BPintar

(BMKG’s Portable Integrated NWP and Assessment Report)

Center for Standardization and Instruments of BMKG

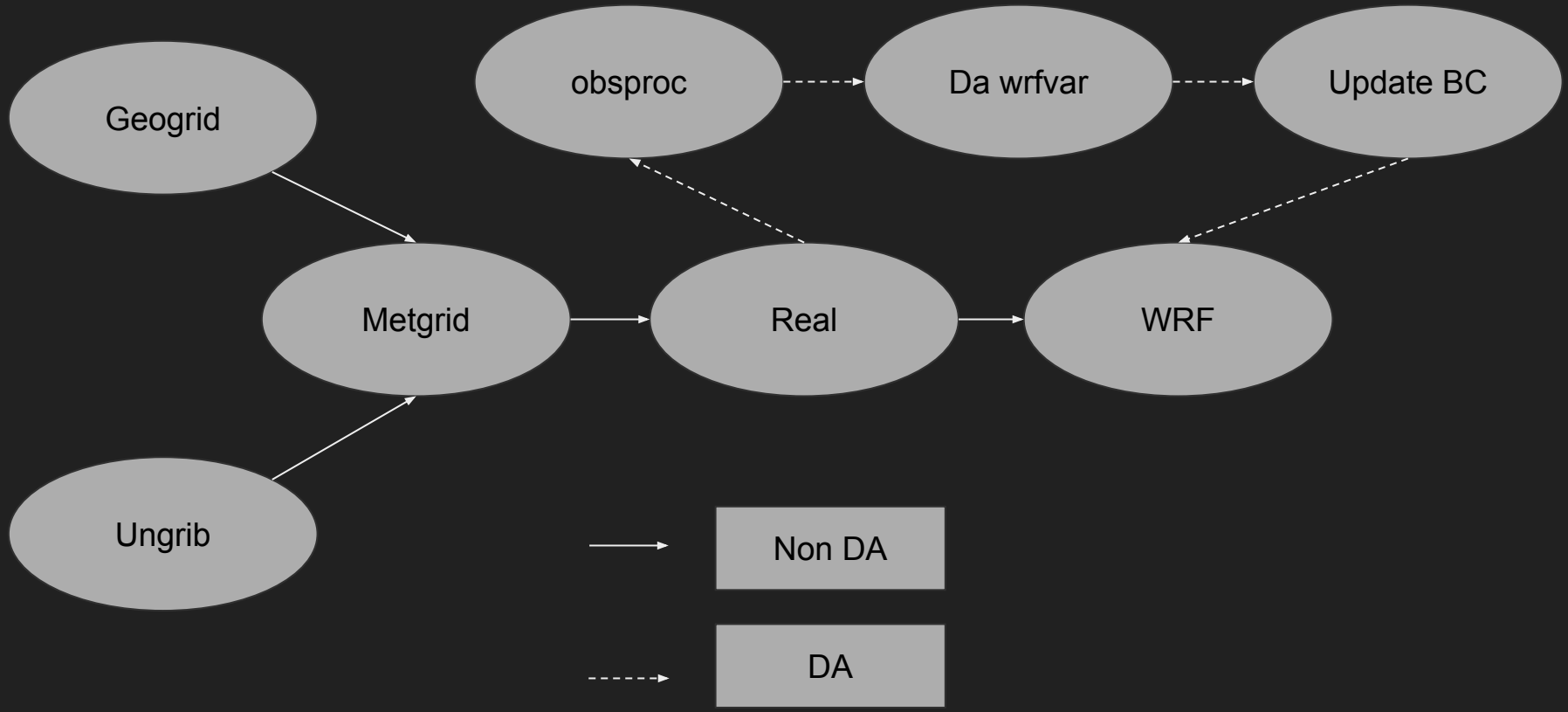
What is BPintar?

- BMKG’s Portable Integrated NWP and Assessment Report
- Developed version of PNTOOL (Plug-N-Run NWP Tool) created by Kyung Jeen Park https://docs.google.com/document/d/1Agpabjw5fSUD0EH1Fbmt-xdLXp3s0EOJY_SW0CSyxXs/edit
- We're still in the development stage right now
- Ubuntu persistent run (Using USB media)
- Added features:
  - 3DVAR (local observation data)
  - HARP (Hirlam Aladdin R Packages) Verification tool (https://github.com/harphub/harp)

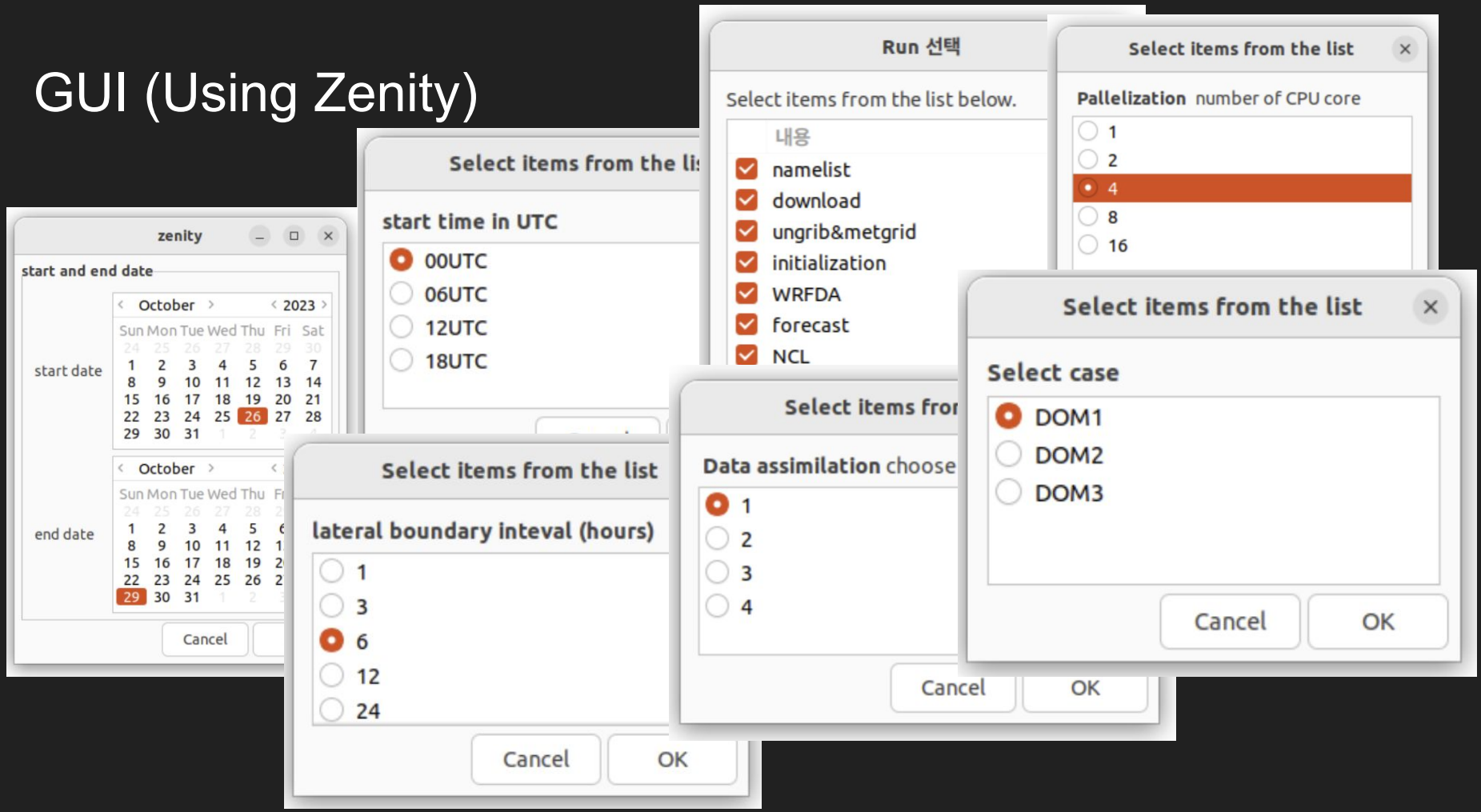
Why BPintar?

- Portable
- Easy to install
- Integrated NWP System (WRF, display and analysis)
- Comes with GUI (Graphical User Interfaces)
- Automatic run
- 3DVAR local data assimilation and verification System Included
- Intended for lightweight running and training purposes
- Open for development

Precompiled WRF Binaries

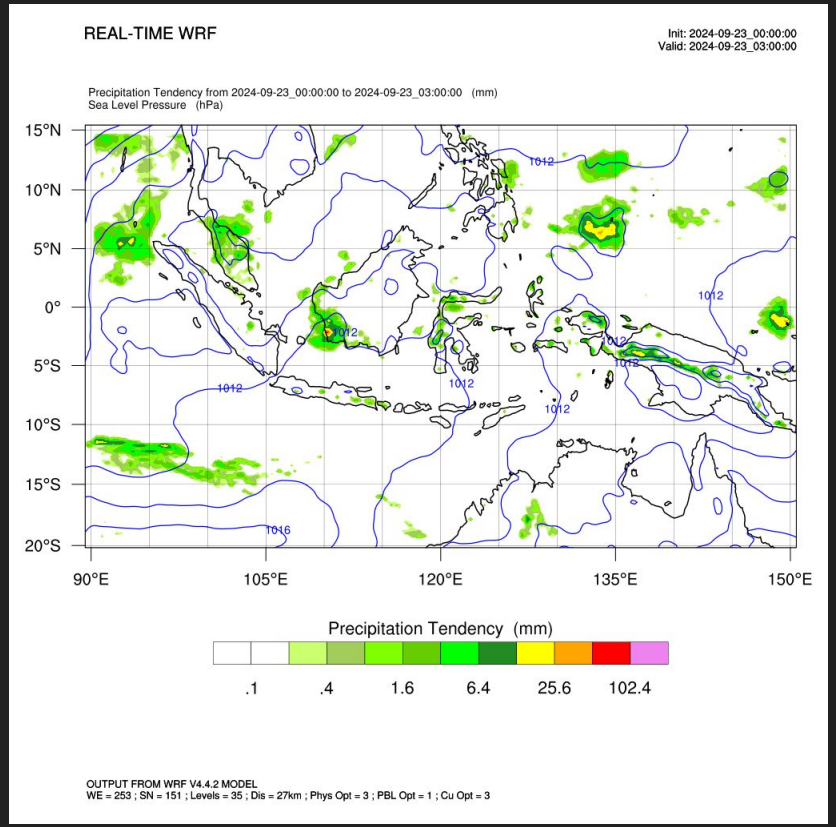


GUI (Using Zenity)



Display Software (NCL on Conda Python)

NCL
NCAR Command Language



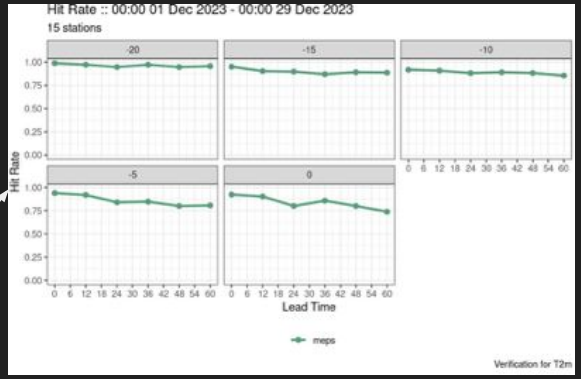
https://github.com/harphub/harp

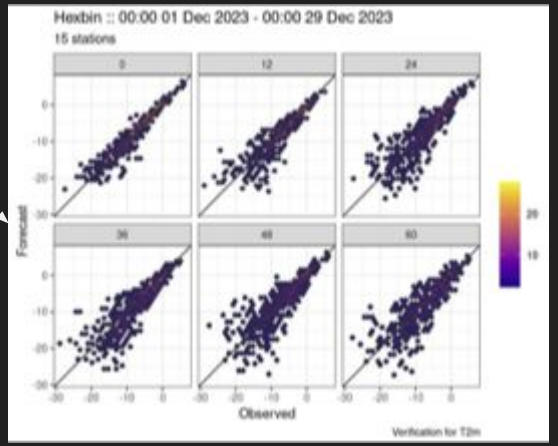
HARP Integrated

Forecast Data
- NetCDF
- GRIB

Observation Data
- csv
- xls
- txt

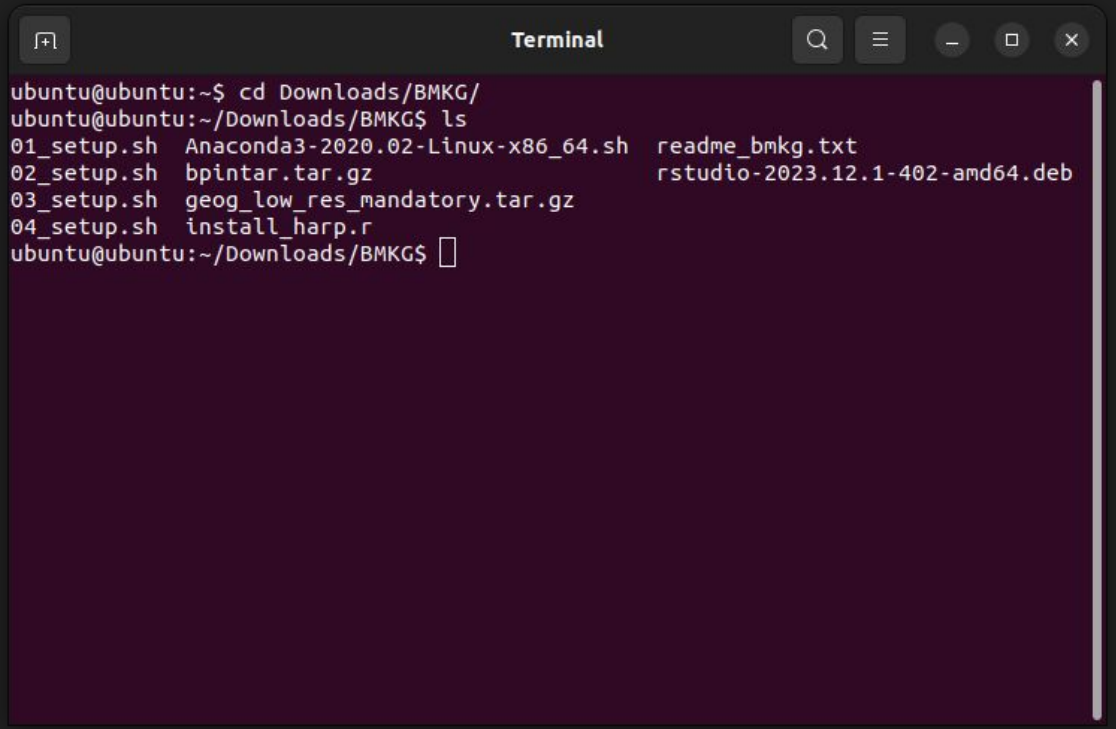
SQLite





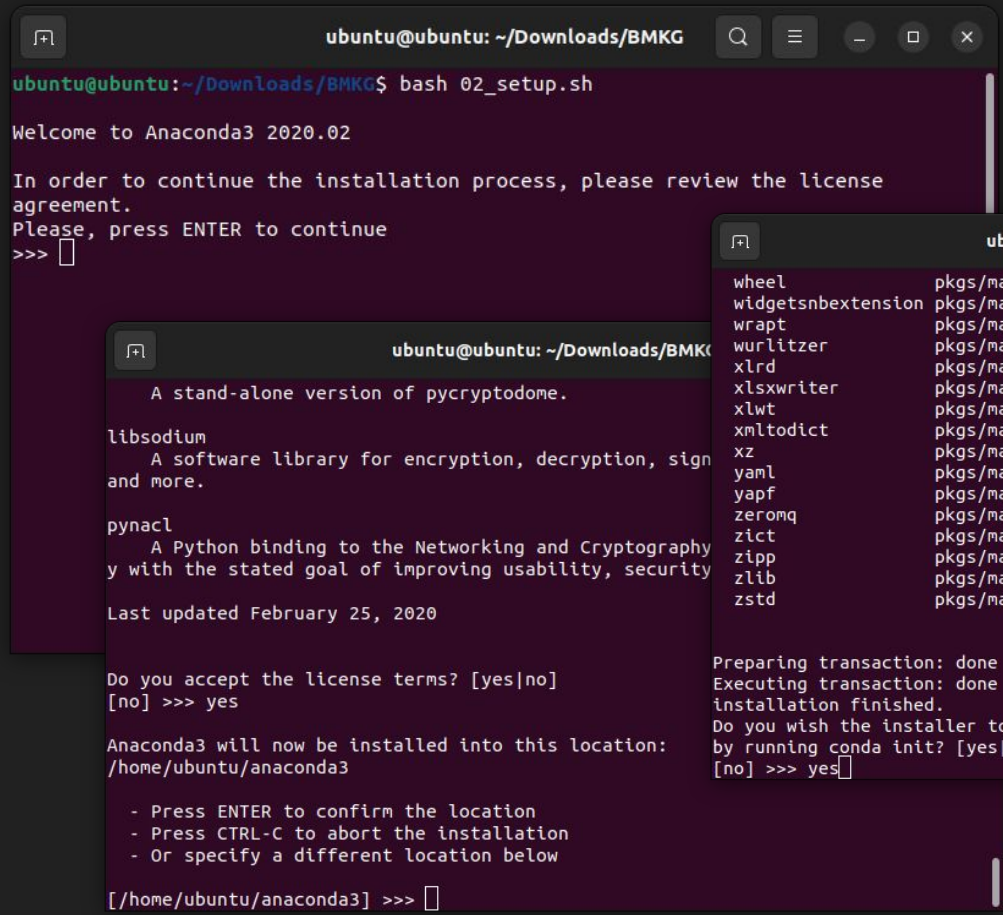
How to Install? (01_setup.sh)

- Go to downloads/BMKG folder
  - cd /home/ubuntu/Downloads/BMKG
- Open terminal and run linux shell script
  - bash 01_setup.sh
  - exit (type exit after finish)



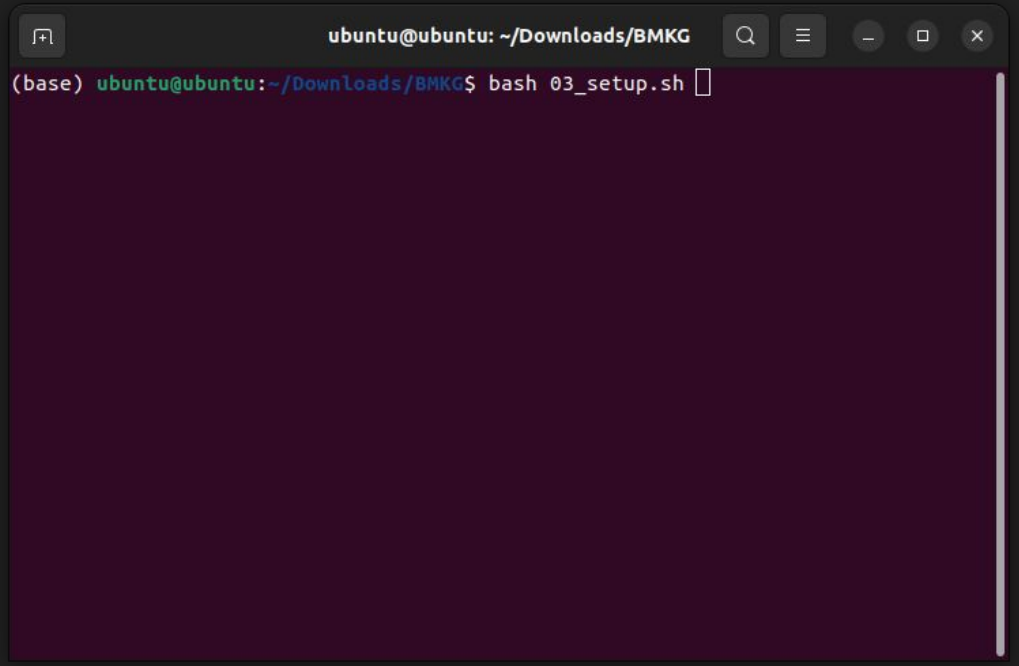
02_setup.sh

- Go to downloads/BMKG folder
  - cd /home/ubuntu/Downloads/BMKG
- Open new terminal and continue with run 02_setup.sh (to install Anaconda)
  - bash 02_setup.sh
  - hit enter button
  - type “yes” for license terms
  - hit enter to confirm location
  - type “yes” to initialize Anaconda
  - exit (type exit after finish)



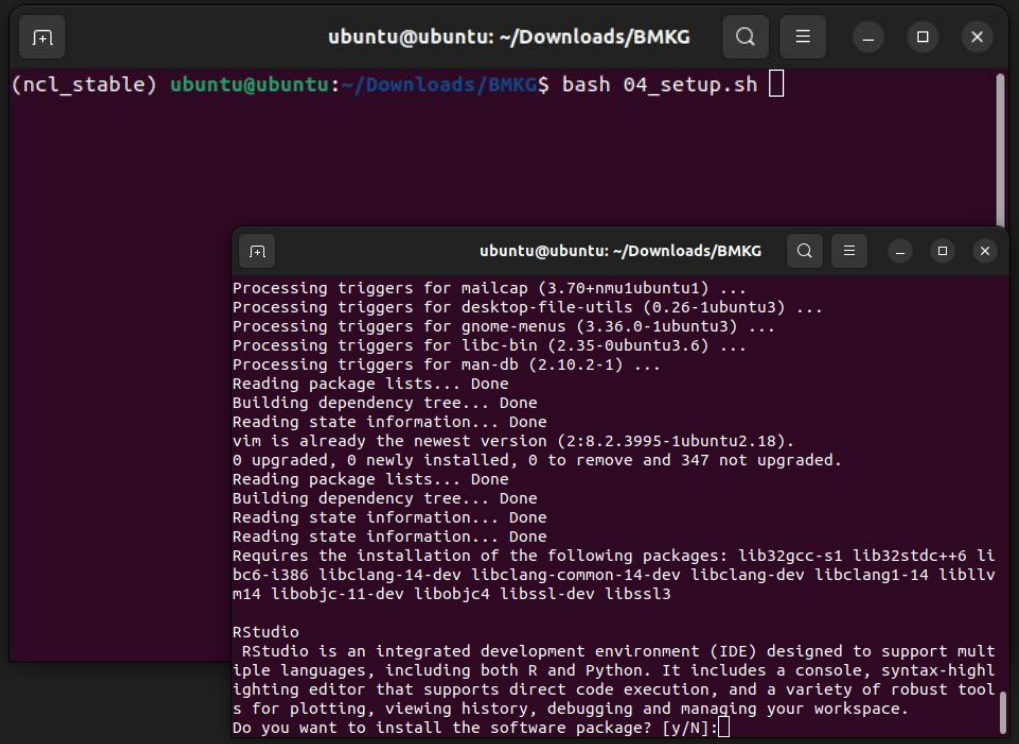
03_setup.sh

- Go to downloads/BMKG folder
  - cd /home/ubuntu/Downloads/BMKG
- Open new terminal and continue with run 03_setup.sh (to install NCL)
  - bash 03_setup.sh
  - hit enter button
  - type “yes” for license terms
  - hit enter to confirm location
  - exit (type exit after finish)

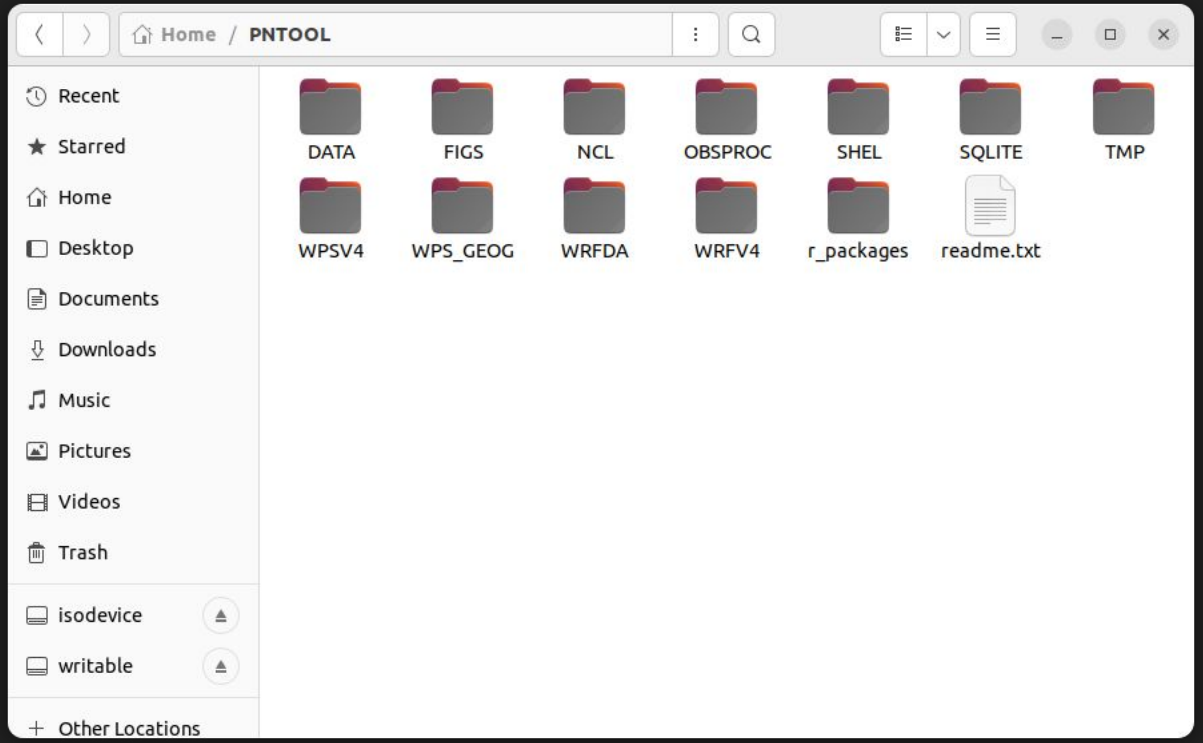


04_setup.sh

- Go to downloads/BMKG folder
  - cd /home/ubuntu/Downloads/BMKG
  - bash 04_setup.sh
  - hit enter button
  - type “yes” and hit enter button to install r software package



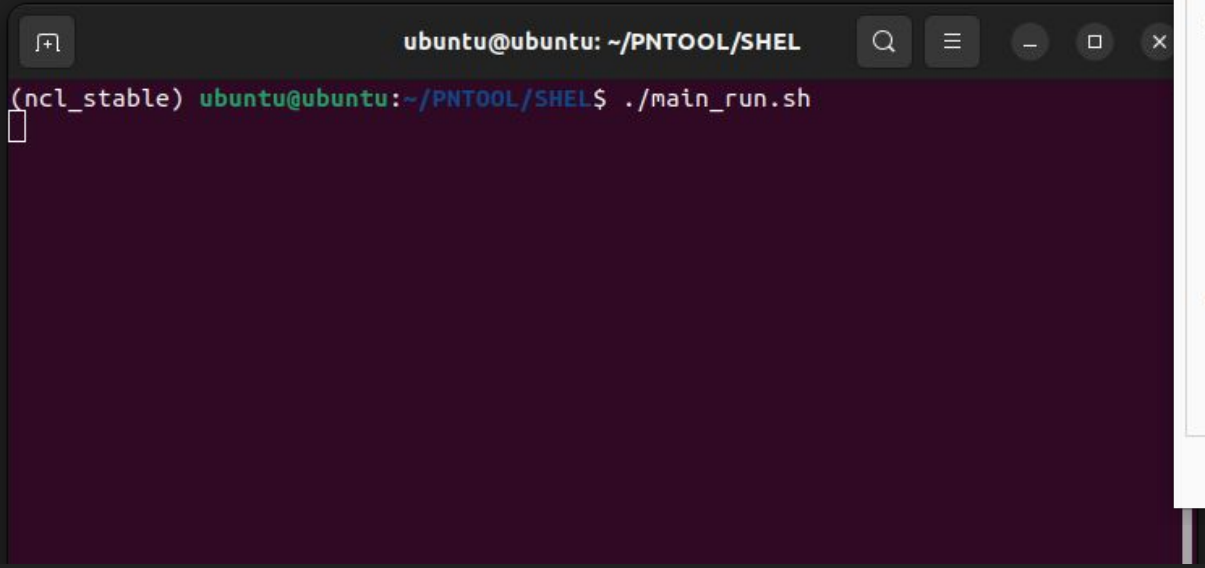
Run BPintar

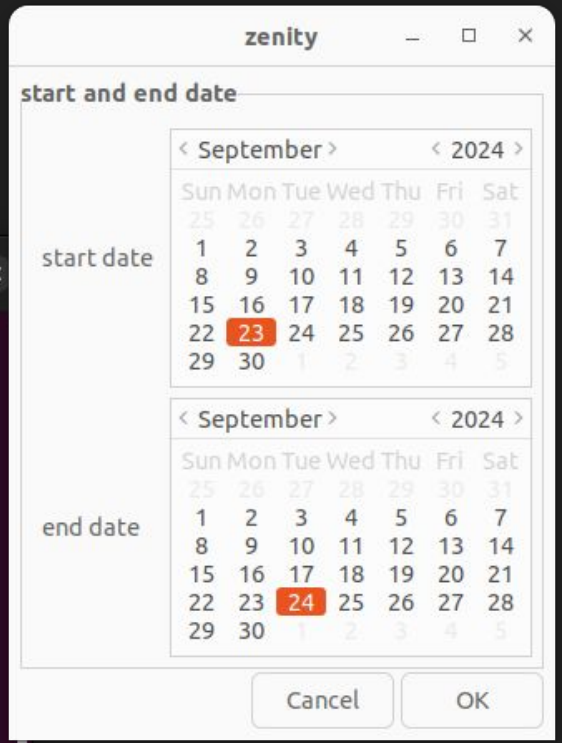

Home / PNTOOL
Recent
Starred
Home
Desktop
Documents
Downloads
Music
Pictures
Videos
Trash
isodevice
writable
Other Locations
DATA
FIGS
NCL
OBSPROC
SHEL
SQLITE
TMP
WPSV4
WPS_GEOG
WRFDA
WRFV4
r_packages
readme.txt

Folder list

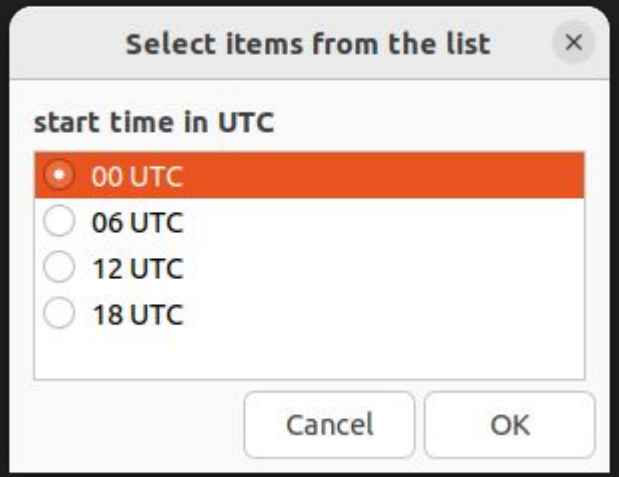
- DATA
  - Asimilate : local data observation (synop, aws, sound, etc)
  - GFS : GFS Initial condition
  - OBS: observation data for HARP
- FIGS = Picture from NCL output
- NCL = NCL installation folder
- OBSPROC = WRF obsproc pre-compiled binary folder
- SHEL = All script and domain folder
  - CASE : Domain name and folder output of WRF process (wrfout data)
- SQLITE
  - OBS = sqlite database for observation data
  - Static = station list for harp
  - Wrfout = sqlite database for forecast data
- TMP = Temporary folder
- WPSV4 = Pre-compiled WPS binary
- WPS_GEOG = WPS GEOG file
- WRFDA = Pre-compiled WRFDA binary
- WRFV4 = Pre-compiled WRF binary
- r_packages = r packages installed folder

- Go to PNTOOL folder
  - cd /home/ubuntu/PNTOOL/SHEL
- Run main_ run.sh and select the forecast date
  - ./main_run.sh

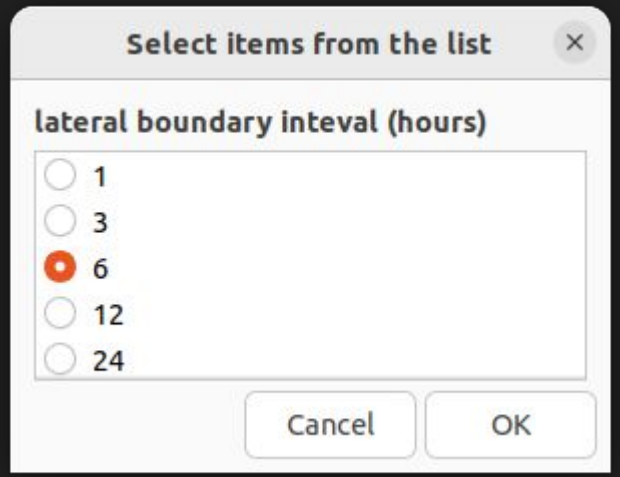




- Select initial condition and hit “OK”

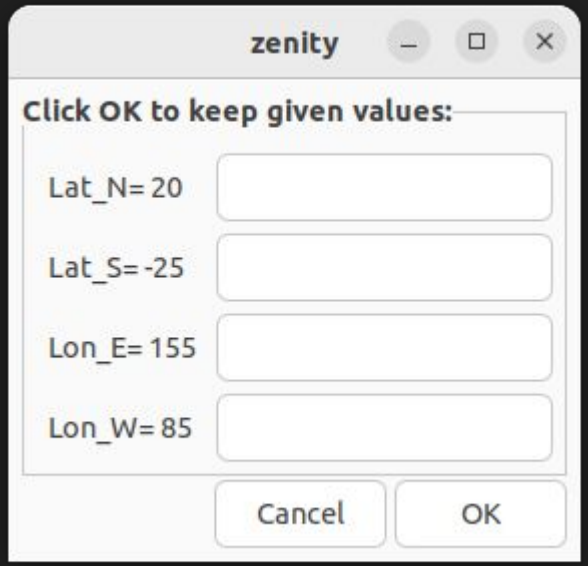


- Select lateral boundary interval and hit “OK”

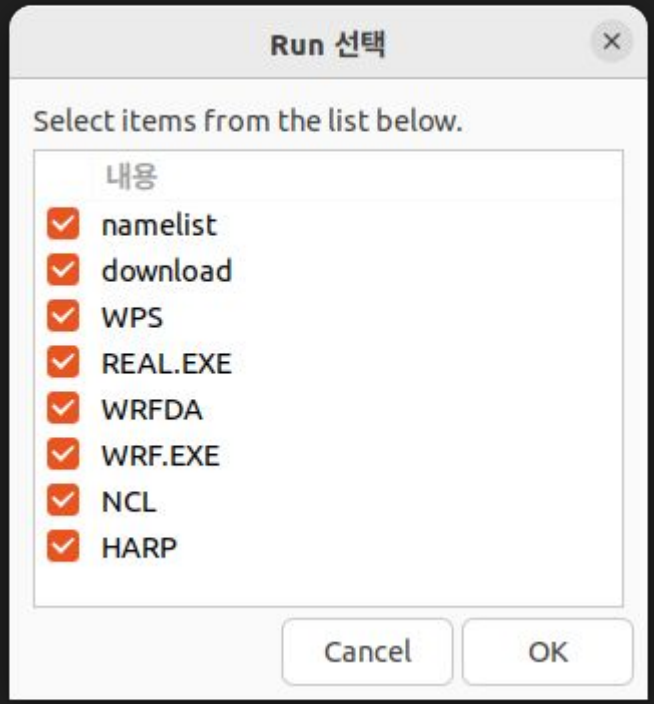


- Select case and hit “OK”

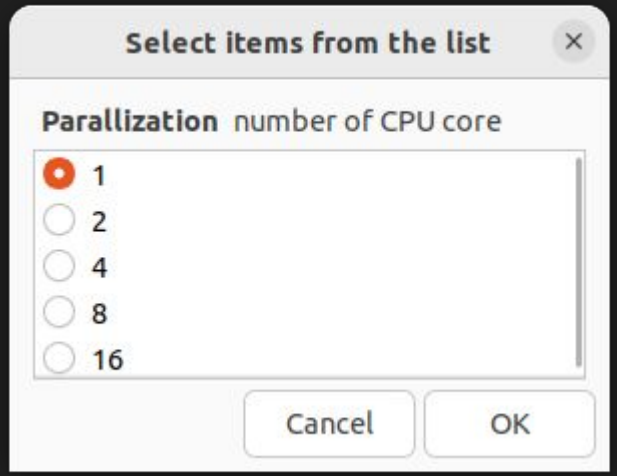
- Select domain range for GFS data (default value are listed) and hit “OK”



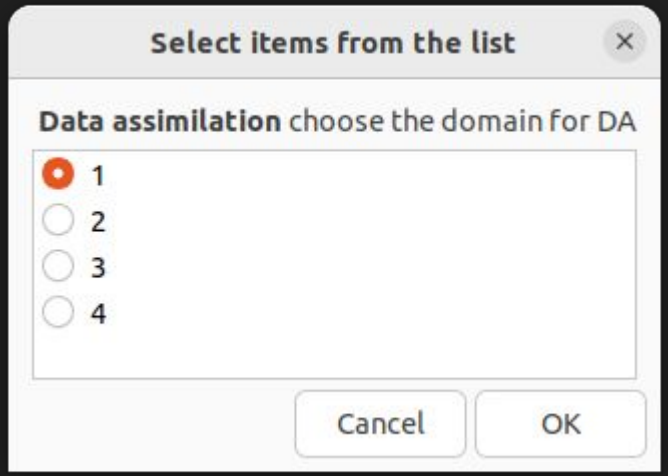
- You may select processes from item list from following window.
- Additional pop-up window will appear if WRFDA selected (checked)



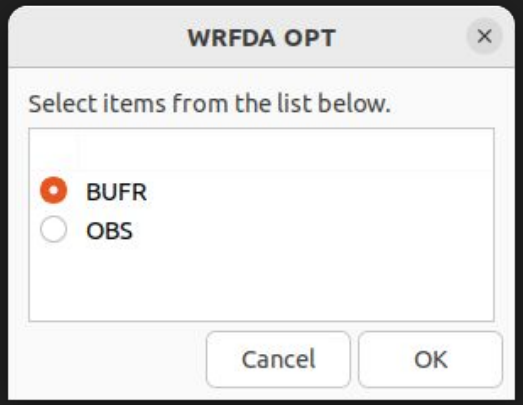
- Select number of processor (based on your machine configuration)

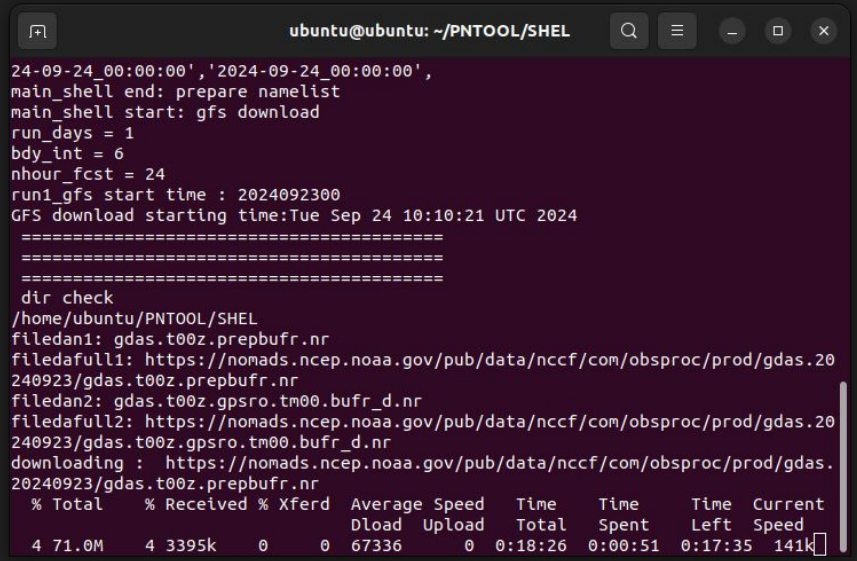


- Select assimilation domain



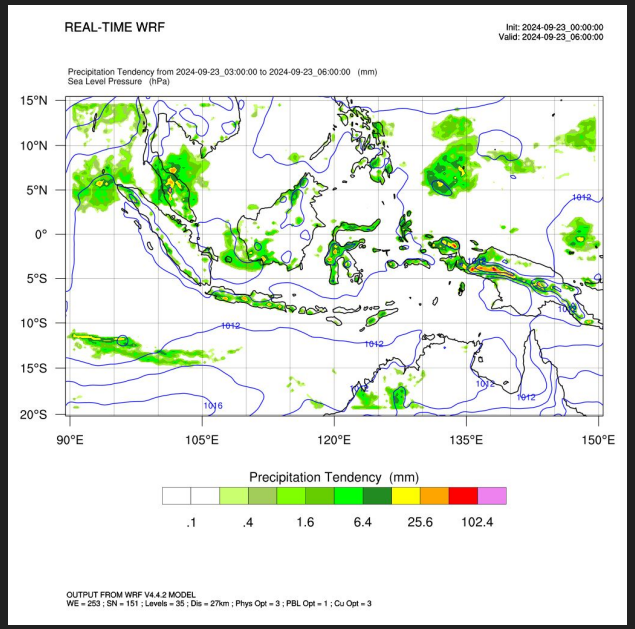
- You may select data assimilation type
  - BUFR = bufr data format will be download from NCEP website
  - OBS = Using local observation data (you must prepare your own data with the special format)
- And finally with until all processes finish

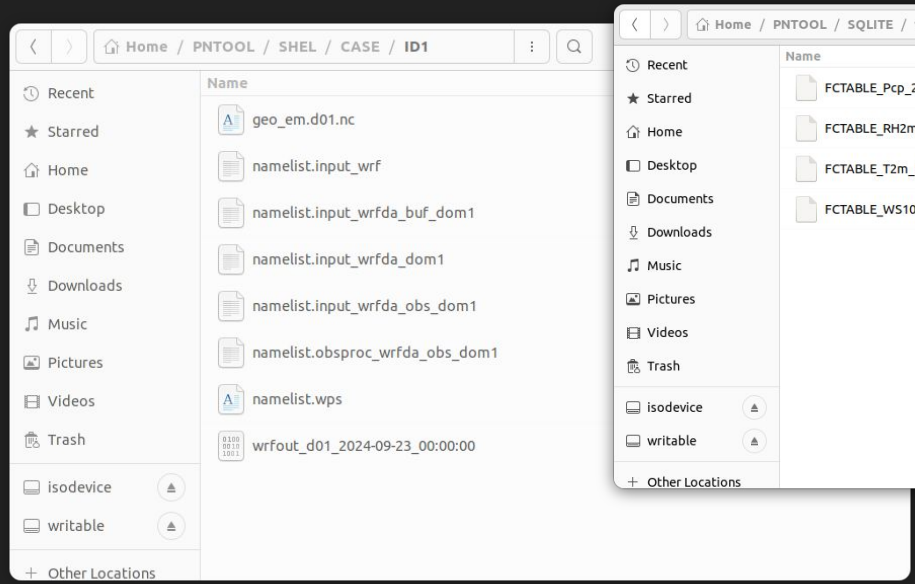




Output

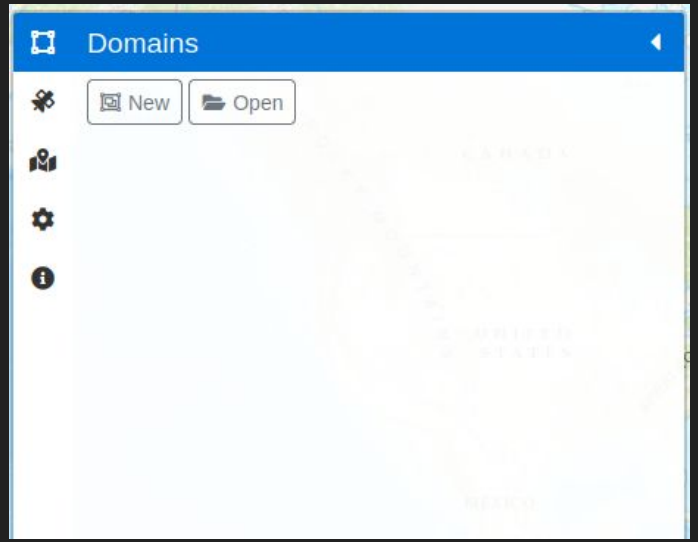
- Picture format (/home/ubuntu/PNTOOL/FIGS)
- Netcdf format/wrfout (/home/ubuntu/PNTOOL/SHEL/CASE/{case id})
- Sqlite format (/home/ubuntu/PNTOOL/SQLITE/wrfout)

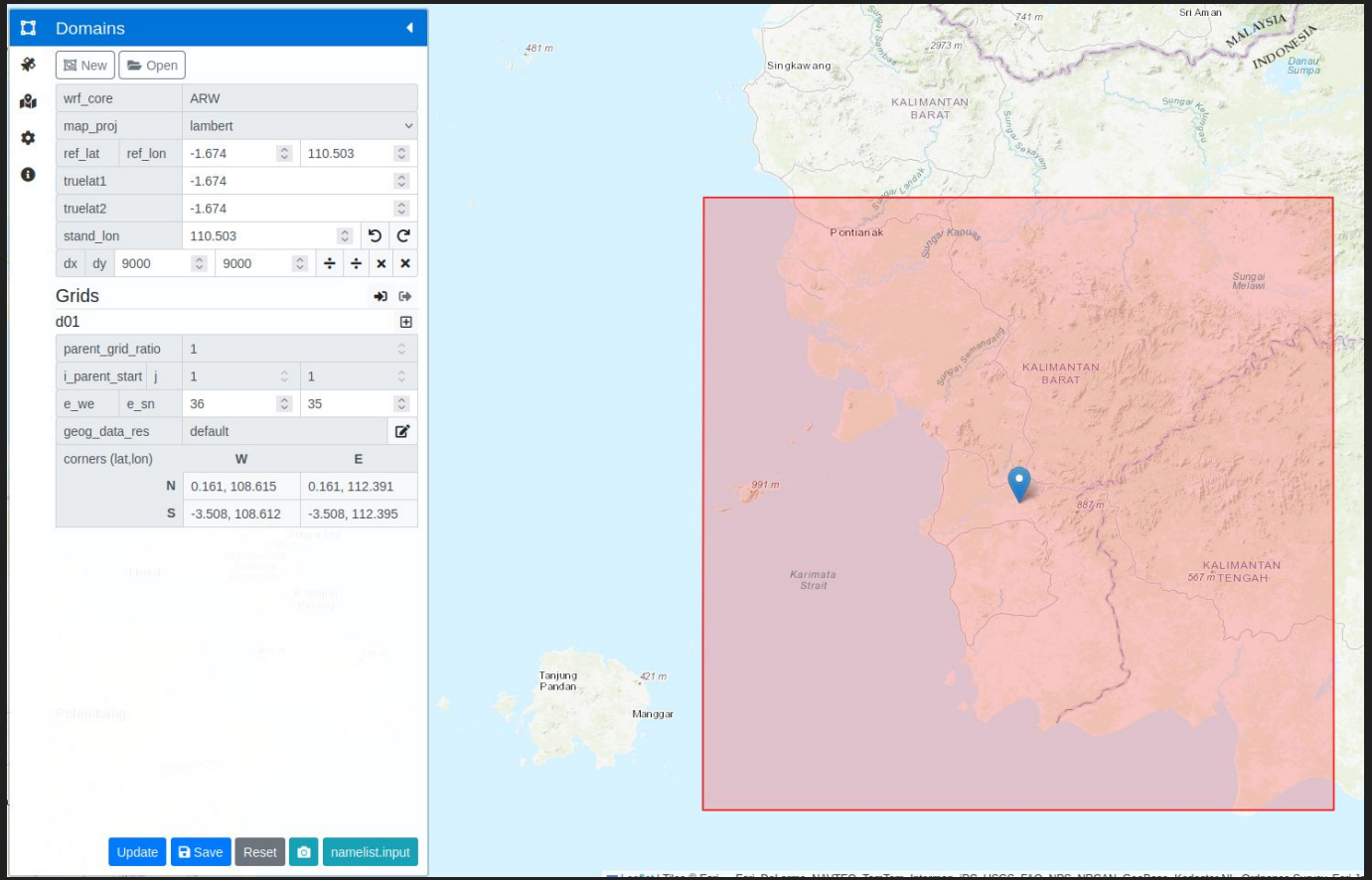




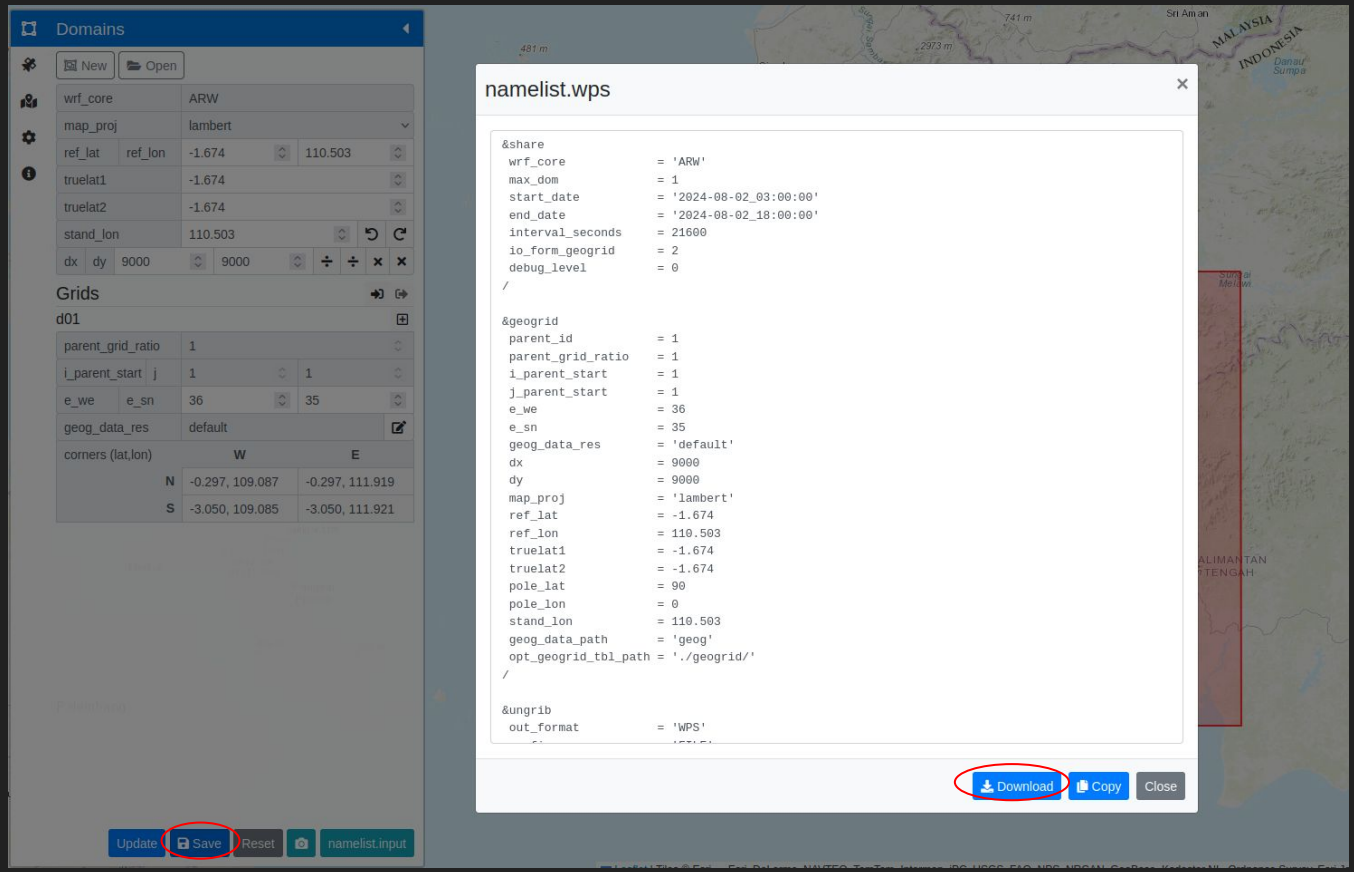
Create New Domain

- Go to https://jiririchter.github.io/WRFDomainWizard/
- Create new and select your area of interest (drag and drop)



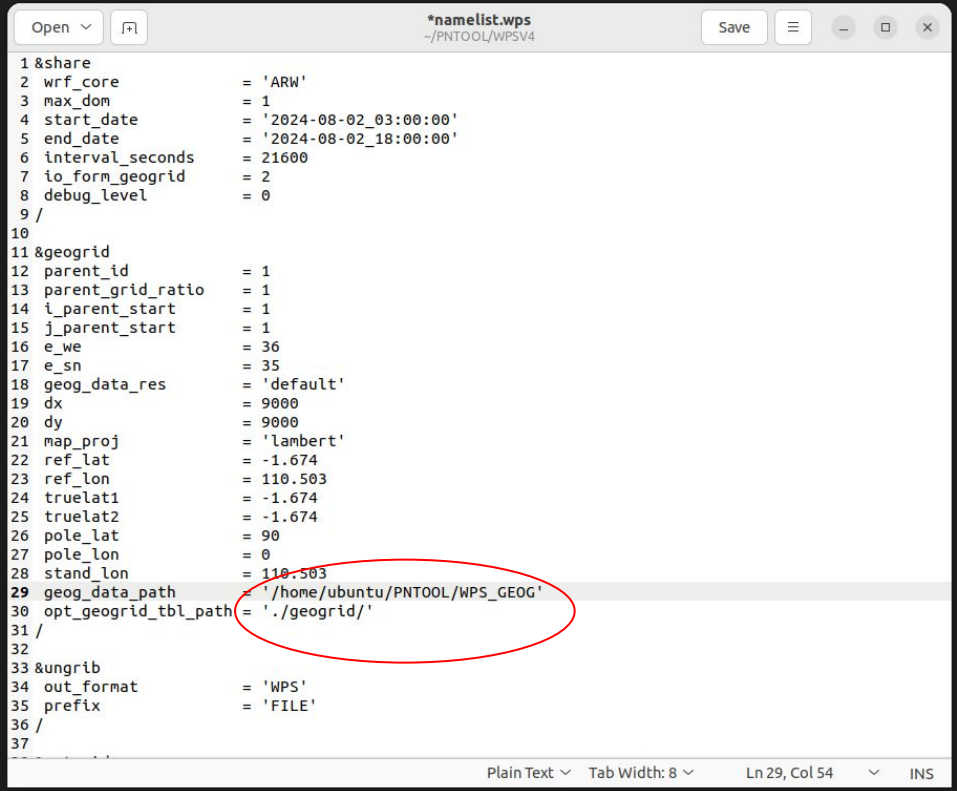

Domains
New
Open
wrf_core
ARW
map_proj
lambert
ref_lat
ref_lon
-1.674
110.503
truelat1
-1.674
truelat2
-1.674
stand_lon
110.503
dx
dy
9000
9000
Grids
d01
parent_grid_ratio
1
i_parent_start
j
1
1
e_we
e_sn
36
35
geog_data_res
default
corners (lat,lon)
W
E
N
0.161, 108.615
0.161, 112.391
S
-3.508, 108.612
-3.508, 112.395
Update
Save
Reset
namelist.input
Singkawang
KALIMANTAN BARAT
Pontianak
Sungai Kapuas
Sungai Melawi
Sungai Semandang
KALIMANTAN BARAT
KALIMANTAN TENGAH
Karimata Strait
Tanjung Pandan
Manggar
Sri Aman
MALAYSIA
INDONESIA
Danau Sumpa
741 m
2973 m
481 m
991 m
887 m
567 m
421 m

Click save and download



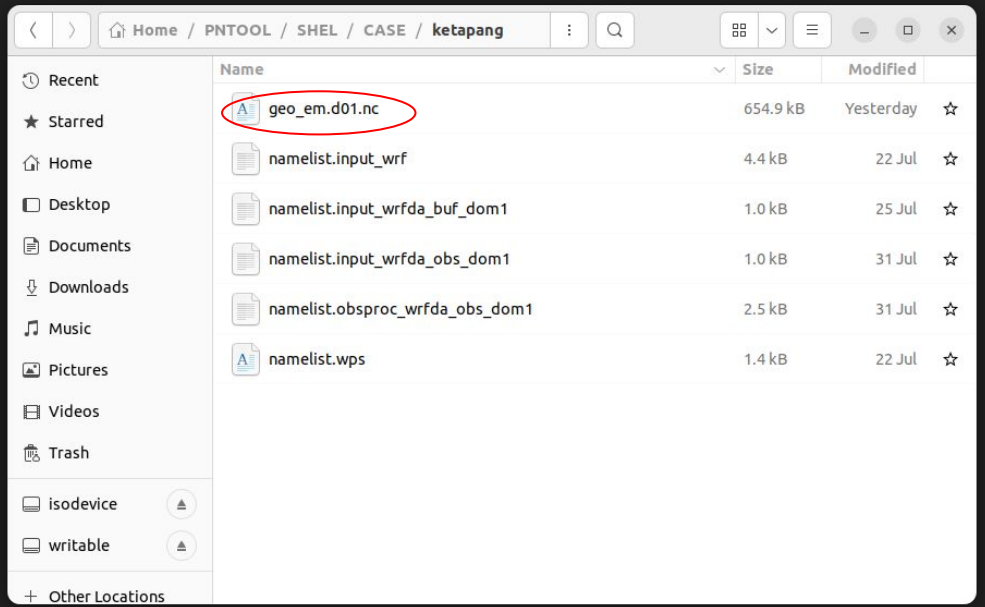
Create geo_em file

- Copy downloaded namelist.wps to WPSV4 folder
  - cd /home/ubuntu/download
  - cp namelist.wps /home/ubuntu/PNTOOL/WPSV4
  - cd /home/ubuntu/PNTOOL/WPSV4
  - ln -sf geogrid/GEOGRID.TBL .
  - gedit namelist.wps (as shown)
  - ./geogrid.exe
- The output will be generated (geo_em.d01.nc)



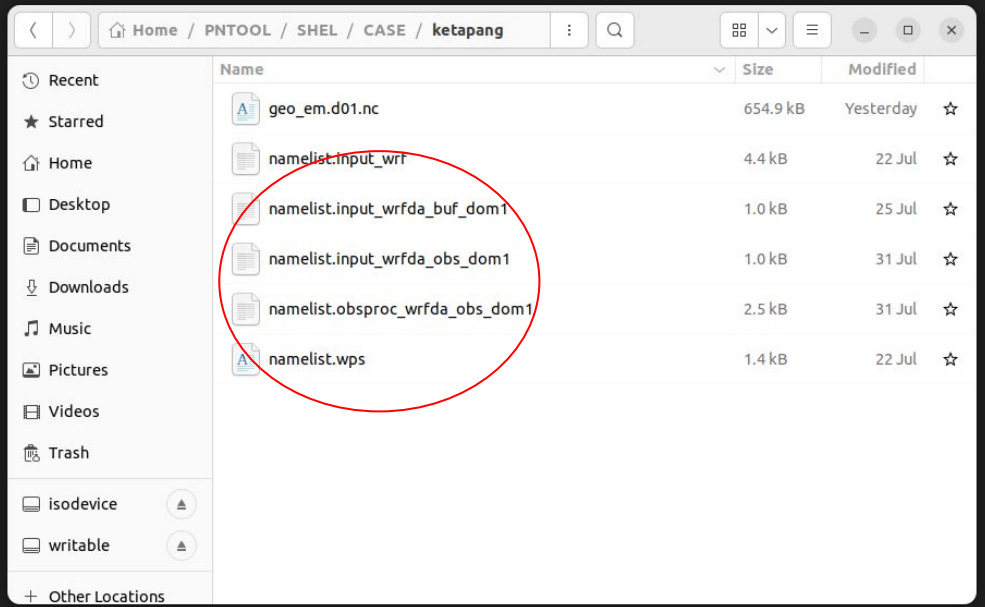
Creating new case name

- Copy folder ID1 to different name (ketapang) in /home/ubuntu/PNTOOL/SHEL/CASE
  - cd /home/ubuntu/PNTOOL/SHEL/CASE
  - cp -r ID1 ketapang
  - cd ketapang
- Copy file geo_em.d01.nc generated from geogrid to this folder
  - cp /home/ubuntu/PNTOOL/WPSV4/geo_em.d01.nc .

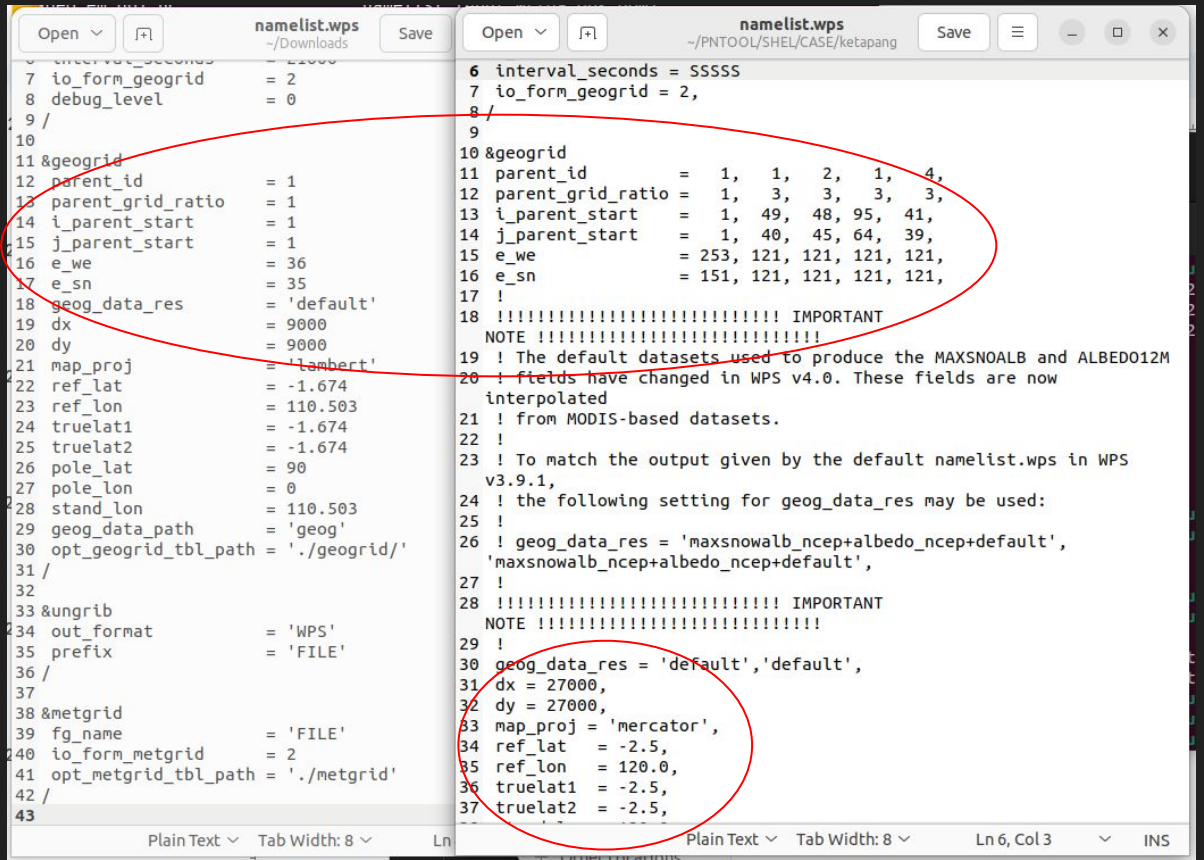


Edit all namelist file

- PNTOOL comes with 5 (five) namelist file
- When creating new domain, we also need to edit these file to match with geo_em data
- There are several parts that we have to look for, mainly grid setting and grid resolution



namelist.wps



Open ~ namelist.wps ~/Downloads Save

```
 7 io_form_geogrid       = 2
 8 debug_level           = 0
 9 /
10
11 &geogrid
12  parent_id            = 1
13  parent_grid_ratio    = 1
14  i_parent_start       = 1
15  j_parent_start       = 1
16  e_we                 = 36
17  e_sn                 = 35
18  geog_data_res        = 'default'
19  dx                   = 9000
20  dy                   = 9000
21  map_proj             = 'lambert'
22  ref_lat              = -1.674
23  ref_lon              = 110.503
24  truelat1             = -1.674
25  truelat2             = -1.674
26  pole_lat             = 90
27  pole_lon             = 0
28  stand_lon            = 110.503
29  geog_data_path       = 'geog'
30  opt_geogrid_tbl_path = './geogrid/'
31 /
32
33 &ungrib
34  out_format           = 'WPS'
35  prefix               = 'FILE'
36 /
37
38 &metgrid
39  fg_name              = 'FILE'
40  io_form_metgrid      = 2
41  opt_metgrid_tbl_path = './metgrid'
42 /
43
```

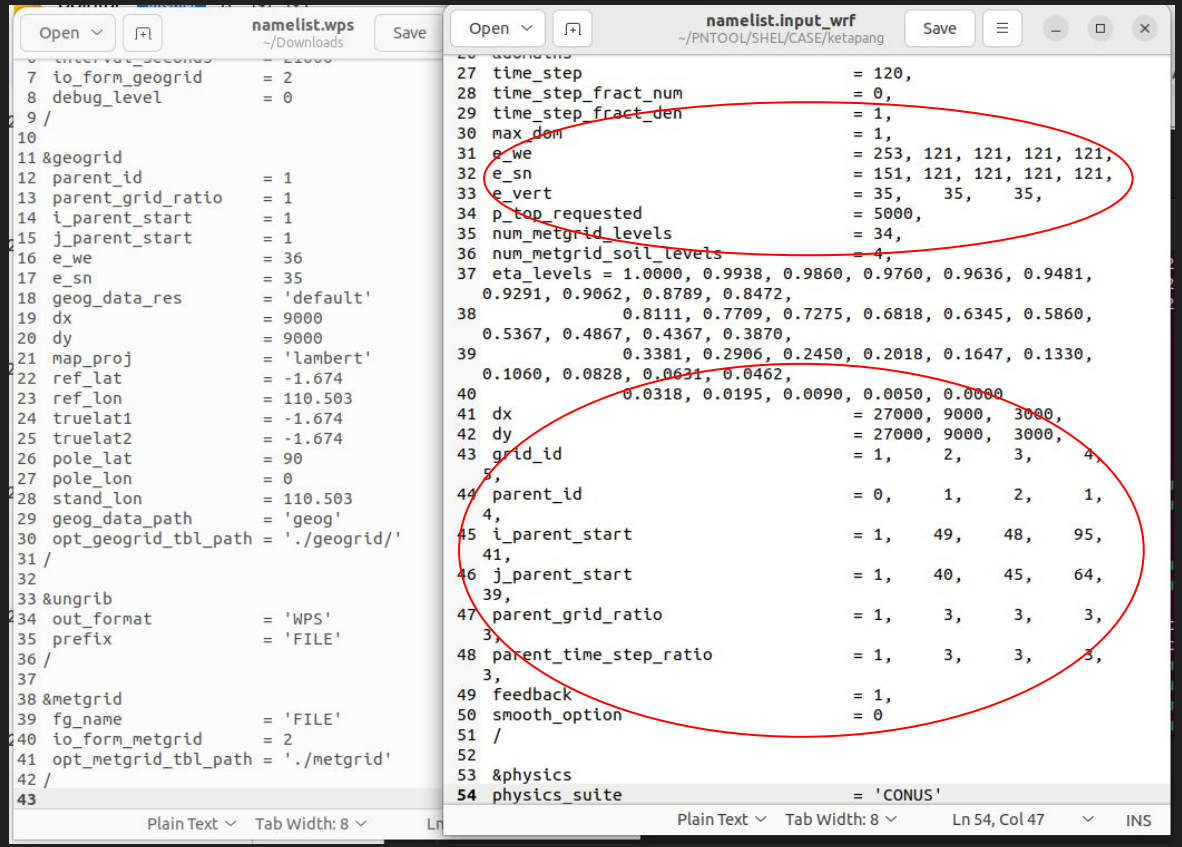
Plain Text Tab Width: 8 Ln

Open ~ namelist.wps ~/PNTOOL/SHEL/CASE/ketapang Save

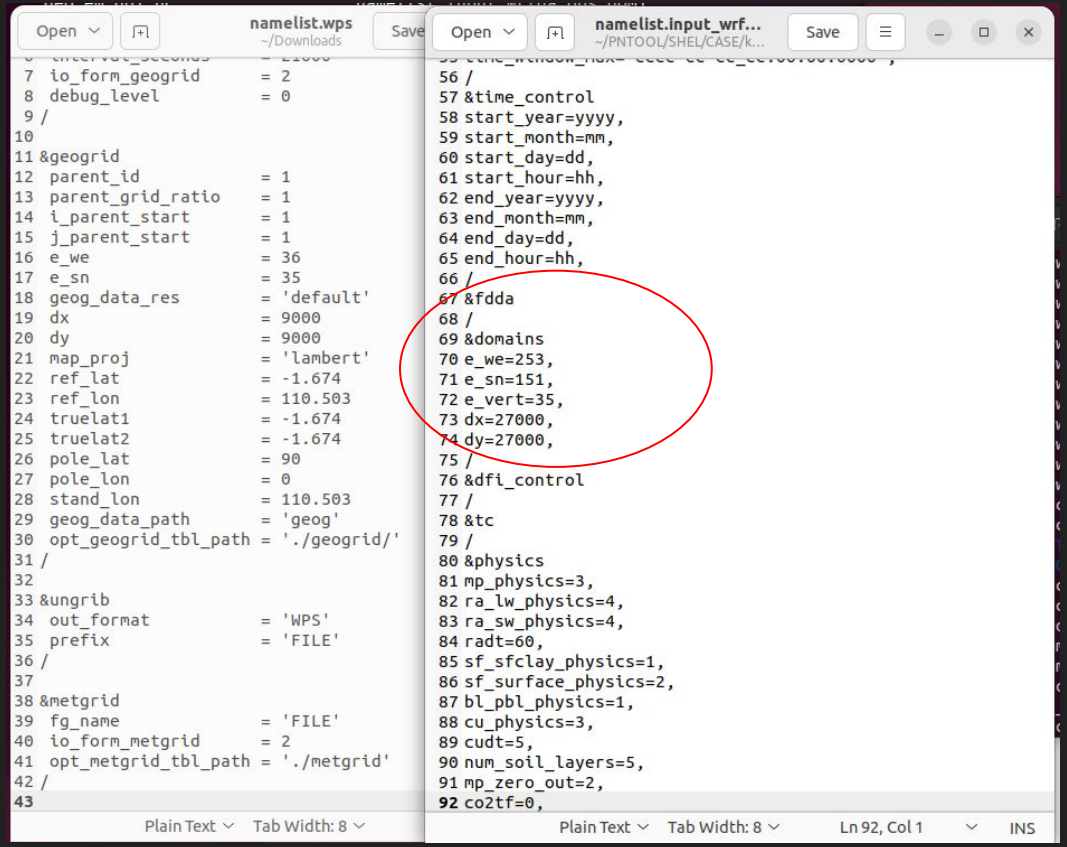
```
 6 interval_seconds = SSSSS
 7 io_form_geogrid = 2,
 8 /
 9
10 &geogrid
11  parent_id         =   1,   1,   2,   1,   4,
12  parent_grid_ratio =   1,   3,   3,   3,   3,
13  i_parent_start    =   1,  49,  48, 95,  41,
14  j_parent_start    =   1,  40,  45, 64,  39,
15  e_we              = 253, 121, 121, 121, 121,
16  e_sn              = 151, 121, 121, 121, 121,
17  !
18  !!!!!!!!!!!!!!!!!!!!!!!!!!!! IMPORTANT
  NOTE !!!!!!!!!!!!!!!!!!!!!!!!!!!!
19  ! The default datasets used to produce the MAXSNOALB and ALBEDO12M
20  ! fields have changed in WPS v4.0. These fields are now
  interpolated
21  ! from MODIS-based datasets.
22  !
23  ! To match the output given by the default namelist.wps in WPS
  v3.9.1,
24  ! the following setting for geog_data_res may be used:
25  !
26  ! geog_data_res = 'maxsnowalb_ncep+albedo_ncep+default',
  'maxsnowalb_ncep+albedo_ncep+default',
27  !
28  !!!!!!!!!!!!!!!!!!!!!!!!!!!! IMPORTANT
  NOTE !!!!!!!!!!!!!!!!!!!!!!!!!!!!
29  !
30  geog_data_res = 'default','default',
31  dx = 27000,
32  dy = 27000,
33  map_proj = 'mercator',
34  ref_lat   = -2.5,
35  ref_lon   = 120.0,
36  truelat1  = -2.5,
37  truelat2  = -2.5,
```

Plain Text Tab Width: 8 Ln 6, Col 3 INS

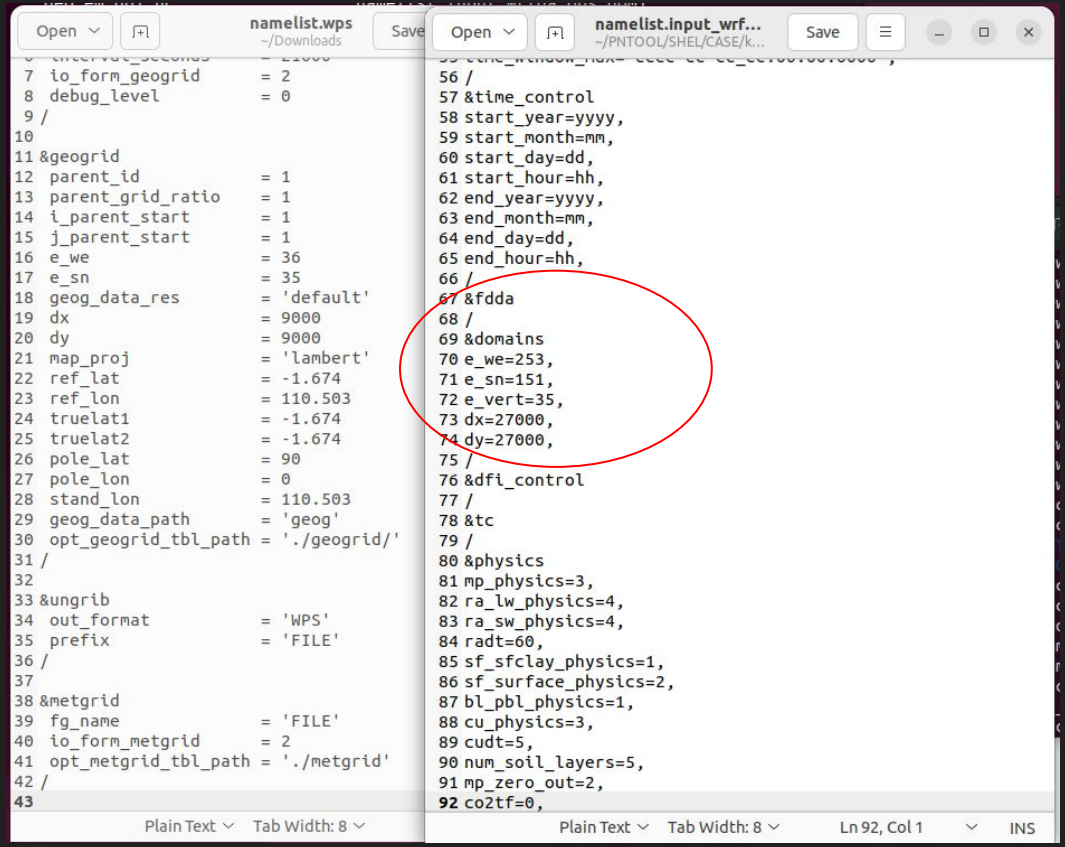
namelist.input_wrf



namelist.input_wrda_buf_dom1



namelist.input_wrda_obs_dom1



namelist.wps
~/Downloads

```
 7  io_form_geogrid       = 2
 8  debug_level           = 0
 9 /
10
11 &geogrid
12  parent_id             = 1
13  parent_grid_ratio     = 1
14  i_parent_start        = 1
15  j_parent_start        = 1
16  e_we                  = 36
17  e_sn                  = 35
18  geog_data_res         = 'default'
19  dx                    = 9000
20  dy                    = 9000
21  map_proj              = 'lambert'
22  ref_lat               = -1.674
23  ref_lon               = 110.503
24  truelat1              = -1.674
25  truelat2              = -1.674
26  pole_lat              = 90
27  pole_lon              = 0
28  stand_lon             = 110.503
29  geog_data_path        = 'geog'
30  opt_geogrid_tbl_path  = './geogrid/'
31 /
32
33 &ungrib
34  out_format            = 'WPS'
35  prefix                = 'FILE'
36 /
37
38 &metgrid
39  fg_name               = 'FILE'
40  io_form_metgrid       = 2
41  opt_metgrid_tbl_path  = './metgrid'
42 /
43
```

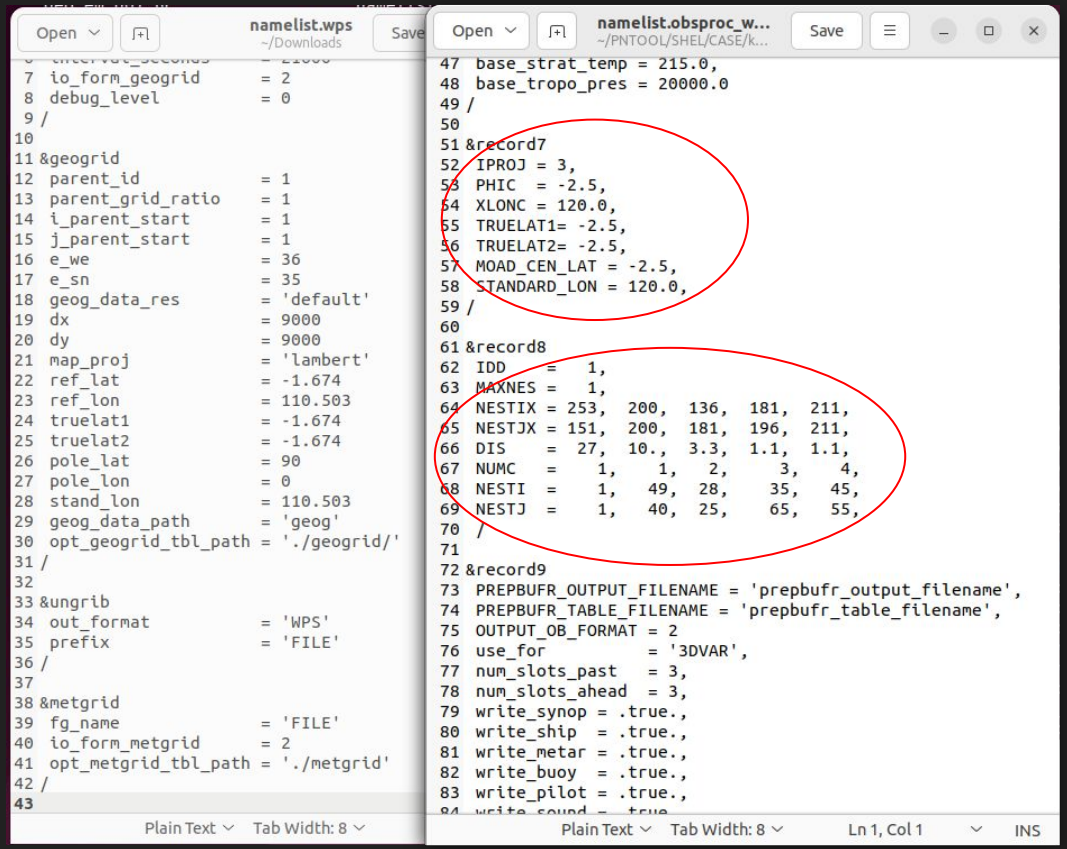
Plain Text Tab Width: 8

namelist.input_wrf...
~/PNTOOL/SHEL/CASE/k...

```
56 /
57 &time_control
58 start_year=yyyy,
59 start_month=mm,
60 start_day=dd,
61 start_hour=hh,
62 end_year=yyyy,
63 end_month=mm,
64 end_day=dd,
65 end_hour=hh,
66 /
67 &fdda
68 /
69 &domains
70 e_we=253,
71 e_sn=151,
72 e_vert=35,
73 dx=27000,
74 dy=27000,
75 /
76 &dfi_control
77 /
78 &tc
79 /
80 &physics
81 mp_physics=3,
82 ra_lw_physics=4,
83 ra_sw_physics=4,
84 radt=60,
85 sf_sfclay_physics=1,
86 sf_surface_physics=2,
87 bl_pbl_physics=1,
88 cu_physics=3,
89 cudt=5,
90 num_soil_layers=5,
91 mp_zero_out=2,
92 co2tf=0,
```

Plain Text Tab Width: 8 Ln 92, Col 1 INS

namelist.obsproc_wrda_obs_dom1



namelist.wps
~/Downloads

```
 7  io_form_geogrid       = 2
 8  debug_level           = 0
 9 /
10
11 &geogrid
12  parent_id             = 1
13  parent_grid_ratio     = 1
14  i_parent_start        = 1
15  j_parent_start        = 1
16  e_we                  = 36
17  e_sn                  = 35
18  geog_data_res         = 'default'
19  dx                    = 9000
20  dy                    = 9000
21  map_proj              = 'lambert'
22  ref_lat               = -1.674
23  ref_lon               = 110.503
24  truelat1              = -1.674
25  truelat2              = -1.674
26  pole_lat              = 90
27  pole_lon              = 0
28  stand_lon             = 110.503
29  geog_data_path        = 'geog'
30  opt_geogrid_tbl_path  = './geogrid/'
31 /
32
33 &ungrib
34  out_format            = 'WPS'
35  prefix                = 'FILE'
36 /
37
38 &metgrid
39  fg_name               = 'FILE'
40  io_form_metgrid       = 2
41  opt_metgrid_tbl_path  = './metgrid'
42 /
43
```

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namelist.obsproc_w...
~/PNTOOL/SHEL/CASE/k...

```
47  base_strat_temp = 215.0,
48  base_tropo_pres = 20000.0
49 /
50
51 &record7
52  IPROJ = 3,
53  PHIC  = -2.5,
54  XLONC = 120.0,
55  TRUELAT1= -2.5,
56  TRUELAT2= -2.5,
57  MOAD_CEN_LAT = -2.5,
58  STANDARD_LON = 120.0,
59 /
60
61 &record8
62  IDD    =   1,
63  MAXNES =   1,
64  NESTIX = 253,  200,  136,  181,  211,
65  NESTJX = 151,  200,  181,  196,  211,
66  DIS    =  27,  10.,  3.3,  1.1,  1.1,
67  NUMC   =   1,    1,   2,    3,    4,
68  NESTI  =   1,   49,  28,   35,   45,
69  NESTJ  =   1,   40,  25,   65,   55,
70  /
71
72 &record9
73  PREPBUFR_OUTPUT_FILENAME = 'prepbufr_output_filename',
74  PREPBUFR_TABLE_FILENAME = 'prepbufr_table_filename',
75  OUTPUT_OB_FORMAT = 2
76  use_for          = '3DVAR',
77  num_slots_past   = 3,
78  num_slots_ahead  = 3,
79  write_synop = .true.,
80  write_ship  = .true.,
81  write_metar = .true.,
82  write_buoy  = .true.,
83  write_pilot = .true.,
```

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References

- https://docs.google.com/document/d/1Agpabjw5fSUD0EH1Fbmt-xdLXp3s0EOJY_SW0CSyxXs/edit
- https://www2.mmm.ucar.edu/wrf/users/docs/user_guide_v4/v4.4/contents.html
- https://www.ncl.ucar.edu/
- https://jiririchter.github.io/WRFDomainWizard/
- https://github.com/harphub/harp

Thank You