar the tar ball: `>tar -xvz nu-wrf_v7lis7-3.5.1-p2.tgz`

For developers with proper ssh keys, the code can also be checked out of Subversion:

- `svn co svn+ssh://progressdirect/svn/nu-wrf/code/tags/stable/v7lis7-3.5.1-p2`
- `svn co svn+ssh://progress.nccs.nasa.gov/svn/nu-wrf/code/tags/stable/v7lis7-3.5.1-p2`

Compile NU-WRF

Login to discover-sp3: First login to discover, and then `ssh -YC discover-sp3` (to goto sp3 nodes) or login to Pleiades (default is sp3 nodes):

`cd NUWRFDIR` (path/to/v7lis7-3.5.1-p2)

`./build.sh wps wrf rip > & log.out &` (to compile WPS, WRF and RIP in the background and save log in log.out file.)

Or

`./build.sh all > & log.out &` (to compile WRF and all pre & post processors)

Executables will be created in the directory: `$NUWRFDIR/bin/`

wrf.exe
ungrib.exe
geogrid.exe
real.exe

Model setup on discover

NUWRFDIR: path/to/NUWRF/v7lis7-3.5.1-p2/

>mkdir RUNDIR: Create path/to/NUWRF/RUNDIR

Note: It is preferable to create the RUNDIR outside the NUWRFDIR. This is useful when switching between NU-WRF versions or for updating to new changes.

In **CSH shell**, you can define environment variable using:

>setenv NUWRFDIR path/to/NUWRF/v7lis7-3.5.1-p2/

>setenv RUNDIR path/to/NUWRF/RUNDIR

In **BASH** environment, you can define environment variable using:

>export NUWRFDIR = path/to/NUWRF/v7lis7-3.5.1-p2/

>export RUNDIR = path/to/NUWRF/RUNDIR

Model setup on discover

Configuration files, runscripts, input files needed to run the basic WRF case with NU-WRF is also provided in the directory:

```
/discover/nobackup/projects/nu-wrf/tutorial/WRF-basic/
```

```
>set WRF_basic = /discover/nobackup/projects/nu-wrf/tutorial/WRF-basic/
```

For setting up a new domain and new run the user can use the sample files provided in the NUWRFDIR/scripts/discover/

Copy the following shell scripts from \$NUWRFDIR to your \$RUNDIR:

```
>cp $NUWRFDIR/scripts/discover/config.discover.sh $RUNDIR/.
```

```
>cp $NUWRFDIR/scripts/discover/run*.sh $RUNDIR/.
```

```
>cp $NUWRFDIR/defaults/namelist.wps $RUNDIR/.
```

```
>cp $NUWRFDIR/defaults/namelist.input $RUNDIR/.
```

Two files - **namelist.wps** and **namelist.input** contains information for domain boundaries, date/time for the test run, and domain grid, nesting and options. If user is testing the case in WRF-basic directory, (domain, dates) then copy them from WRF-basic directory.

```
>cp $WRF-basic/run*.sh $RUNDIR/.
```

```
>cp $WRF-basic/namelist.wps $RUNDIR/.
```

```
>cp $WRF-basic/namelist.input $RUNDIR/.
```

Copy the GFS grib atmospheric data for initial conditions from \$WRF_basic/grib_input/ to \$RUNDIR

```
cp $WRF_basic/grib_data/fnl* $RUNDIR/.
```

Model setup on discover (contd...)

Configure file:

Edit config.discover.sh to change the following definitions to the user directory:

NUWRFDIR=/discover/nobackup/emkemp/NUWRF/svn/trunk

WORKDIR=/discover/nobackup/emkemp/NUWRF/case13_slurm

Change to:

NUWRFDIR=/discover/nobackup/username/NUWRFDIR

WORKDIR=/discover/nobackup/username/RUNDIR

Make sure that the user has access to this directory:

LISDIR=/discover/nobackup/projects/lis

Run script general changes:

Edit all the runscripts (`run*` files) for account information changes:

```
#SBATCH --account s0942
```

(Change s0942 to your discover run account)

```
#SBATCH --ntasks=16 --constraint=hasw
```

(Change if you want to change number of nodes, `hasw` – to run on haswell nodes)

```
#SBATCH --qos=high (Change the status high to general depend on user privileges)
```

```
#Substitute your e-mail here
```

```
##SBATCH --mail-user=user@nasa.gov (User must partially uncomment lines
```

```
involving e-mails, remove first #)
```

Run components - GEOGRID

>cd \$RUNDIR

- User should edit run script `run_geogrid.discover.sh` to change the links to `GEOGRID.TBL` depend on the run. Note: There are multiple `GEOGRID.TBL` files to support multiple dynamical cores in WRF. `GEOGRID.TBL.ARW` must be used for ARW. `GEOGRID.TBL.NMM` must be used for NMM.
- A sample `namelist.wps` file is available in the directory: `$NUWRFDIR/defaults/namelist.wps`. Copy this file to your `$RUNDIR` and make changes in `namelist.wps` if you need domain changes. User can refer to ARW online tutorial / web for more details on `namelist.wps` options: http://www2.mmm.ucar.edu/wrf/users/tutorial/201501/WPS_RUN.pdf
- Make sure that you have access to the directory: `'/discover/nobackup/projects/nu-wrf/cases/geog'`

Submit the job with this command:

>qsub run_geogrid.discover.sh

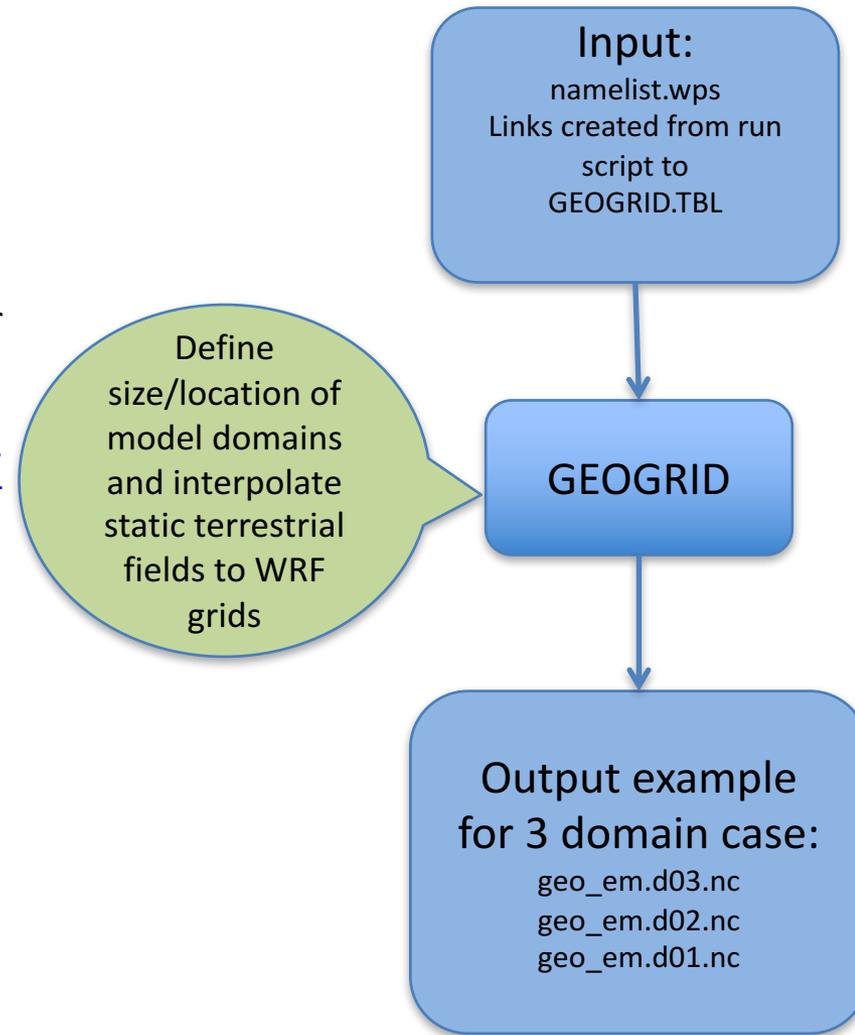
Or

>sbatch run_geogrid.discover.sh

Check this file for successful run completion:

`geogrid.slurm.out`

`geogrid.log.<node>` will also be created for tracking run failures/ debugging.



Run components –UNGRIB

```
>cd RUNDIR
```

Copy the ungrib files to your RUNDIR, example:

```
>cp $WRF_basic/fnl* $RUNDIR/.
```

Make sure you have `namelist.wps` file in your `$RUNDIR`.

Edit run script `run_ungrib.discover.sh`

- User should change the link to **Vtable** to the correct Vtable files for a specific run depend on what input files are used. Some Vtables are provided with WPS in the `$NUWRFDIR/WPS/ungrib/Variable_Tables` directory- E.g., `Vtable.GFS`, `Vtable.SST`, `Vtable.ECMWF`

```
In -fs $NUWRFDIR/WPS/ungrib/Variable_Tables/Vtable.GFS Vtable
```

- User may need to change the grib file prefix depending on their data source. Example:

```
./link_grib.csh nam.* || exit 1
```

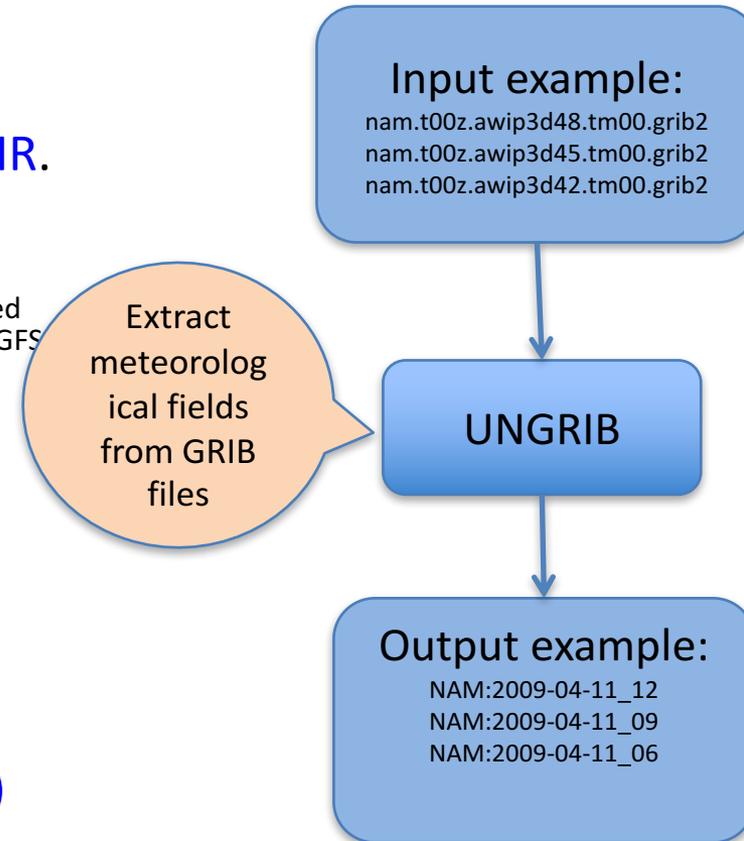
Submit the job with this command:

```
>qsub run_ungrib.discover.sh (or sbatch can be used)
```

Check this file for successful run completion:

`ungrib.slurm.out`

`ungrib.log` will also be created for tracking run failures/
debugging.



Run components –METGRID

>cd RUNDIR

Edit run script run_metgrid.discover.sh

- User should change the link to [METGRID.TBL](#). There are multiple METGRID.TBL files to support multiple dynamical cores in WRF. For example: METGRID.TBL.ARW should be used for ARW, METGRID.TBL.NMM should be used for NMM.

```
In -fs $NUWRFDIR/WPS/metgrid/METGRID.TBL.ARW metgrid/METGRID.TBL
```

Make sure you have [namelist.wps](#) file in your [\\$RUNDIR](#).

- Metgrid block in the namelist.wps file will look like this.

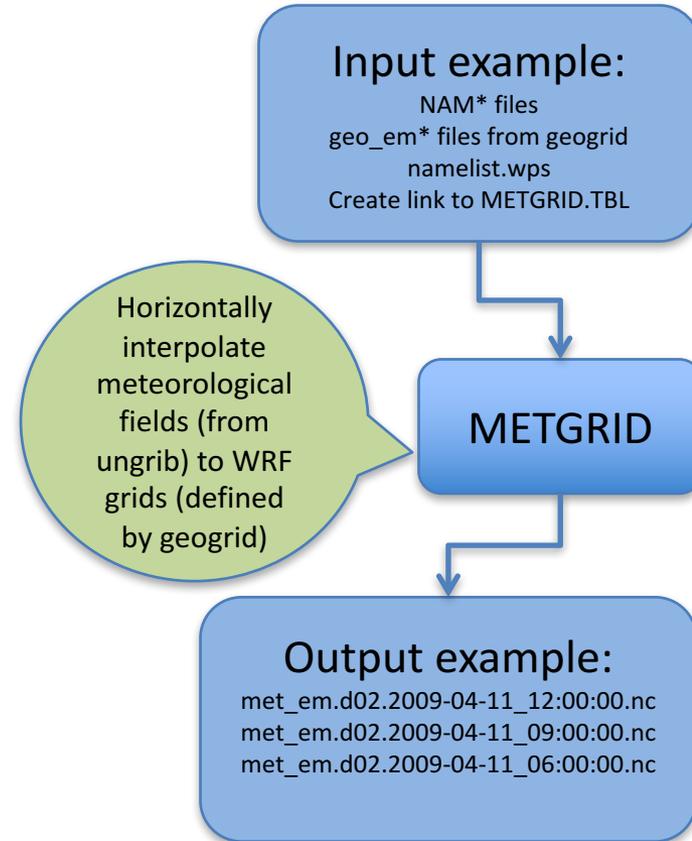
```
&metgrid  
fg_name = 'FNL',  
io_form_metgrid = 2,  
/  

```

Submit the job with this command:

```
>qsub run_metgrid.discover.sh (or sbatch can be used)
```

Check this file for run completion: metgrid.slurm.out
metgrid.log.<node> also will also be created for debugging purposes.



Run components – REAL

>cd RUNDIR

Edit run script run_real.discover.sh

Make sure you have `namelist.input` file in your `$RUNDIR`. A sample `namelist.input` file is available in

`$NUWRFDIR/defaults/namelist.input`.

Or in `$WRF_basic/namelist.input`

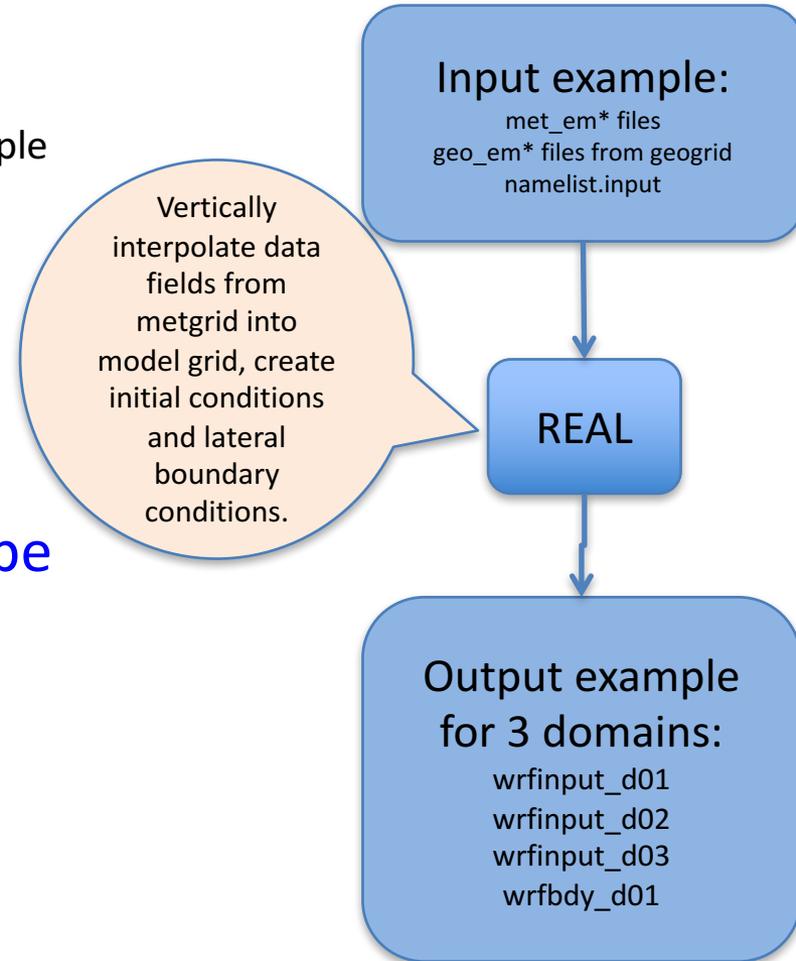
Submit the job with this command:

>qsub run_real.discover.sh (or sbatch can be used)

Check this file for run completion:

`real.slurm.out`

`real.rsl.out.<node>` and `real.rsl.error.<node>` also will also be created.



Run components – WRF

```
>cd RUNDIR
```

```
Edit run script run_wrf.discover.sh
```

The runscripts will create links for

LS_PARAMETERS

MET_FORCING and many other input files.

Edit namelist.input file if the user need any option changes.

Refer [userguide](#) for namelist.input options for different workflows.

Sample [namelist.input](#) is available in [NUWRFDIR/defaults/](#) directory.

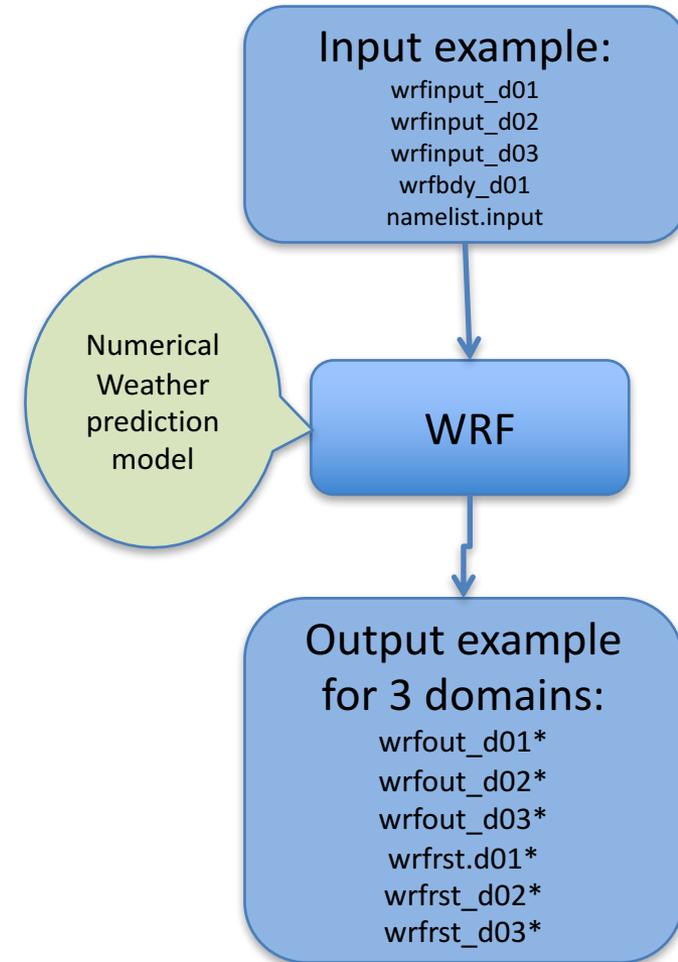
Submit the job with this command:

```
>qsub run_wrf.discover.sh (or sbatch can be used)
```

Check this file for run completion: [wrf.slurm.out](#)

[wrf.rsl.out.<node>](#) and [wrf.rsl.error.<node>](#) also

will also be created.



POST PROCESSING

- NCVIEW

WRF output files (NETCDF4) can be viewed using ncvview.

On discover:

```
>/usr/local/other/SLES11/ncview/2.1.1/bin/ncview filename
```

- RIP

```
>cd $RUNDIR/
```

```
>qsub run_rip.discover.sh
```

Other software packages can be used are G_SDSU, RIP4, ARWPOST, UPP, MET, and LVT.

For more information on post processing packages available with WRF, user can refer to WRF userguide: <http://www2.mmm.ucar.edu/wrf/users/> and WRF homepage: <http://www.wrf-model.org/index.php>