

HOW TO RUN WPS & WRF

Kelly Werner, NCAR/MMM



This material is based upon work supported by the National Center for Atmospheric Research, which is a major facility sponsored by the National Science Foundation under Cooperative Agreement No. 1852977.

PRESENTATION OUTLINE

WPS/WRF Flow

Running WPS

Troubleshooting WPS Errors

Running WRF

WRF Log Files

Troubleshooting WRF Errors

PRESENTATION OUTLINE

WPS/WRF Flow

Running WPS

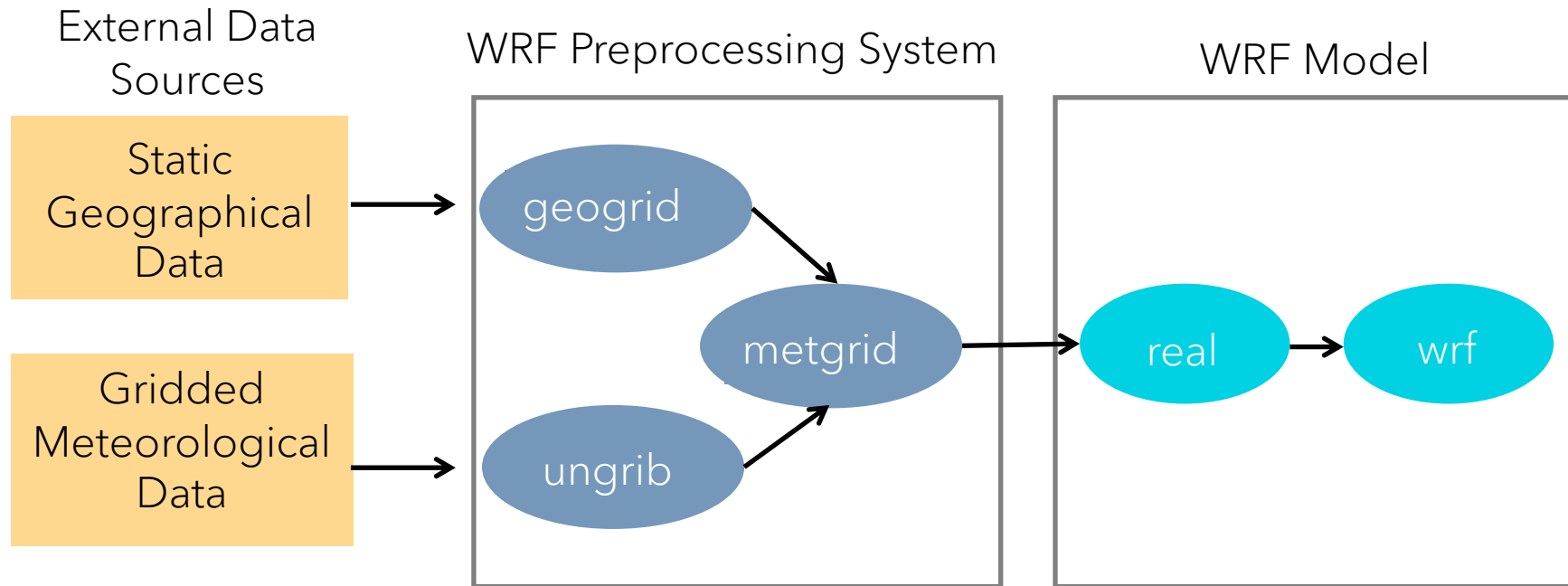
Troubleshooting WPS Errors

Running WRF

WRF Log Files

Troubleshooting WRF Errors

WPS AND WRF FLOWCHART: REAL-DATA CASE



PRESENTATION OUTLINE

WPS/WRF Flow

Running WPS

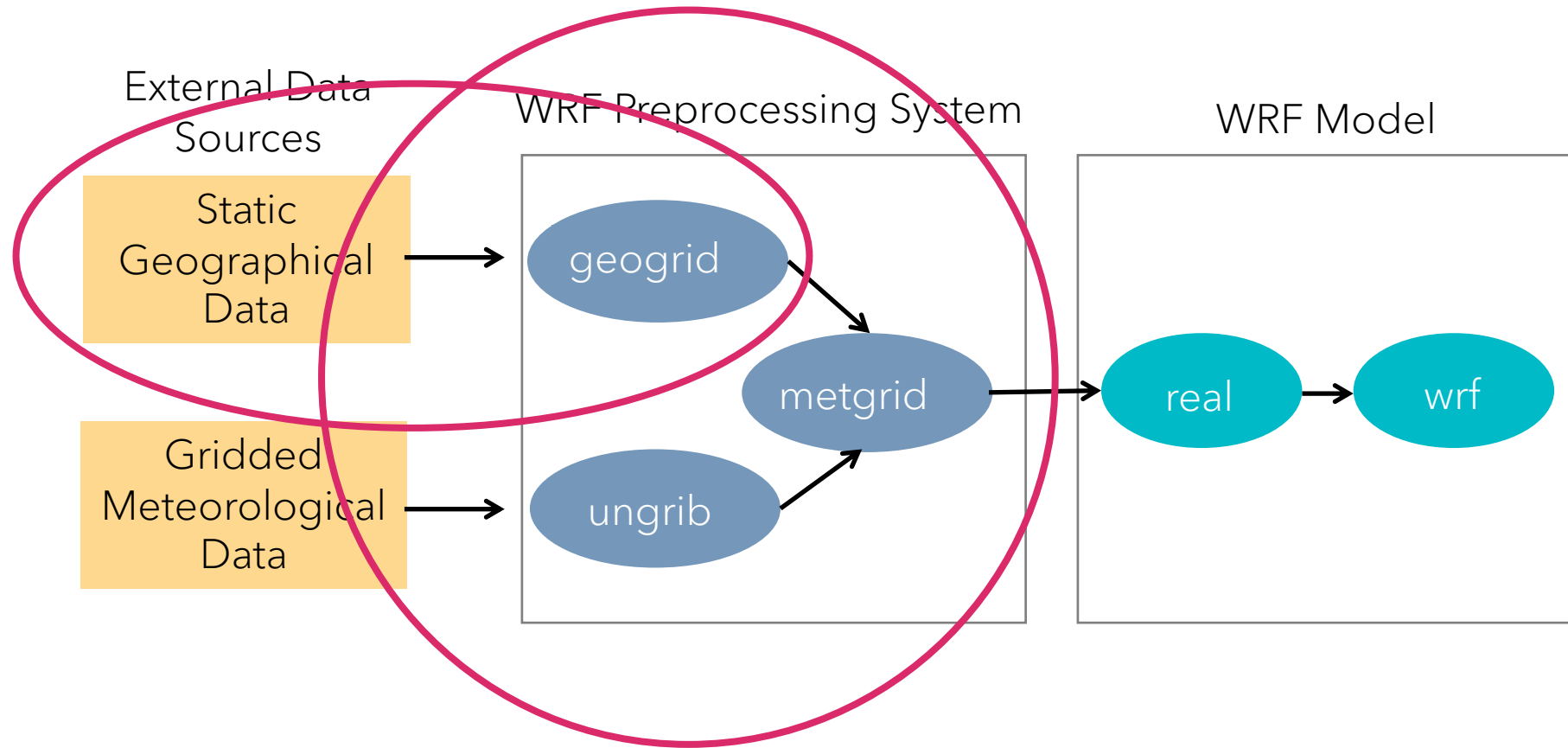
Troubleshooting WPS Errors

Running WRF

WRF Log Files

Troubleshooting WRF Errors

RUNNING WPS: GEOGRID



MODIFYING NAMELISTS

What is a 'namelist'?

- A Fortran namelist is a list of user-specified runtime options the code will read-in during execution.

- A namelist file may contain multiple namelist records

```
&namelist : record start  
/          : record end
```

- The format is very specific, so edit with care. As a general rule:

- Settings for multiple columns: domain dependent
- Only a single column setting: value valid for all domains

1. Change directories ('cd') to make sure you are in the appropriate running directory.

```
> cd WPS
```

2. Edit the namelist.wps file

```
e_we      = 150, 220,  
e_sn      = 130, 214,  
dx        = 15000,  
dy        = 15000,
```

GEOGRID: NAMELIST SET-UP

Edit the namelist.wps file



For geogrid, only
the &share and
&geogrid
namelist records
need to be edited

&share

```
wrf_core = 'ARW',  
max_dom = 2,
```

/

&geogrid

```
parent_id           = 1,  1,  
parent_grid_ratio   = 1,  3,  
i_parent_start       = 1, 53,  
j_parent_start       = 1, 25,  
e_we                 = 150, 220,  
e_sn                 = 130, 214,  
geog_data_res        = 'default', 'default',  
dx                   = 15000,  
dy                   = 15000,  
map_proj              = 'lambert',  
ref_lat               = 33.00,  
ref_lon               = -79.00,  
truelat1              = 30.0,  
truelat2              = 60.0,  
stand_lon             = -79.0,  
geog_data_path        = '/data/static/WPS_GEOG/'
```

/

GEOGRID: NAMELIST SET-UP

Which WRF core?
- for ARW, set to 'ARW'

```
&share  
  wrf_core = 'ARW',  
  max_dom = 1,  
/
```

Total number of model domains,
including nests

GEOGRID: NAMELIST SET-UP

&geogrid

```
parent_id = 1, 1,  
parent_grid_ratio = 1, 3,  
i_parent_start = 1, 20,  
j_parent_start = 1, 17,
```

```
e_we = 220, 181,  
e_sn = 175, 181,  
dx = 15000,  
dy = 15000,
```

```
geog_data_res = 'default', 'default',  
geog_data_path = '/data/static/geog/'
```

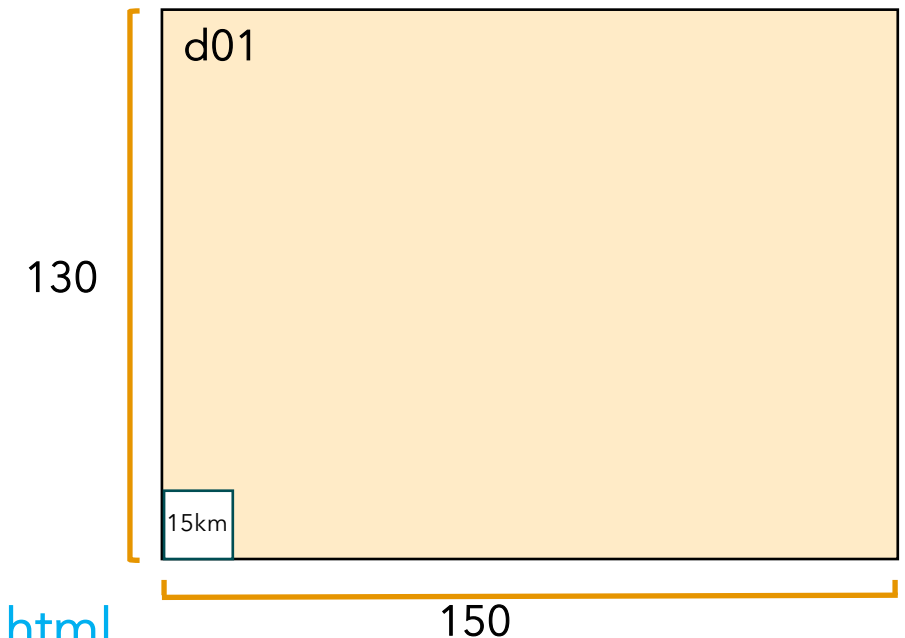
/

For Nesting

Leave all set to '1' for a single domain case

Domain Size

- How many grid points in the W-E and S-N directions?
- What is the grid spacing (resolution)?



GEOGRID: NAMELIST SET-UP

&geogrid

```
parent_id = 1, 1,  
parent_grid_ratio = 1, 3,  
i_parent_start = 1, 20,  
j_parent_start = 1, 17,
```

```
e_we = 220, 181,  
e_sn = 175, 181,  
dx = 15000,  
dy = 15000,
```

```
geog_data_res = 'default', 'default',  
geog_data_path = '/data/static/geog/'
```

/

Static Data

- Which static source data to use
 - Default: MODIS 30s
 - See geogrid/GEOGRID.TBL for other options
- Path to static data directories

GEOGRID: NAMELIST SET-UP

&geogrid

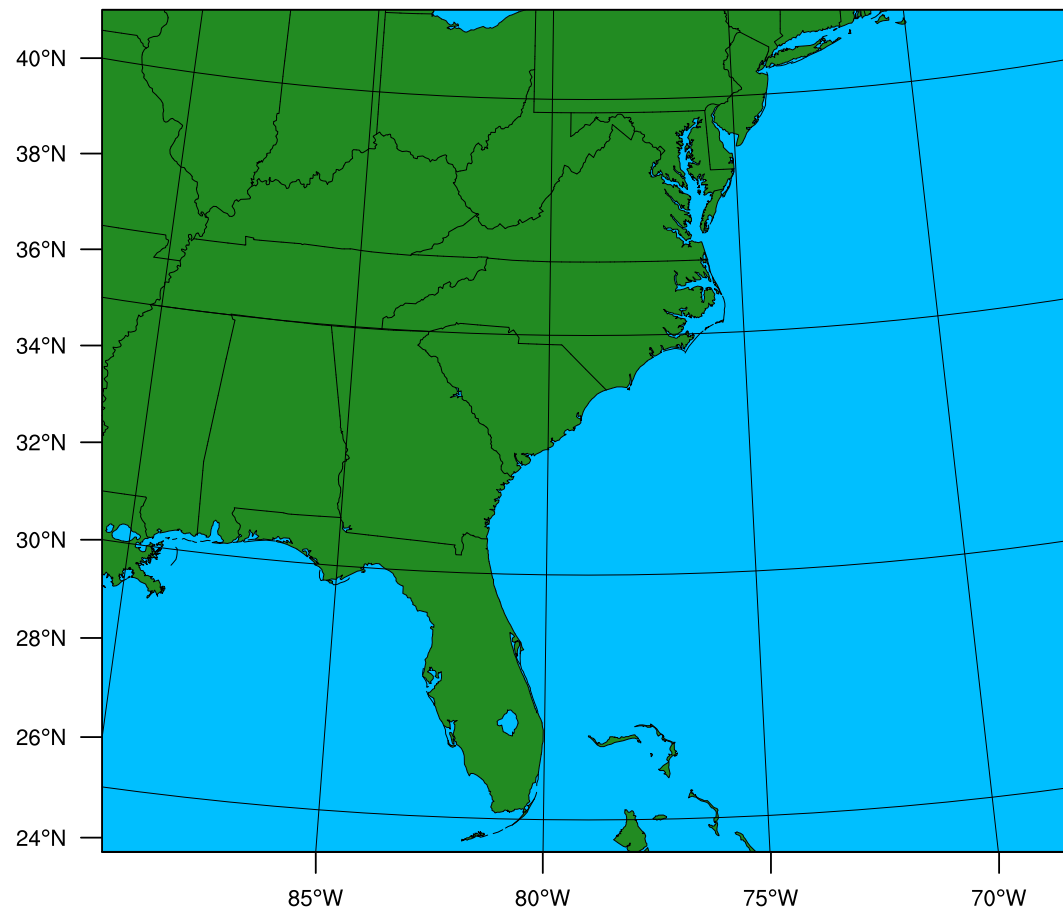
```
map_proj= 'lambert',  
ref_lat   = 37.0,  
ref_lon   = -97.0,  
truelat1  = 45.0,  
truelat2  = 30.0,  
stand_lon = -97.0,
```

/

Map Projection and Global Location

- What projection to use
- What are the parameters of the projection?

WPS Domain Configuration



GEOGRID:
DOMAIN

GEOGRID: STATIC DATA

https://www2.mmm.ucar.edu/wrf/users/download/get_sources_wps_geog.html

THIS IS THE ONE
YOU WANT

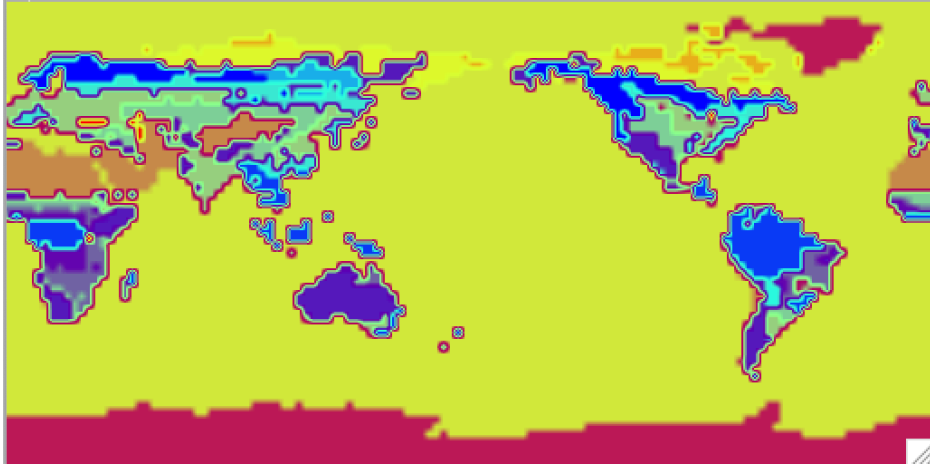
WRF Preprocessing System (WPS) Geographical Input Data Mandatory Fields Downloads		
Click on file (link) below to download individual data files	Download Highest Resolution of each Mandatory Field	Download Lowest Resolution of Each Mandatory Field
	*Note: ~29G Uncompressed (2.6G Compressed)	
albedo modis	x	x
greenfrac fpar modis	x	x
greenfrac fpar modis 5m		x
lai modis 10m	x	x
lai modis 30s	x	
maxsnowalb modis	x	x

~ 29 GB when
uncompressed

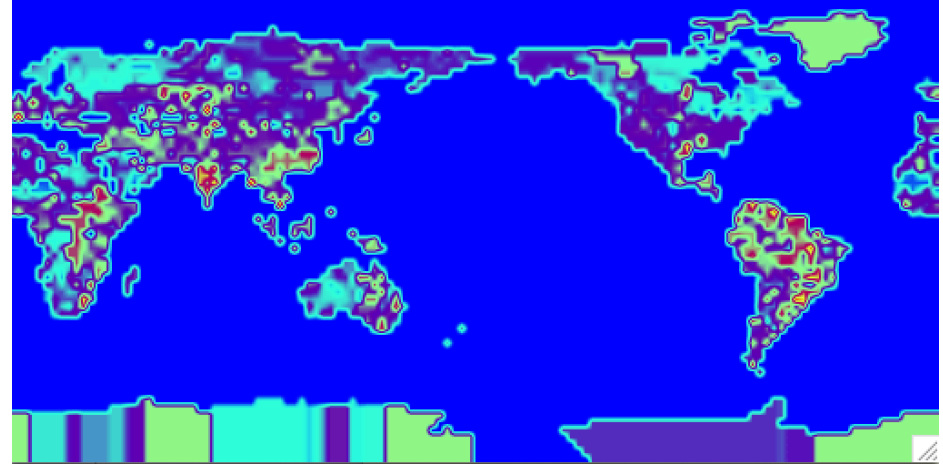
GEOGRID: STATIC DATA

You now have global static datasets available.

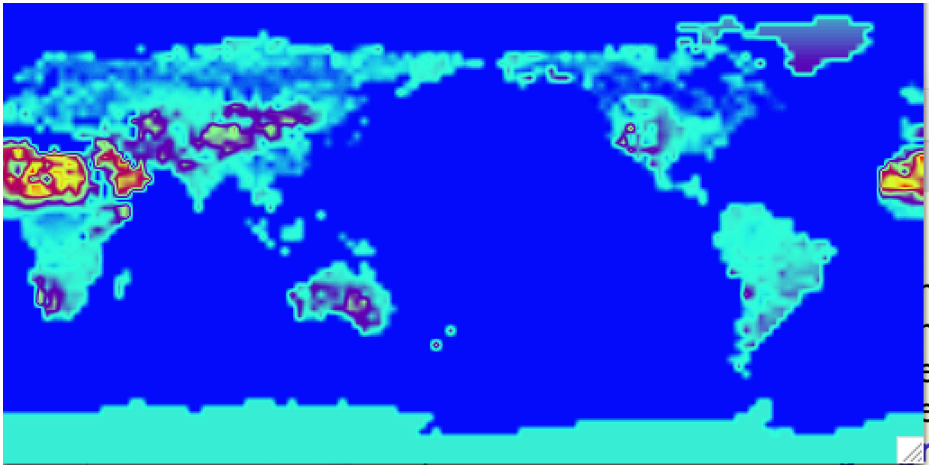
Landuse



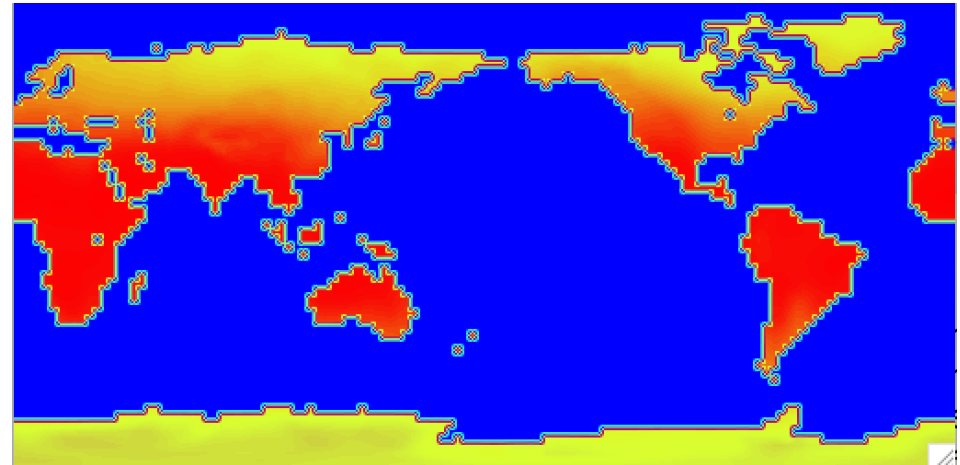
Clay
Fraction



Albedo



Soil Temp



RUNNING GEOGRID

Run geogrid:

```
> ./geogrid.exe
```

Processing messages are written

- To the geogrid.log file
- To the screen

```

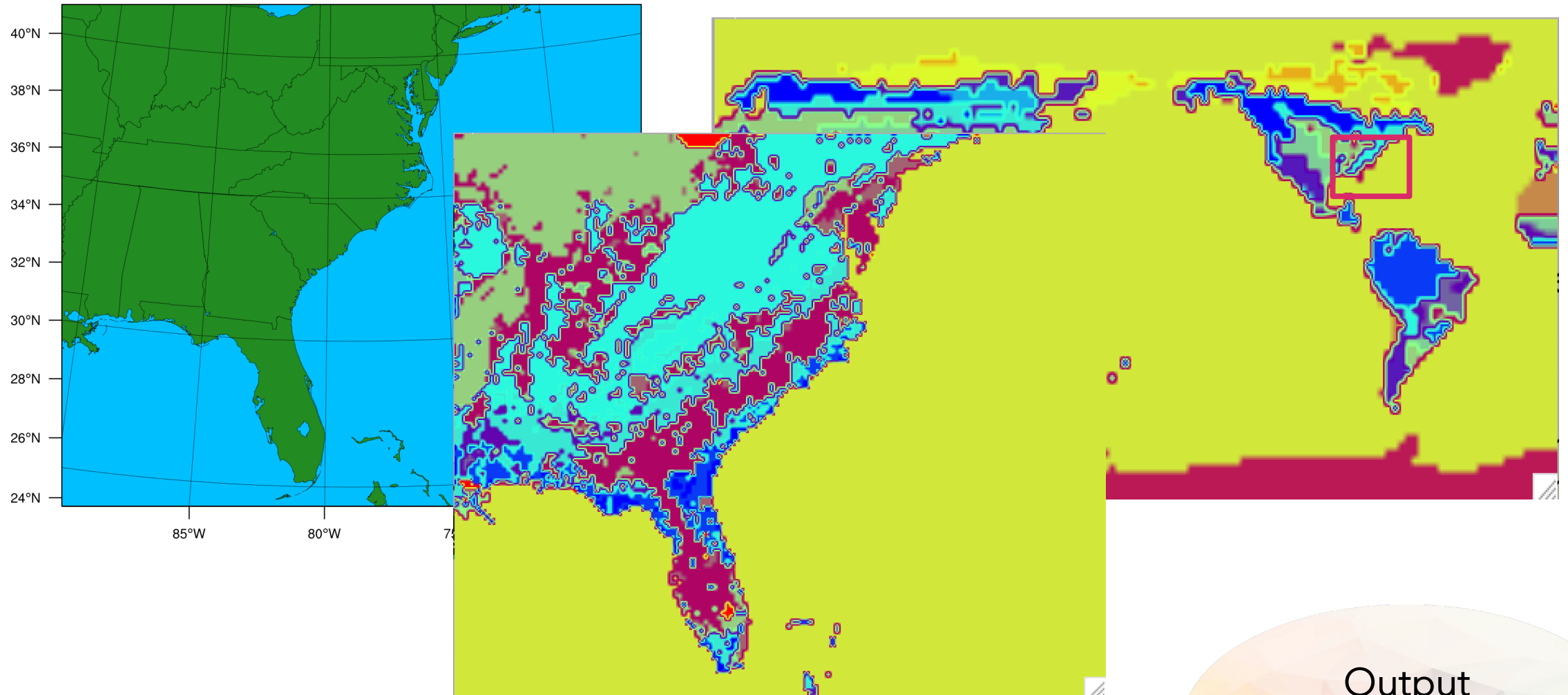
Parsed 11 entries in GEOGRID.TBL
Processing domain 1 of 2
    Processing XLAT and XLONG
    Processing MAPFAC
    Processing F and E
    Processing ROTANG
    Processing LANDUSEF
    Calculating landmask from LANDUSEF
    Processing HGT M

```

...

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

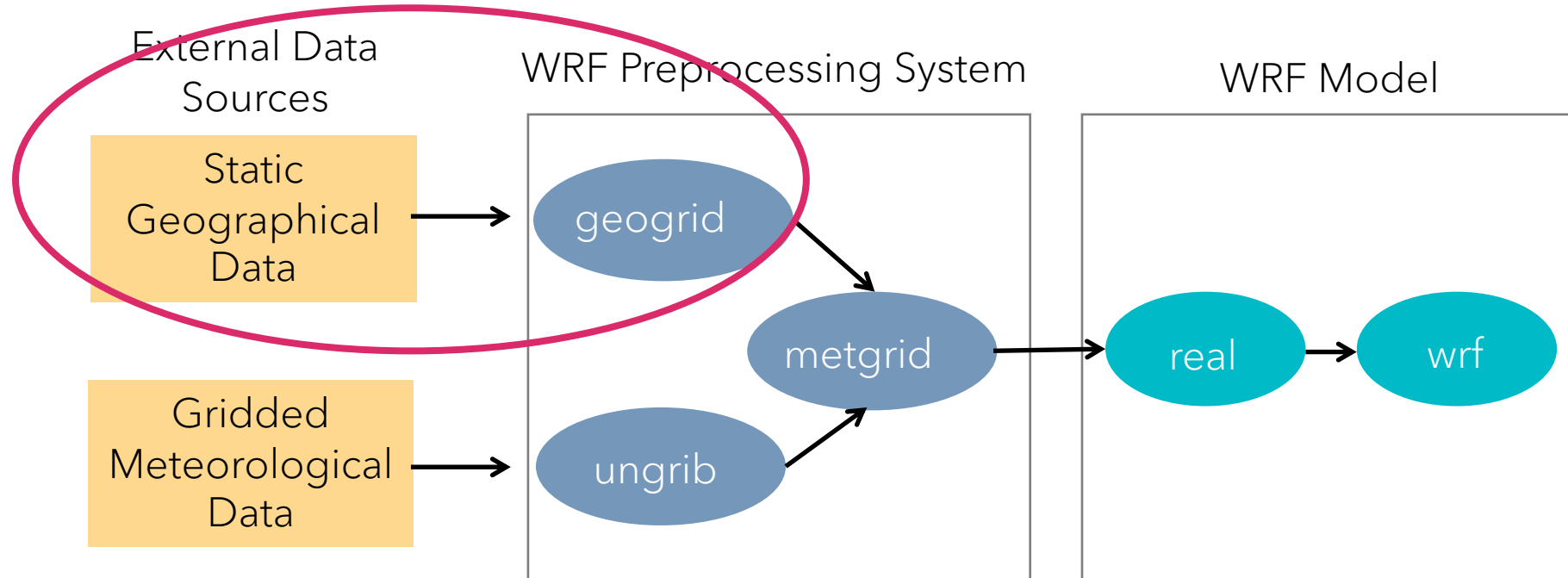

WPS Domain Configuration



Output
geo_em.d01.nc

GEOGRID'S OUTPUT

RUNNING WPS: UNGRIB



UNGRIB: OBTAINING INPUT DATA



NCEP GFS 0.25 Degree Global Forecast Grids Historical Archive

ds084.1 | DOI: 10.5065/D65D8PWK ☆

[ASK A QUESTION >](#)

DESCRIPTION

DATA ACCESS

CITATION

DOCUMENTATION

SOFTWARE

METRICS

ABSTRACT: The NCEP operational Global Forecast System analysis and forecast grids are on a 0.25 by 0.25 global latitude longitude grid. Grids include analysis and forecast time steps at a 3 hourly interval from 0 to 240, and a 12 hourly interval from 240 to 384. Model forecast runs occur at 00, 06, 12, and 18 UTC daily. For real-time data access please use the [NCEP data server](#).

TEMPORAL RANGE: 2015-01-15 00:00 +0000 to 2023-07-31 12:00 +0000 (Entire dataset)
PERIOD DETAILS BY DATASET PRODUCT ▼

UPDATES: Daily

VARIABLES:

Air Temperature	Albedo	Cloud Frequency	Cloud Liquid Water/Ice
Dew Point Temperature	Evaporation	Geopotential Height	Gravity Wave
Heat Flux	Humidity	Hydrostatic Pressure	Ice Depth/Thickness

`gfs.0p25.2019090412.f000.grib2`
`gfs.0p25.2019090412.f003.grib2`
`gfs.0p25.2019090412.f006.grib2`
`gfs.0p25.2019090412.f009.grib2`
`gfs.0p25.2019090412.f012.grib2`

Obtain files to span the entire time of your simulation

UNGRIB: NAMELIST SET-UP

```
gfs.0p25.2019090412.f000.grib2  
gfs.0p25.2019090412.f003.grib2  
gfs.0p25.2019090412.f006.grib2  
gfs.0p25.2019090412.f009.grib2  
gfs.0p25.2019090412.f012.grib2
```

&share

```
wrf_core = 'ARW',  
max_dom = 1,
```

```
start_date = '2019-09-04_12:00:00',  
end_date   = '2019-09-05_00:00:00',
```

```
interval_seconds = 10800
```

```
/
```

Data Time Range

Between which times should
ungrib process GRIB data?

Data Frequency

How many seconds between output files for ungrib?
- E.g., 10800 s = 3 hrs

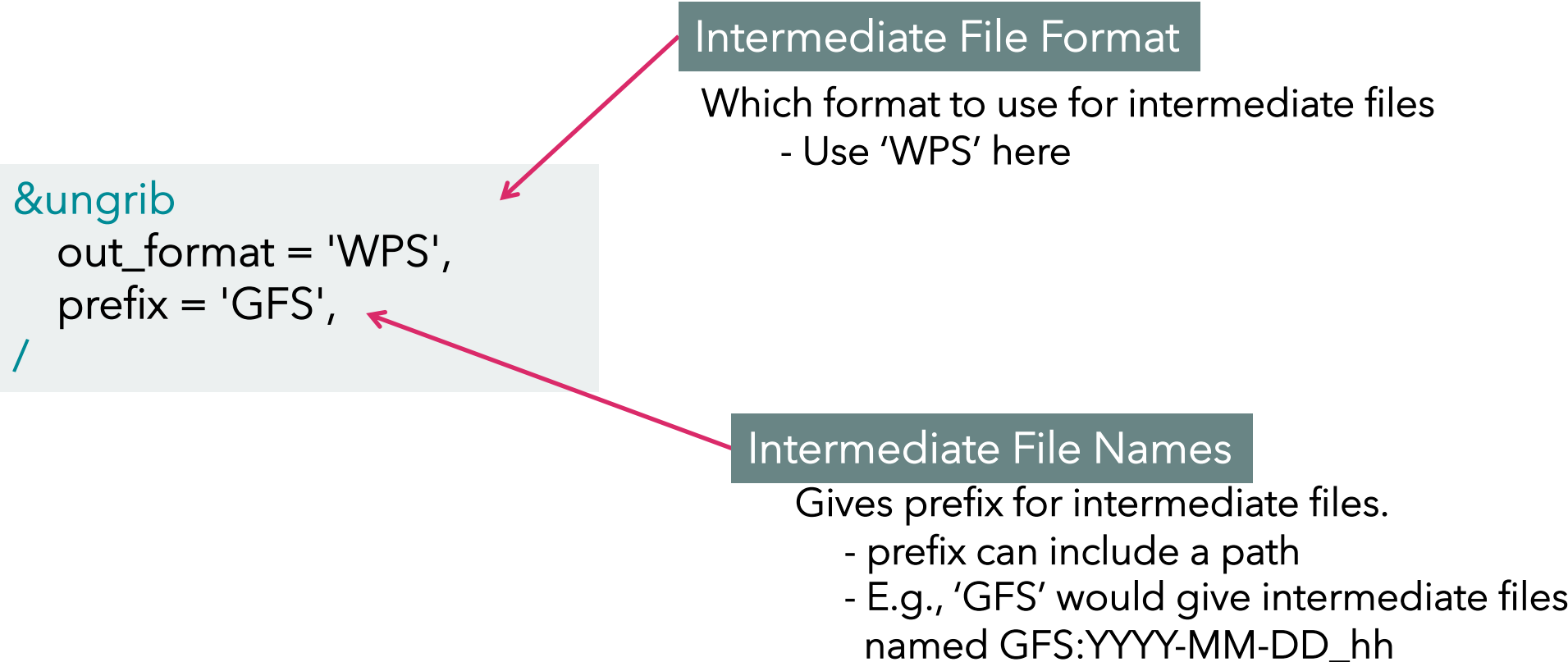
For ungrib, only
the &share
and &ungrib
namelists need
to be edited

UNGRIB: NAMELIST SET-UP

Intermediate File Format

Which format to use for intermediate files
- Use 'WPS' here

```
&ungrib  
  out_format = 'WPS',  
  prefix = 'GFS',  
/
```



Intermediate File Names

Gives prefix for intermediate files.
- prefix can include a path
- E.g., 'GFS' would give intermediate files
named GFS:YYYY-MM-DD_hh

UNGRIB: LINK-IN INPUT DATA

Link the first-guess meteorological and surface input data to the WPS directory

Use the 'link_grib.csh' script provided in the WPS directory

```
> ./link_grib.csh path-to-your-grib-files/gribfile-prefix  
> ls GRIBFILE*
```

```
GRIBFILE.AAA -> ../data/gfs.0p25.2019090412.f000.grib2  
GRIBFILE.AAB -> ../data/gfs.0p25.2019090412.f003.grib2  
GRIBFILE.AAC -> ../data/gfs.0p25.2019090412.f006.grib2  
GRIBFILE.AAD -> ../data/gfs.0p25.2019090412.f009.grib2  
GRIBFILE.AAE -> ../data/gfs.0p25.2019090412.f012.grib2
```

UNGRI B: LINK TO THE VTABLE

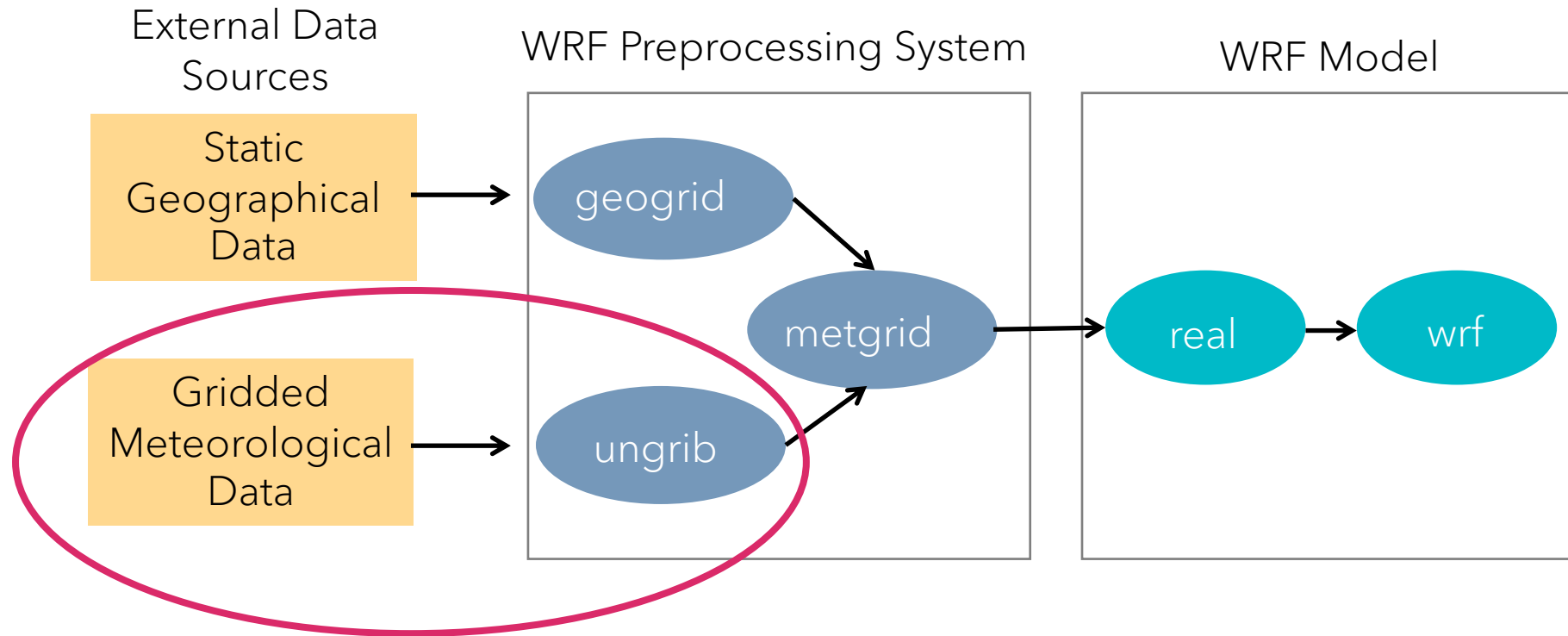
*Link the correct Vtable to the file
name "Vtable" in the WPS directory*

- Several Vtables are provided with WPS in the WPS/ungrib/Variable_Tables directory.
- Ungrib expects to find a file named "Vtable" in the WPS directory.

```
> ln -sf ungrib/Variable_Tables/Vtable.GFS Vtable  
> ls Vtable
```

```
Vtable -> ungrib/Variable_Tables/Vtable.GFS
```


RUNNING WPS: METGRID



METGRID: NAMELIST SET-UP

&share

```
wrf_core = 'ARW',  
max_dom = 1,  
  
start_date = '2019-09-04_12:00:00', '2019-09-04_12:00:00',  
end_date   = '2019-09-05_00:00:00', '2019-09-05_00:00:00',  
  
interval_seconds = 10800  
io_form_geogrid = 2,  
/  

```

Data Time Range

Time range to process for each domain.

Intermediate File Prefixes

Prefix(es) of intermediate files
* This should match the prefix
given in ungrib

&metgrid

```
fg_name = 'GFS',  
/  

```



For metgrid,
only the &share
and &metgrid
namelists need
to be edited

Run metgrid:

```
> ./metgrid.exe
```

Processing messages are written

- To the metgrid.log file
- To the screen

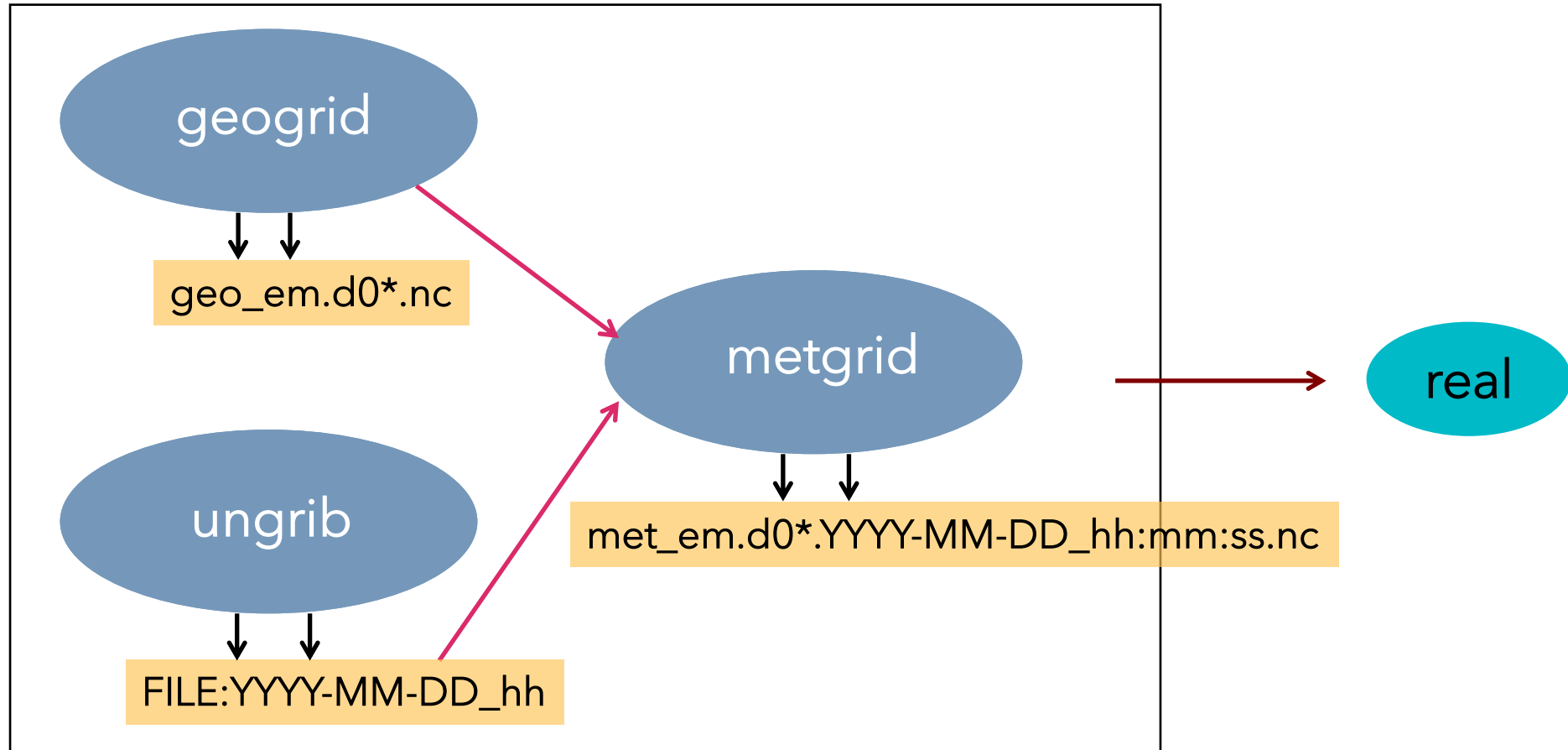
Output

met_em.d01.2019-09-04_12:00:00.nc
met_em.d01.2019-09-04_15:00:00.nc
met_em.d01.2019-09-04_18:00:00.nc
met_em.d01.2019-09-04_21:00:00.nc
met_em.d01.2019-09-05_00:00:00.nc

```
Processing domain 1 of 1
Processing 2012-01-27_00
FILE
Processing 2012-01-27_06
FILE
Processing 2012-01-27_12
FILE
Processing 2012-01-27_18
FILE
Processing 2012-01-28_00
FILE
```

```
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
!      Successful completion of metgrid.      !
!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!!
```

THE WPS PROCESS



PRESENTATION OUTLINE

WPS/WRF Flow

Running WPS

Troubleshooting WPS Errors

Running WRF

WRF Log Files

Troubleshooting WRF Errors

COMMON WPS ERRORS

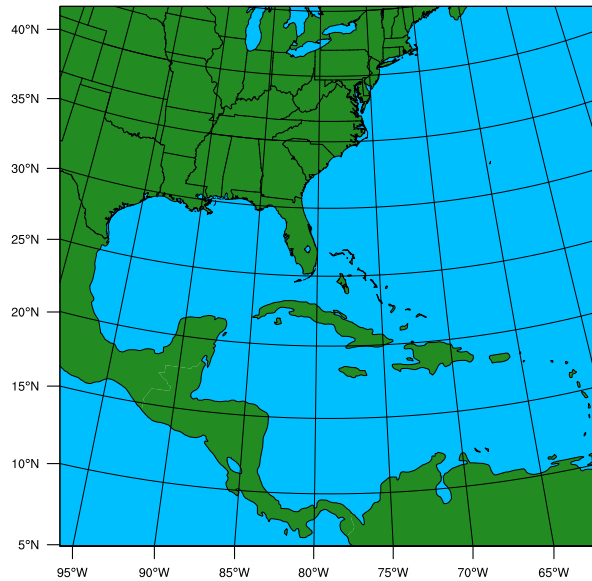
```
WRF_DEBUG: Warning DIM
4 , NAME num_metgrid_levels
REDIFINED by var GHT 27
26 in wrf_io.F90 line 2347
ERROR: Error in ext_pkg_write_field
```

- Ensure that all 3D meteorological fields have surface level data
- Try setting 'debug_level=1000' in the &share namelist record, then check 'metgrid.log' for a table showing which fields are available at each level.

COMMON WPS ERRORS

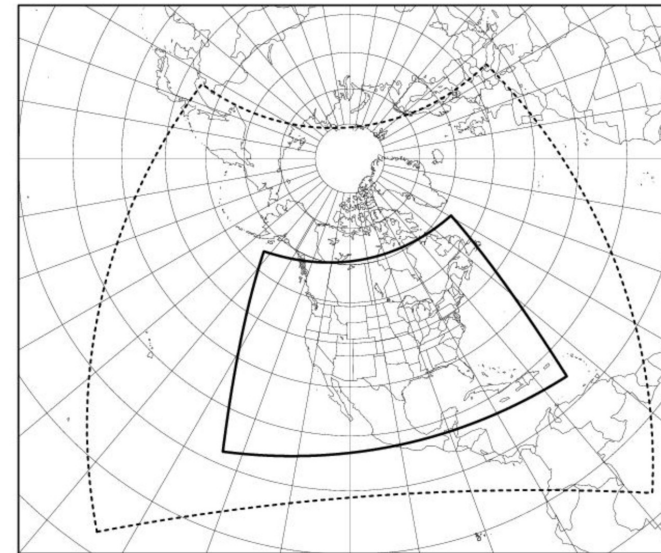
WARNING: Field PRES has missing values at level 200100 at (i,j)=(1,1)
WARNING: Field GHT has missing values at level 200100 at (i,j)=(1,1)
WARNING: Field SOILHGT has missing values at level 200100 at (i,j)=(1,1)
WARNING: Field PSFC has missing values at level 200100 at (i,j)=(1,1)
WARNING: Field PMSL has missing values at level 201300 at (i,j)=(1,1)
ERROR: Missing values encountered in interpolated fields. Stopping.

WPS Domain Configuration



Model
Domain

DASHED = EXPANDED NAM-12 ; SOLID = GRID 211,212,215,218



NAM
Coverage

- When using a regional dataset (e.g., NAM), ensure the model domain is completely covered by the data

PRESENTATION OUTLINE

WPS/WRF Flow

Running WPS

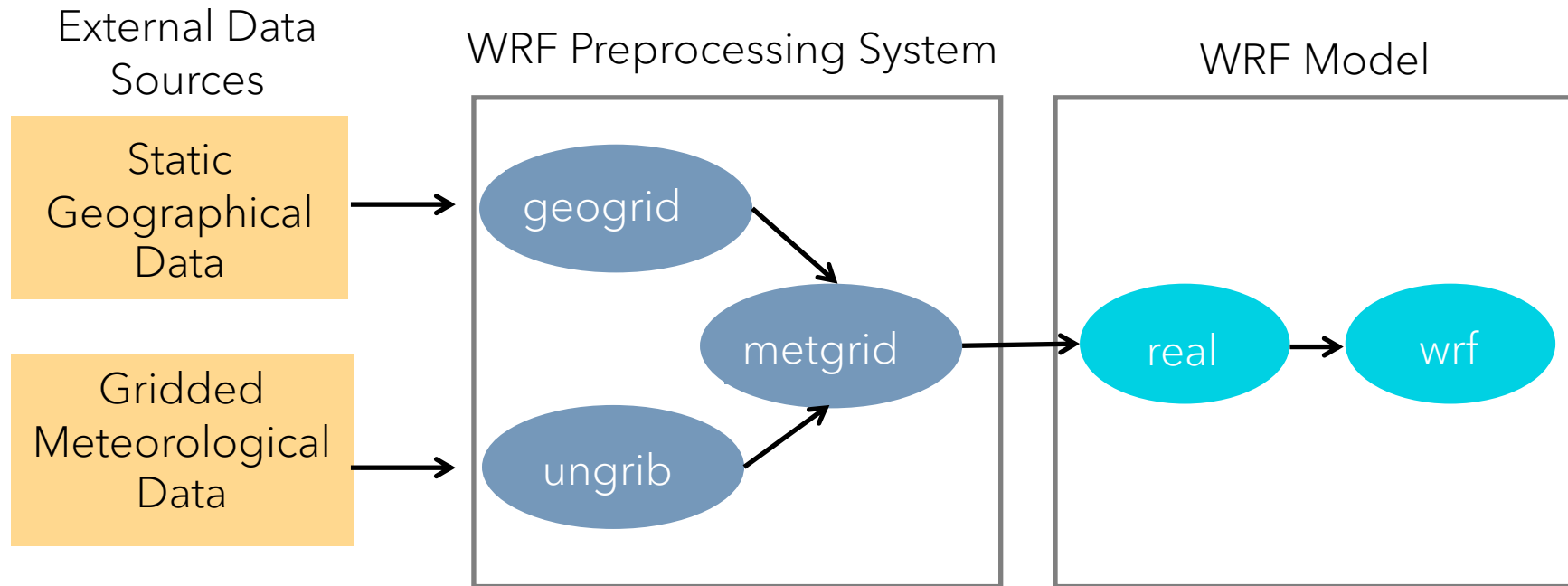
Troubleshooting WPS Errors

Running WRF

WRF Log Files

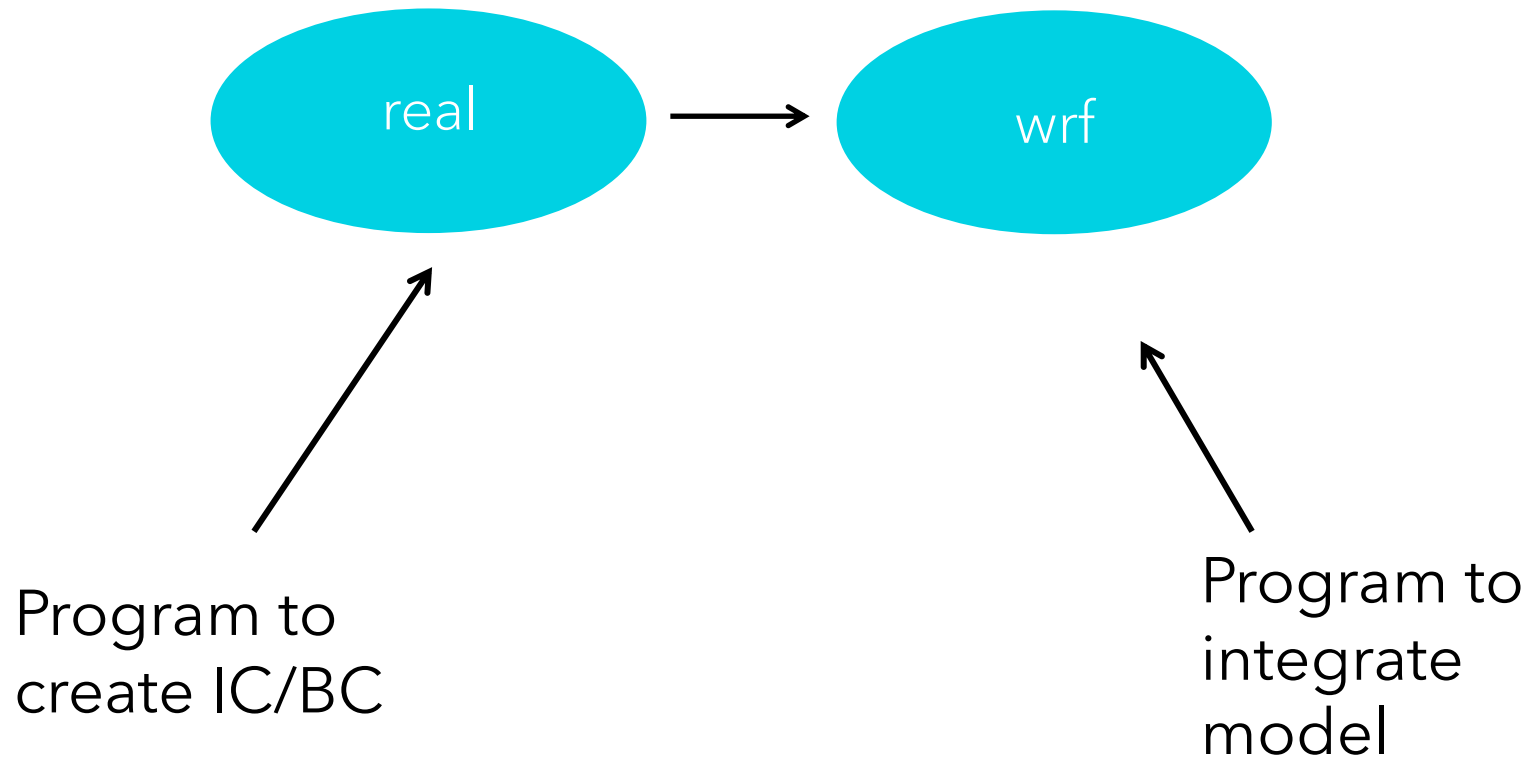
Troubleshooting WRF Errors

WPS AND WRF FLOWCHART: REAL-DATA CASE



WRF FLOWCHART: REAL-DATA CASE

WRF Model



RUNNING WRF FOR A REAL-DATA CASE

WRF/TEST/EM_REAL DIRECTORY

Change directories ('cd') to make sure you are in the appropriate running directory.

```
> cd wrf/test/em_real
```

```
LANDUSE.TBL -> ../../run/LANDUSE.TBL
GENPARM.TBL -> ../../run/GENPARM.TBL
SOILPARM.TBL -> ../../run/SOILPARM.TBL
VEGPARM.TBL -> ../../run/VEGPARM.TBL
URBPARM.TBL -> ../../run/URBPARM.TBL
RRTM_DATA -> ../../run/RRTM_DATA
RRTMG_SW_DATA -> ../../run/RRTMG_SW_DATA
RRTMG_LW_DATA -> ../../run/RRTMG_LW_DATA
ozone.formatted -> ../../run/ozone.formatted
ozone_lat.formatted -> ../../run/ozone_lat.formatted
ozone_plev.formatted -> ../../run/ozone_plev.formatted
```

...

```
namelist.input - editing required
```

```
real.exe -> ../../main/real.exe
```

```
wrf.exe -> ../../main/wrf.exe
```

```
ndown.exe -> ../../main/ndown.exe
```

.... (many more)

Model physics data files:

- used to either initialize physics variables, or make physics computation faster

* Some of these files are text files, hence editable

Executables

COPY/LINK METGRID OUTPUT FILE TO WRF RUNNING DIRECTORY



Assuming WPS
was run
successfully

- ✓ Created model domain with static data
- ✓ Prepared meteorological data
- ✓ Created met_em.d0* files for multiple time periods
 - used for initial and boundary conditions

```
> ln -sf ../../../../WPS/met_em.d0* .
```

&time_control

run_days = 0,
run_hours = 36,
run_minutes = 0,
run_seconds = 0,

run_* variables

Model simulation length

- Not domain-dependent. Only set a single value
- Only wrf.exe reads these

start_year = 2019, 2019,
start_month = 09, 09,
start_day = 04, 04,
start_hour = 12, 12,
end_year = 2019, 2019,
end_month = 09, 09,
end_day = 06, 06,
end_hour = 00, 00,

start_* and end_* variables

- Program real uses WPS output (met_em*) between these times to produce lateral and boundary conditions
- Can also be used to specify simulation length if run_* variables are not set (or set to 0)

interval_seconds = 10800
input_from_file = .true., .true.,
history_interval = 60, 60,
frames_per_outfile = 1, 1,
restart = .false.,
restart_interval = 7200,

restart & restart_interval

Whether this is a restart run, and the time interval (mins) between restart file (wrfrst_d0*) output

EDIT NAMELIST.INPUT: &DOMAINS

&domains

```
time_step      = 90,  
time_step_fract_num = 0,  
time_step_fract_den = 1,  
  
max_dom        = 1,  
e_we           = 150, 220,  
e_sn           = 130, 214,  
e_vert         = 45, 45,  
dzstretch_s    = 1.1  
p_top_requested = 5000,  
num_metgrid_levels = 34,  
num_metgrid_soil_levels = 4,  
dx             = 15000,  
dy             = 15000,  
grid_id        = 1, 2,  
parent_id      = 0, 1,  
i_parent_start = 1, 53,  
j_parent_start = 1, 25,  
parent_grid_ratio = 1, 3,  
parent_time_step_ratio = 1, 3,  
feedback       = 1,  
smooth_option  = 0  
/  

```

time_step* variables

- Time step for model integration (seconds)
- Use *_num (numerator) and *_den (denominator) to set time step in fractions
time_step should never be > 6xDX!

e_we and e_sn

The full west-east and south-north dimensions of the domain

e_vert

Number of vertical model levels

num_metgrid_levels

Number of metgrid (input) data levels

num_metgrid_soil_levels

Number of metgrid (input) soil data levels

dx and dy

Grid distance (resolution) in meters

&domains

```
time_step           = 90,  
time_step_fract_num = 0,  
time_step_fract_den = 1,  
  
max_dom             = 2,  
e_we                = 150, 220,  
e_sn                = 130, 214,  
e_vert              = 45, 45,  
dzstretch_s         = 1.1  
p_top_requested     = 5000,  
num_metgrid_levels  = 34,  
num_metgrid_soil_levels = 4,  
dx                  = 15000,  
dy                  = 15000,  
eta_levels           = 1.0, 0.996, 0.99, 0.98, ..., 0.0  
grid_id              = 1, 2,  
parent_id            = 0, 1,  
i_parent_start       = 1, 53,  
j_parent_start       = 1, 25,  
parent_grid_ratio     = 1, 3,  
parent_time_step_ratio = 1, 3,  
feedback             = 1,  
smooth_option        = 0  
/  

```

EDIT NAMELIST.INPUT: &DOMAINS

p_top_requested

Pressure value at the model top

- Constrained by the available data from WPS
- Default value of 5000 Pa is recommended as the lowest model top

eta_levels

Specify your own model levels from 1.0 to 0.0

- If not specified, program *real* will calculate a reasonable set for you

RUN INITIALIZATION PROGRAM: REAL.EXE

Serial or smpar compile

```
> ./real.exe >& real.log
```

Parallel (dmpar) compile

```
> mpiexec -np N ./real.exe
```

Look at the end of the log file or
rsl.out.0000 file for:

```
SUCCESS COMPLETE REAL_EM INIT
```

Where N is the number of processors requested
- outputs rsl.out.* and rsl.error.* for each processor

Output Files

wrfinput_d01

Single time level data at model's
start time

wrfbdy_d01

- Lateral boundary data
- Available at the beginning of
each time period processed

RUN WRF MODEL: WRF.EXE

Serial or smpar compile

```
> ./wrf.exe >& wrf.log
```

Parallel (dmpar) compile

```
> mpiexec -np N ./wrf.exe
```

Where N is the number of processors requested
- outputs rsl.out.* and rsl.error.* for each processor

Look at the end of the log file or
rsl.out.0000 file for:

SUCCESS COMPLETE WRF

Output Files

wrfout_d01_YYYY-MM-DD_hh:mm:ss

Model output at time interval specified by
history_interval, and dependent on
frames_per_outfile

wrfrst_d0x_YYYY-MM-DD_hh:mm:ss

- Restart outputs if restart_interval is set to a time within the range of the forecast time
- Use to restart the model at the time of this file



- In the initial run, set *restart_interval* to a value that is within the model integration time
 - A restart file will be created during the initial run
 - e.g., **wrfirst_d01_2019-09-05_00:00:00**
- When running the restart,
 - Set *restart* = *.true.*
 - Set *start_time* to the restart initial time
 - Set *run_** to the amount of time you wish to run
 - Run WRF as usual

```
./wrf.exe >& wrf.log
```

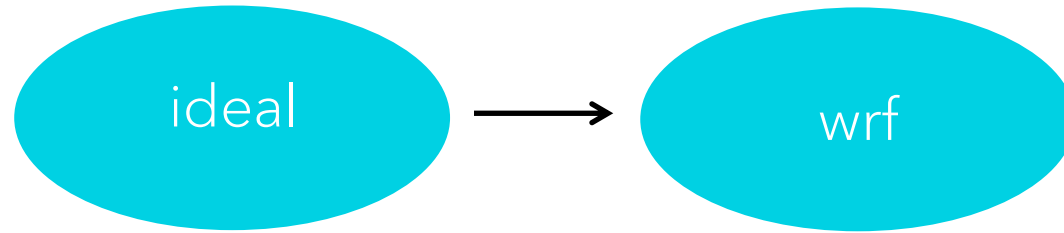
or

```
mpiexec -np N ./wrf.exe
```

RUNNING WRF FOR AN IDEALIZED CASE

WRF FLOWCHART: IDEALIZED CASE

WRF Model



*WPS is not used when
running idealized
cases*

Program to
create Initial
Conditions

Program to
integrate
model

IDEALIZED CASES

- Idealized cases allow users to run a controlled scenario.
- Typically, the only required input is then namelist.input file, and the input sounding files (provided with the code)

```
em_b_wave  
em_convrad  
em_esmf_exp  
em_fire  
em_grav2d_x  
em_heldsuarez  
em_hill2d_x  
em_les  
em_quarter_ss  
em_real  
em_scm_xy  
em_seabreeze2d_x  
em_squall2d_x  
em_squall2d_y  
em_tropical_cyclone
```

Change directories ('cd') to make sure you are in the appropriate idealized case running directory.

```
> cd wrf/test/em_<CASE>
```

RUN INITIALIZATION PROGRAM: IDEAL.EXE

Serial or smpar compile

```
> ./ideal.exe >& ideal.log
```

Parallel (dmpar) compile – for 3D cases only

```
> mpiexec -np 1 ./ideal.exe
```

Look at the end of the log file or
rsl.out.0000 file for:

SUCCESS COMPLETE IDEAL INIT

NOTE: Even when compiled for parallel execution,
ideal.exe must always be run with a single processor

Input

Typically a sounding file named
input_sounding, or a pre-defined
2D input (e.g., *input_jet* in the
em_b_wave case)

Output File

wrfinput_d01

- Single time level data at model's start time
- No boundary file for ideal cases

IDEAL CASE BOUNDARY CONDITIONS

*Boundary condition options
are set in namelist.input in the
&bdy_control record.*

Example for an east-west (x-direction) case

```
&bdy_control
```

```
periodic_x      = .true.,  
symmetric_xs    = .false.,  
symmetric_xe    = .false.,  
open_xs         = .false.,  
open_xe         = .false.,
```

```
/
```


RUN WRF MODEL FOR IDEAL CASE: WRF.EXE

Serial or smpar compile

```
> ./wrf.exe >& wrf.log
```

Parallel (dmpar) compile – for 3D cases only

```
> mpiexec -np N ./wrf.exe
```

Where N is the number of processors requested

Look at the end of the log file or
rsl.out.0000 file for:

SUCCESS COMPLETE WRF

Output

wrfout_d01_YYYY-MM-DD_hh:mm:ss

Model output at time interval specified by
history_interval, and dependent on
frames_per_outfile

ADDITIONAL NOTES FOR IDEAL CASES

- Edit *namelist.input* to change options.
- For your own case, you may provide a different sounding.
- You may also edit *dyn_em/module_initialize_<CASE>.F* to change other aspects of the initialization.

WHERE SHOULD YOU START?

See namelist templates and descriptions in *test/em_real*

- README.namelist
- examples.namelist

Helpful Documentation

- [Users' Guide Chapter on 'Running](#)
- Namelist Best Practice web pages:
WPS: http://www2.mmm.ucar.edu/wrf/users/namelist_best_prac_wps.html
WRF: http://www2.mmm.ucar.edu/wrf/users/namelist_best_prac_wrf.html

Not all namelist options are domain-dependent. If in doubt:

- Check Registry files (found in WRF/Registry/)
 - * grep for parameter names – look for “max_dom”
(*max_dom* means expected value for each domain)

PRESENTATION OUTLINE

WPS/WRF Flow

Running WPS

Troubleshooting WPS Errors

Running WRF

WRF Log Files

Troubleshooting WRF Errors

The standard out and error will go to the following files:

Serial or smpar compile

```
> ./wrf.exe >& wrf.log
```

All standard out and error will go to the wrf.log file. This file can be named whatever the user wants.

Parallel (dmpar) compile

```
> mpiexec -np N ./wrf.exe
```

rs1.out.0000	rs1.error.0000
rs1.out.0001	rs1.error.0001
rs1.out.0002	rs1.error.0002
rs1.out.0003	rs1.error.0003

There is one pair of files for each processor requested

WHAT IS IN A WRF LOG OR RSL FILE?

Model Version & Decomposition Info

```
Ntasks in X  4, ntasks in Y  4  
WRF V4.5 MODEL
```

Computational Timing Info

```
Timing for main: time 2000-01-24_20:03:00 on domain 1: 0.89475 elapsed seconds  
Timing for main: time 2000-01-24_20:06:00 on domain 1: 0.09011 elapsed seconds  
Timing for main: time 2000-01-24_20:09:00 on domain 1: 0.08634 elapsed seconds  
Timing for main: time 2000-01-24_20:12:00 on domain 1: 0.09004 elapsed seconds
```

Timing Info for Writing History and Restart Files

```
Timing for Writing wrfout_d01_2000-01-25_00:00:00 for domain 1: 0.07091 elapsed seconds
```

Model Errors

```
5 points exceeded cfl=2 in domain 1 at time 4.200000 MAX AT i,j,k: 123 48 3  
cfl,w,d(eta)= 4.165821
```

PRESENTATION OUTLINE

WPS/WRF Flow

Running WPS

Troubleshooting WPS Errors

Running WRF

WRF Log Files

Troubleshooting WRF Errors

COMMON RUNTIME PROBLEMS

```
module_configure: initial_config:  
error reading namelist: &dynamics
```

- Check for typos or erroneous namelist variables in the specified namelist record.
- Make sure no columns have been added for a single entry variable.

```
input_wrf.F: SIZE MISMATCH: namelist  
ide,jde,num_metgrid_levels= 70 61 27;  
input data ide,jde,num_metgrid_levels= 74 61 27
```

- Grid dimension error
- Modify namelist to match input files.

COMMON RUNTIME PROBLEMS

Segmentation fault (core dumped)

- Check for 'cfl' errors in error files.
- If it seg-faults at the beginning of simulation, it often means the input data is bad.
- Could mean you need more or fewer processors
- See potential solutions here:
<https://forum.mmm.ucar.edu/threads/what-is-the-most-common-reason-for-a-segmentation-fault.133/>

TROUBLESHOOTING

- Check the *rsl.error.0000* file for errors
- See the WRF Frequently Asked Questions Page
<https://forum.mmm.ucar.edu/forums/frequently-asked-questions.115/>
- Check the WRF & MPAS-A Support Forum to see if your issue has previously been addressed. If not, post to the forum.
<https://forum.mmm.ucar.edu/>

QUESTIONS?