1ª Monan Regional Model Training
06/08/2024
14h00 -16h45

Paulo Yoshio Kubota

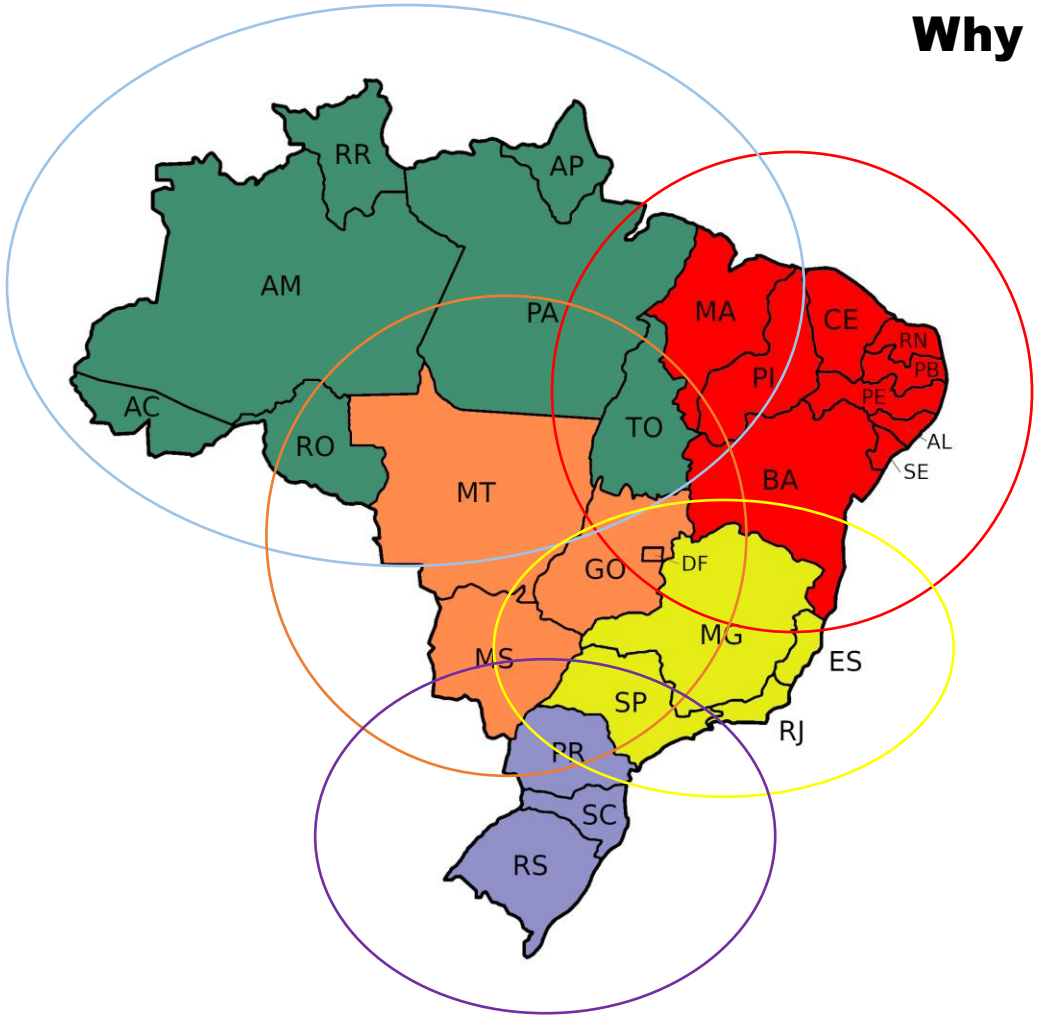
Monan Regional Model Training

14:00-15:30 - Parte1

Paulo Yoshio Kubota

a) Overview
b) Download
c) Setup modules
d) Copy data
e) Compiles Tools Pre-processing Source
f) Compile Model Source
g) Compile Post-Processing Source
h) Control Execution Scripts

1-Objectives/Planning



Why Invest in the MONAN-Regional setup?

"Limited Computational Availability.

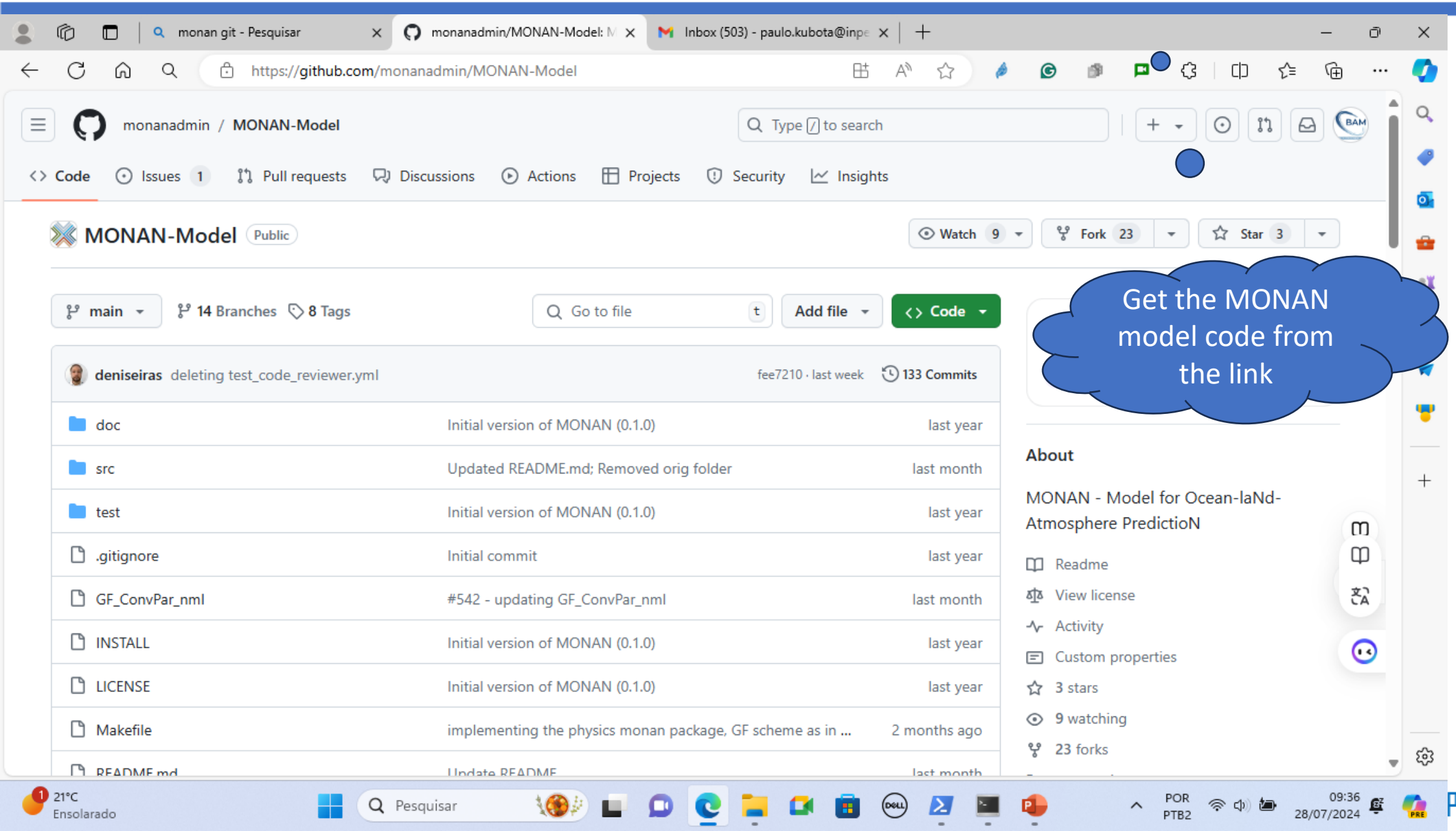
Each region has individual NWP needs.

Physical processes of different scales act differently in each region.

Collaboration in the exchange of information about the skill of the MONAN model for each region.

Collaboration between meteorological centers, universities, companies, etc."

Link oficial https://github.com/monanadmin/MONAN-Model.git



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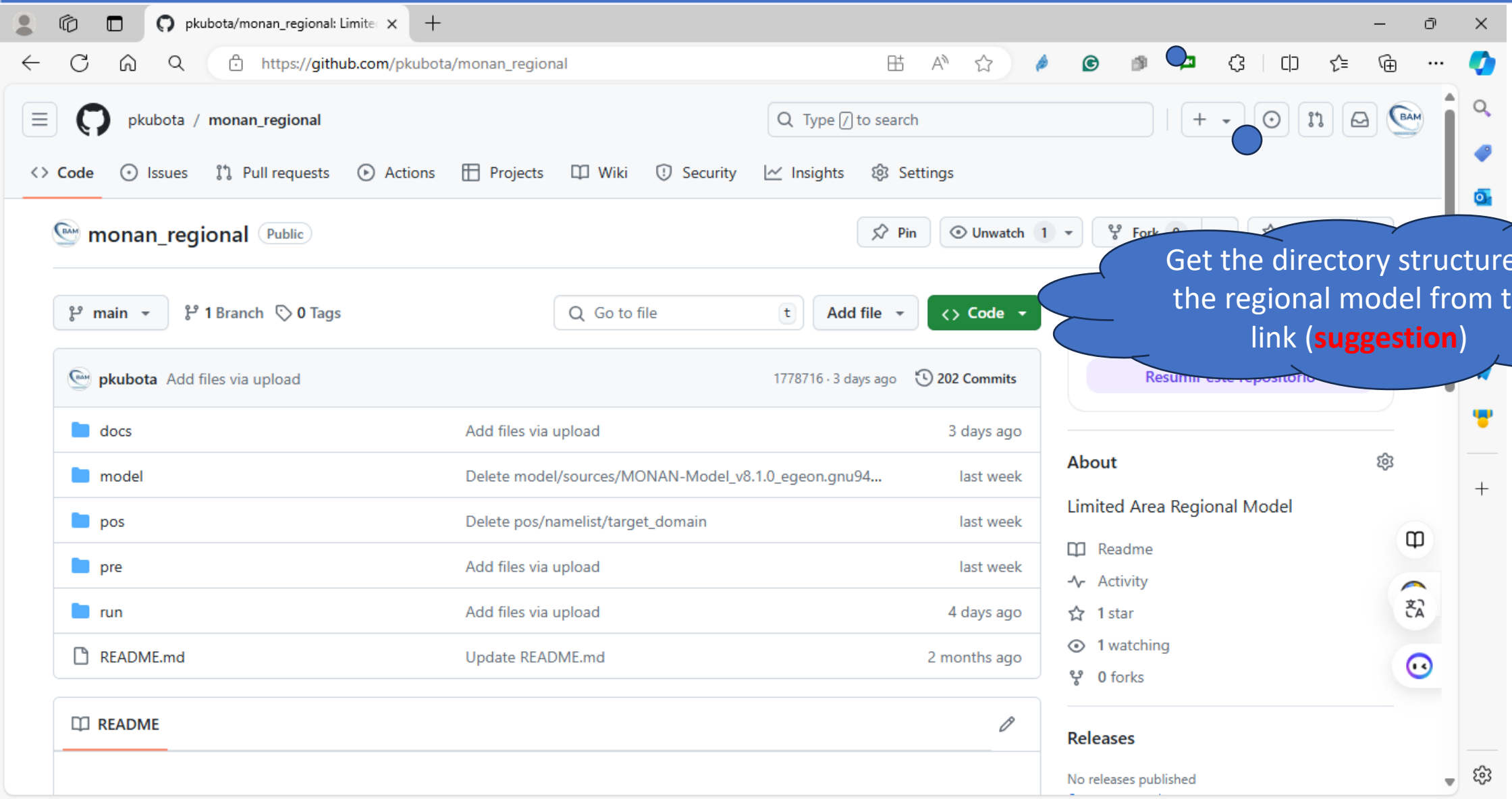
Link pessoal

git clone https://github.com/pkubota/monan_regional.git



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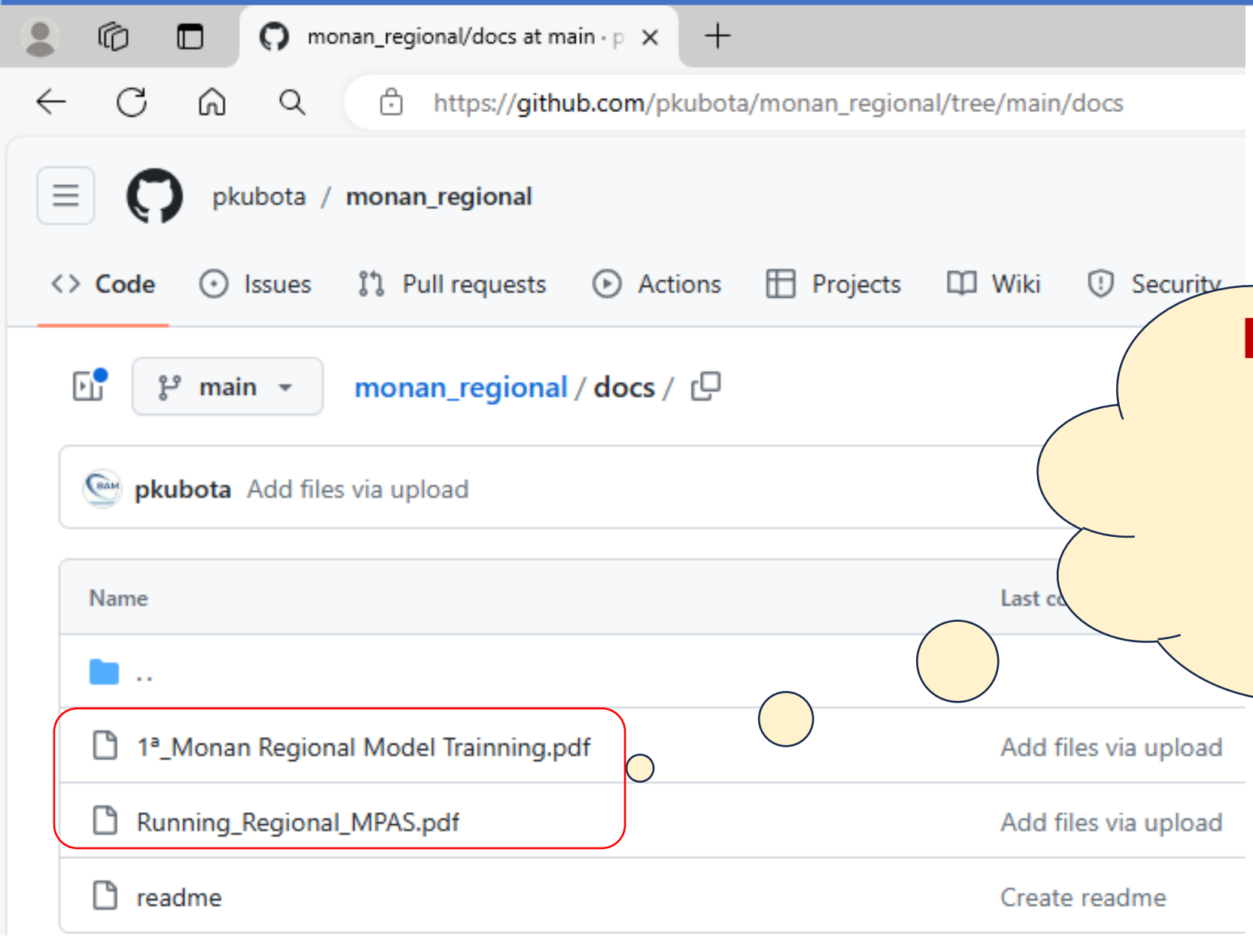
Link pessoal

git clone https://github.com/pkubota/monan_regional.git



Download the PDF files to follow the training instructions

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Now the training of the MONAN/MPAS regional model will start

Step 1 - Download Structure of the MONAN-Regional

```
ssh -YC  aluno##@egeon-login.cptec.inpe.br
```

```
[aluno##@egeon-login1 ~]$ pwd
 /home/aluno##
```

slow hard disk

```
[aluno##@egeon-login1 ~]$ cd /mnt/beegfs/aluno##
```

change directory

```
[aluno##@egeon-login1 aluno##]$ pwd
/mnt/beegfs/aluno##
```

fast hard disk

Download monan_regional

```
[aluno##@egeon-login1 aluno##]$ git  clone  https://github.com/pkubota/monan_regional.git
```

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Step 2 - Download Structure of the MONAN-Regional

```
git  clone  https://github.com/pkubota/monan_regional.git
```

Step 3 - Structure of the monan_regional

```
 [aluno##@egeon-login1 aluno##]$ pwd
/mnt/beegfs/aluno##
```

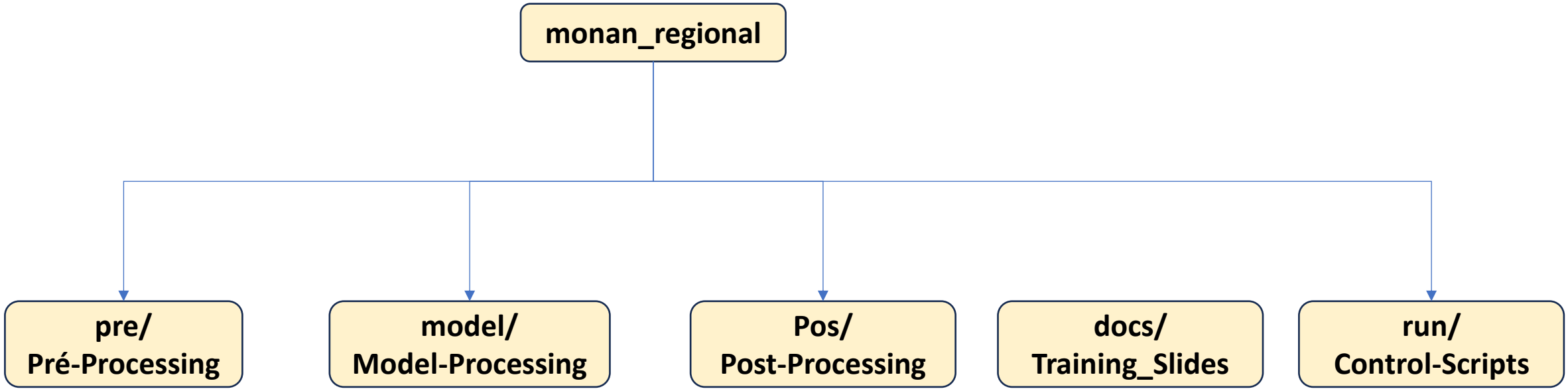
check the directory

```
[aluno##@egeon-login1 aluno##]$ cd  monan_regional
```

change directory to the main directory of the model

```
aluno##@egeon-login1 monan_regional]$ ls
```

List files/directories



Step 4 - Model control script permission change

```
aluno##@egeon-login1 monan_regional]$ pwd
/mnt/beegfs/aluno##/monan_regional
```

check the directory

```
[aluno##@egeon-login1 monan_regional]$ cd  run
```

change directory

```
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional/run
```

check the directory

```
[aluno##@egeon-login1 run]$ chmod 777 *
```

permission change

```
[aluno##@egeon-login1 run]$ ls
copy_data.bash          load_monan_app_modules.sh
readme                  run_GradsCtl.bash
runModel.bash           runPost.bash
runPre.bash             scripts
```

List files

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Load Modules (Necessary libraries)

Step 5 – Load the necessary modules

```
[aluno##@egeon-login1 run]$ source     load_monan_app_modules.sh
```

```
pip install netCDF4
```

```
[aluno##@egeon-login1 run]$ pip install netCDF4
```

Required for the
MPAS-Limited-Area python package

```
pip install numpy
```

```
[aluno##@egeon-login1 run]$ pip install numpy
```

```
[aluno##@egeon-login1 run]$ source     load_module_gnu_lib.bash
```

Copy /Data/Table/Exec

Step 6 - Copy of fixed data, tables, and scripts

```
[aluno##@egeon-login1 run]$ ./copy_data.bash
```

albedo_modis	hcnvx	landuse_30s_with_lakes	orogwd_1deg	ssib_landuse_10m
albedo_ncep	hlennw	landuse_5m	orogwd_20m	ssib_landuse_5m
bnu_soiltype_bot	hlens	maxsnowalb	orogwd_2deg	topo_10m
bnu_soiltype_top	hlensw	maxsnowalb_modis	orogwd_30m	topo_2m
clayfrac_5m	hlenw	modis_landuse_20class_15s	readme	topo_30s
crop	hslop	modis_landuse_20class_30s	sandfrac_5m	topo_5m
erod	hstdv	modis_landuse_20class_30s_with_lakes	soiltemp_1deg	topo_gmted2010_30s
greenfrac	hzmax	modis_landuse_21class_30s	soiltype_bot_10m	varsso
greenfrac_fpar_modis	islope	nlcd2006_ll_30s	soiltype_bot_2m	varsso_10m
hangl	lai_modis_10m	nlcd2006_ll_9s	soiltype_bot_30s	varsso_2m
hanis	lai_modis_30s	nlcd2011_can_ll_9s	soiltype_bot_5m	varsso_5m
hasynw	lake_depth	nlcd2011_imp_ll_9s	soiltype_top_10m	
hasys	landuse_10m	nudapt44_1km	soiltype_top_2m	
hasysw	landuse_2m	NUDAPT44_1km	soiltype_top_30s	
hasyw	landuse_30s	orogwd_10m	soiltype_top_5m	

Compiles Source Grid_Rotate

Step 7 – Compile Preprocessing Tools

```
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional/run
```

check the directory

```
[aluno##@egeon-login1 run]$ cd ..
[aluno##@egeon-login1 monan_regional]$ ls
model  pos  pre  README.md  run
```

Return to the main directory

```
[aluno##@egeon-login1 monan_regional]$ pwd
/mnt/beegfs/aluno##/tmp/monan_regional
```

check the directory

change directory

```
[aluno##@egeon-login1 monan_regional]$ cd pre/sources/MPAS-Tools/grid_rotate/
```

```
 [aluno##@egeon-login1 grid_rotate]$ pwd
/mnt/beegfs/aluno##/monan_regional/pre/sources/MPAS-Tools/grid_rotate
```

check the directory

```
[aluno##@egeon-login1 grid_rotate]$ make
```

Compile program

Step 7 – Compile Preprocessing Tools

```
[aluno##@egeon-login1 grid_rotate]$ pwd
/mnt/beegfs/aluno##/monan_regional/pre/sources/MPAS-Tools/grid_rotate
```

check the directory

```
[aluno##@egeon-login1 grid_rotate]$ls /mnt/beegfs/aluno##/monan_regional/pre/exec
```

List files

```
grid_rotate   readme   ungrib.exe
```

Check if the executable (`grid_rotate`) have been generated at the exec directory

Compiles Source model

Step 8 – Compile Model

```
[aluno##@egeon-login1 grid_rotate]$ pwd
/mnt/beegfs/aluno##/monan_regional/pre/sources/MPAS-Tools/grid_rotate
```

check the directory

```
[aluno##@egeon-login1 run]$ cd ../../../../
[aluno##@egeon-login1 monan_regional]$ pwd
/mnt/beegfs/aluno##/monan_regional
```

Return to the main directory

```
[aluno##@egeon-login1 monan_regional]$ ls
model  pos  pre  README.md  run
```

List files

change directory

```
[aluno##@egeon-login1 monan_regional]$ cd model/sources/MONAN-Model_v1.0.0_egeon.gnu940
```

```
[aluno##@egeon-login1 MONAN-Model_v1.0.0_egeon.gnu940]$ pwd
/mnt/beegfs/aluno##/monan_regional/model/sources/MONAN-Model_v1.0.0_egeon.gnu940
```

check the directory

```
[aluno##@egeon-login1 MONAN-Model_v1.0.0_egeon.gnu940]$ tar -zxvf MONAN-Model_v1.0.0_egeon.gnu940.tar.gz
```

```
[aluno##@egeon-login1 MONAN-Model_v1.0.0_egeon.gnu940]$ ./make.sh
```

Compile program

Step 8 – Compile Model

```
[aluno##@egeon-login1 MONAN-Model_v1.0.0_egeon.gnu940]$ pwd
/mnt/beegfs/aluno##/monan_regional/model/sources/MONAN-Model_v1.0.0_egeon.gnu940
```

check the directory

List files

```
[aluno##@egeon-login1 grid_rotate]$ ls  /mnt/beegfs/aluno##/monan_regional/model/exec/MONAN-Model_v1.0.0_egeon.gnu940/exec
```

```
atmosphere_model  build_tables
init_atmosphere_model
```

Check if the executables have been generated at the exec directory

Compiles Source Post-Processing

Step 9 – Post-processing

```
[aluno##@egeon-login1 monan_regional]$ pwd
/mnt/beegfs/aluno##/monan_regional/model/sources/MONAN-Model_v1.0.0_egeon.gnu940
```

check the directory

```
[aluno##@egeon-login1 run]$ cd ../../../
[aluno##@egeon-login1 monan_regional]$ pwd
/mnt/beegfs/aluno##/monan_regional
```

Return to the main directory

```
[aluno##@egeon-login1 monan_regional]$ ls
model  pos  pre  README.md  run
```

List files

```
[aluno##@egeon-login1 monan_regional]$ cd pos/sources/convert_mpas_v0.1.0_egeon.gnu940
```

change directory

```
[aluno##@egeon-login1 convert_mpas_v0.1.0_egeon.gnu940]$ pwd
/mnt/beegfs/aluno##/monan_regional/pos/sources/convert_mpas_v0.1.0_egeon.gnu940
```

check the directory

```
[aluno##@egeon-login1 convert_mpas_v0.1.0_egeon.gnu940]$ tar -zxvf convert_mpas_v0.1.0_egeon.gnu940.tar.gz
```

```
[paulo.kubota@egeon-login1 convert_mpas_v0.1.0_egeon.gnu940]$ ./make.sh
```

Compile program

Step 9 – Post-processing

```
[aluno##@egeon-login1 convert_mpas_v0.1.0_egeon.gnu940]$ pwd
/mnt/beegfs/aluno##/tmp/monan_regional/pos/sources/convert_mpas_v0.1.0_egeon.gnu940
```

check the directory

List files

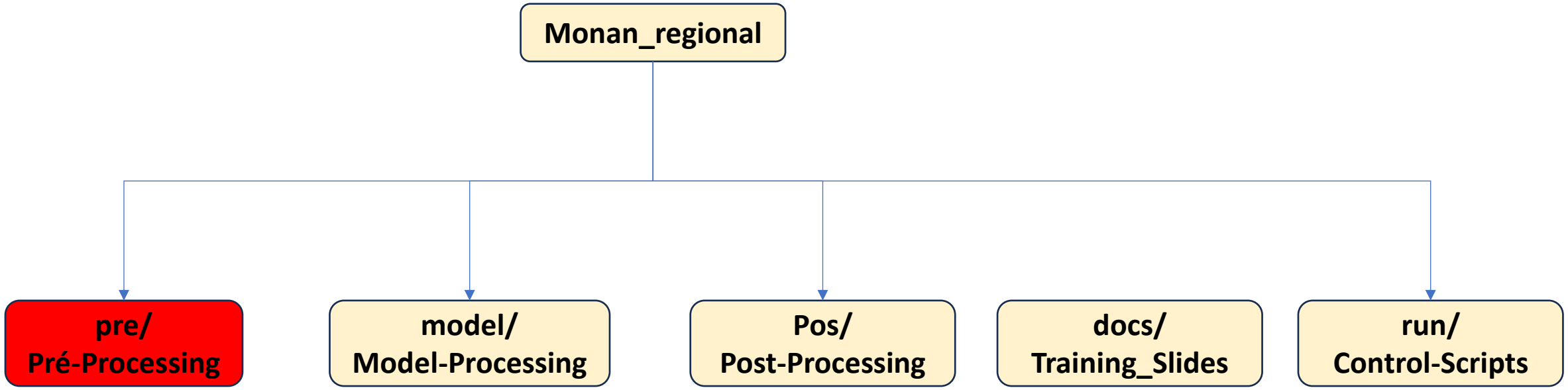
```
[aluno##@egeon-login1 grid_rotate]$  ls  /mnt/beegfs/aluno##/monan_regional/pos/exec/convert_mpas_v0.1.0_egeon.gnu940/exec
```

```
convert_mpas
```

Check if the executable have been generated at the exec directory

Structure of the MONAN

Structure of the MONAN



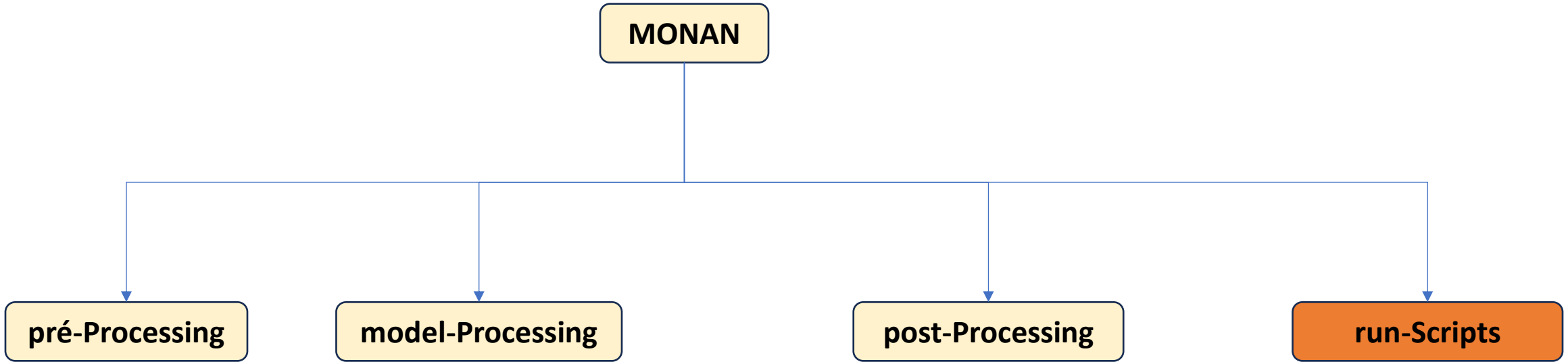
Pré-Processing

Step 10 – Execution Control

```
[aluno##@egeon-login1 convert_mpas_v0.1.0_egeon.gnu940]$ cd /mnt/beegfs/aluno##/monan_regional
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional
```

Return to the main directory

```
[aluno##@egeon-login1 monan_regional]$ ls
```



Step 10 – Execute Pre-processing Scripts Control

```
[aluno##@egeon-login1 aluno##]$ pwd
/mnt/beegfs/aluno##
```

check the directory

```
[aluno##@egeon-login1 aluno##]$ cd  monan_regional/run
```

change directory

```
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional/run
```

check the directory

```
[aluno##@egeon-login1 run]$ ./runPre.bash
```

Execute the script without passing the arguments

```
[aluno##@egeon-login1 run]$ ./runPre.bash
.........................................
.........................................
.........................................
.
```

check the information

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Step 10 – Execute Pre-processing Scripts Control

```
[aluno##@egeon-login1 run]$ ./runPre.bash
```

```
+ '[' -z '' ']'
+ unset __lmod_vx
+ '[' 0 -ne 7 ']'
+ usage
+ sed -n '/^# !CALLING SEQUENCE:/,/^# !/{p}' ./runPre.bash
+ head -n -1
# !CALLING SEQUENCE:
#
#./runPre.bash EXP_NAME EXP_RES   LABELI      LABELF      Domain    AreaRegion   TypeGrid
#
#           o EXP_NAME   : Forcing: ERA5, GFS, etc.
#           o EXP_RES    : Resolution: 1024002 (24km), 2621442
#           o LABELI     : Initial: date 2015030600
#           o LABELF     : End:     date 2015030600
#           o Domain     : global  or regional
#           o AreaRegion : Sul, Nordeste, Norte, Sudeste, CentroOeste, Peru, Argentina
#           o TypeGrid   : quasi_uniform or variable_resolution
#
# For benchmark:
#
#./runPre.bash    GFS   163842   2024042700  2024050100  regional  Sul  variable_resolution
#
#
+ exit 1
```

Execution Control

Step 10 – Execute Pre-processing Scripts Control

```
[aluno##@egeon-login1 run]$ ./runPre.bash  GFS 163842 2024042700  2024050100  regional Peru  variable_resolution
```


```
Sul
Nordeste
Norte
Sudeste
CentroOeste
Peru
Argentina
```

```
$ more Peru.ellipse.pts
```

```
Name: Peru
Type: ellipse
Point: -12.0431800, -77.0282400
Semi-major-axis: 1000000     # at Meters
Semi-minor-axis: 1000000     # at Meters
Orientation-angle: 45
```

Step 10 – Execute Pre-processing Scripts Control

```
[aluno##@egeon-login1 run]$ ./runPre.bash  GFS 163842 2024042700  2024050100  regional Argentina  variable_resolution
```

Sul
Nordeste
Norte
Sudeste
CentroOeste
Peru
Argentina

```
$ more Argentina.ellipse.pts
```

```
Name: Argentina
Type: ellipse
Point: -36.6203, -64.2906
Semi-major-axis: 1000000    # at Meters
Semi-minor-axis: 1000000    # at Meters
Orientation-angle: 45
```

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Step 11 – Execute Pre-processing Scripts Control

```
Group-1
[aluno##@egeon-login1 run]$./runPre.bash  GFS 163842 2024042700 2024042800  regional  Sul           variable_resolution
Group-2
[aluno##@egeon-login1 run]$./runPre.bash  GFS 163842 2024042700 2024042800  regional  Sudeste       variable_resolution
Group-3
[aluno##@egeon-login1 run]$./runPre.bash  GFS 163842 2024042700 2024042800  regional  Nordeste      variable_resolution
Group-4
[aluno##@egeon-login1 run]$./runPre.bash  GFS 163842 2024042700 2024042800  regional  Norte         variable_resolution
Group-5
[aluno##@egeon-login1 run]$./runPre.bash  GFS 163842 2024042700 2024042800  regional  CentroOeste   variable_resolution
Group-6
[aluno##@egeon-login1 run]$./runPre.bash  GFS 163842 2024042700 2024042800  regional  Peru         variable_resolution
Group-7
[aluno##@egeon-login1 run]$./runPre.bash  GFS 163842 2024042700 2024042800  regional  Argentina     variable_resolution
```

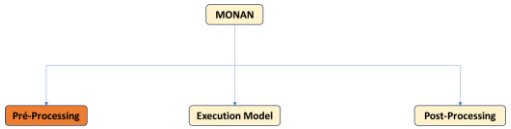
Step 11 – Execute Pre-processing Scripts Control

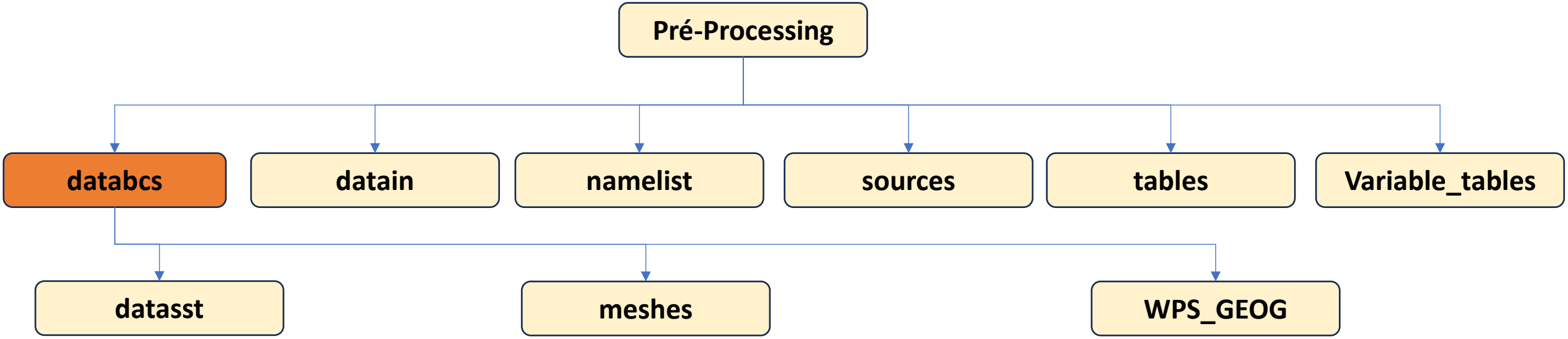
```
Group-1
[aluno##@egeon-login1 run]$./runPre.bash   GFS 163842 2024042700 2024042800  regional  Sul          variable_resolution
Group-2
[aluno##@egeon-login1 run]$./runPre.bash   GFS 163842 2024042700 2024042800  regional  Sudeste      variable_resolution
Group-3
[aluno##@egeon-login1 run]$./runPre.bash   GFS 163842 2024042700 2024042800  regional  Nordeste     variable_resolution
Group-4
[aluno##@egeon-login1 run]$./runPre.bash   GFS 163842 2024042700 2024042800  regional  Norte        variable_resolution
Group-5
[aluno##@egeon-login1 run]$./runPre.bash   GFS 163842 2024042700 2024042800  regional  CentroOeste  variable_resolution
Group-6
[aluno##@egeon-login1 run]$./runPre.bash   GFS 163842 2024042700 2024042800  regional  Peru         variable_resolution
Group-7
[aluno##@egeon-login1 run]$./runPre.bash   GFS 163842 2024042700 2024042800  regional  Argentina    variable_resolution
```

Please run the script runPre.bash

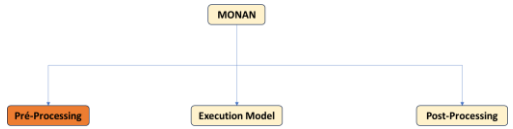
“Choose one of the region options”

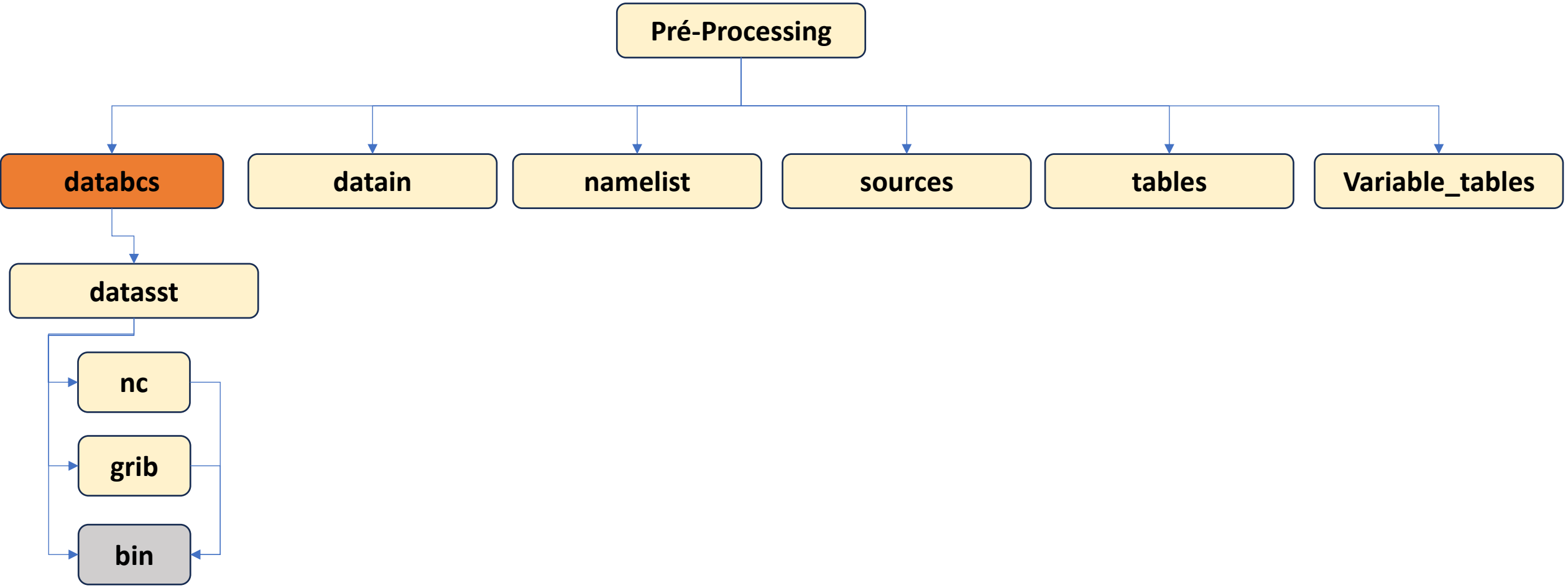
Pré-Processing





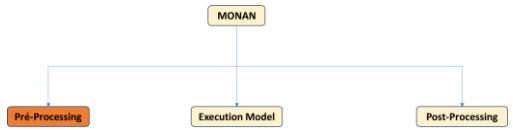
Pré-Processing






```
SST:1997-01-01_00  SST:1997-08-08_00  SST:1998-03-15_00  SST:1998-10-20_00  SST:1999-05-27_00
SST:1997-01-02_00  SST:1997-08-09_00  SST:1998-03-16_00  SST:1998-10-21_00  SST:1999-05-28_00
SST:1997-01-03_00  SST:1997-08-10_00  SST:1998-03-17_00  SST:1998-10-22_00  SST:1999-05-29_00
SST:1997-01-04_00  SST:1997-08-11_00  SST:1998-03-18_00  SST:1998-10-23_00  SST:1999-05-30_00
```

Pré-Processing



Pré-Processing

databcs | datain | namelist | sources | tables | Variable_tables

meshes

https://mpas-dev.github.io/atmosphere/atmosphere_meshes.html

variable_resolution
- global: 060-003km | 060-010km | 015-003km | 046-012km | 060-015km
- regional: 060-003km | 060-010km | 015-003km | 046-012km | 060-015km

quasi_uniform
- global: 003_km | 015_km | 024_km | 030_km | 120_km
- regional: 003_km | 015_km | 024_km | 030_km | 120km

regional_domain

mesh_generation

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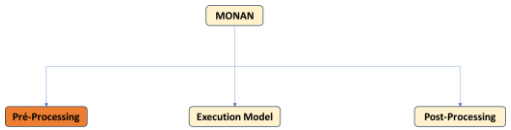
Pré-Processing



Pré-Processing

databcs | datain | namelist | sources | tables | Variable_tables

meshes

https://mpas-dev.github.io/atmosphere/atmosphere_meshes.html

variable_resolution

- global: 060-003km | 060-010km | 015-003km | 046-012km | 060-015km
- regional: 060-003km | 060-010km | 015-003km | 046-012km | 060-015km

quasi_uniform

regional_domain

mesh_generation

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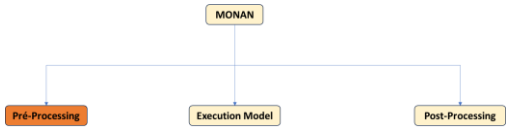
Pré-Processing



Variable-resolution meshes

92-km – 25-km mesh

This mesh contains 163842 horizontal grid cells, with the refinement region spanning approximately 60 degrees of latitude/longitude.

46-km – 12-km mesh

This mesh is like the 92-km – 25-km mesh, but with twice the horizontal resolution and 655362 horizontal grid cells.

60-km – 15-km mesh

This mesh contains 535554 horizontal grid cells, with the refinement region spanning approximately 55 degrees of latitude and 110 degrees of longitude.

60-km – 10-km mesh

This mesh contains 999426 horizontal grid cells, with the refinement region spanning approximately 80 degrees of latitude/longitude.

60-km – 3-km mesh

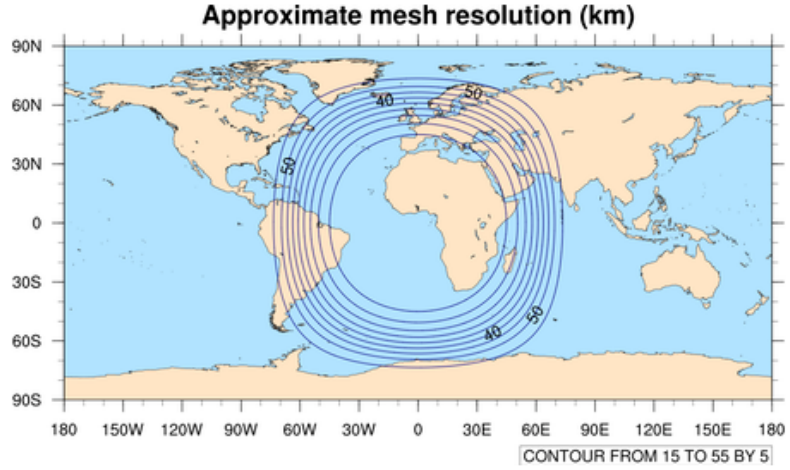
This mesh contains 835586 horizontal grid cells, with the refinement region spanning approximately 16 degrees of latitude/longitude.

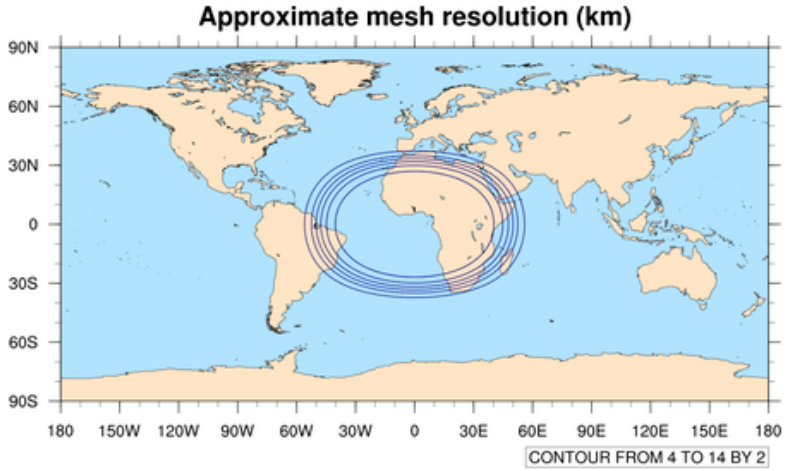
15-km – 3-km mesh (Circular refinement)

This mesh contains 6488066 horizontal grid cells, with the circular refinement region spanning approximately 60 degrees of latitude/longitude.

15-km – 3-km mesh (Elliptical refinement)

This mesh contains x5.8060930 horizontal grid cells, with the elliptical refinement region spanning approximately 60 degrees of latitude and 80 degrees of longitude.





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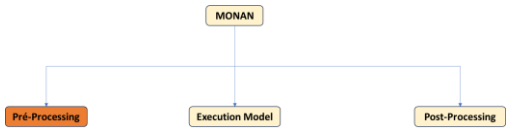
Pré-Processing



Pré-Processing

databcs | datain | namelist | sources | tables | Variable_tables

meshes

https://mpas-dev.github.io/atmosphere/atmosphere_meshes.html

variable_resolution
- global: 060-003km | 060-010km | 015-003km | 046-012km | 060-015km
- regional: 060-003km | 060-010km | 015-003km | 046-012km | 060-015km

quasi_uniform
- global: 003_km | 015_km | 024_km | 030_km | 120_km
- regional: 003_km | 015_km | 024_km | 030_km | 120km

regional_domain

mesh_generation

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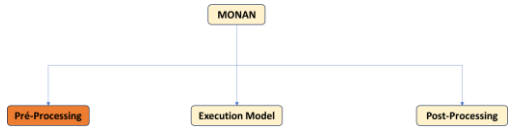
Pré-Processing



Quasi-uniform meshes and static files

480-km mesh (2562 horizontal grid cells)

Download the 480-km mesh (1.5 MB)
Download the 480-km static file (1.0 MB)

384-km mesh (4002 horizontal grid cells)

Download the 384-km mesh (2.4 MB)
Download the 384-km static file (2.3 MB)

240-km mesh (10242 horizontal grid cells)

Download the 240-km mesh (6.3 MB)
Download the 240-km static file (4.0 MB)

120-km mesh (40962 horizontal grid cells)

Download the 120-km mesh (25.7 MB)
Download the 120-km static file (16.2 MB)

60-km mesh (163842 horizontal grid cells)

Download the 60-km mesh (106 MB)
Download the 60-km static file (69.6 MB)

48-km mesh (256002 horizontal grid cells)

Download the 48-km mesh (182 MB)
Download the 48-km static file (174 MB)

30-km mesh (655362 horizontal grid cells)

Download the 30-km mesh (436 MB)
Download the 30-km static file (296 MB)

24-km mesh (1024002 horizontal grid cells)

Download the 24-km mesh (685 MB)
Download the 24-km static file (525 MB)

15-km mesh (2621442 horizontal grid cells)

Download the 15-km mesh (1659 MB)
Download the 15-km static file (1366 MB)

12-km mesh (4096002 horizontal grid cells)

(Download link below following *Important notes*).

10-km mesh (5898242 horizontal grid cells)

(Download link below following *Important notes*).

7.5-km mesh (10485762 horizontal grid cells)

(Download link below following *Important notes*).

5-km mesh (23592962 horizontal grid cells)

(Download link below following *Important notes*).

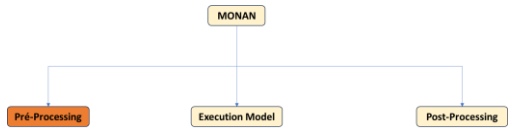
3.75-km mesh (41943042 horizontal grid cells)

(Download link below following *Important notes*).

3-km mesh (65536002 horizontal grid cells)

(Download link below following *Important notes*).

Pré-Processing



Download the 12-km mesh (2713 MB)
Download the 12-km static file (2447 MB)

Download the 10-km mesh (3916 MB)
Download the 10-km static file (2947 MB)

Download the 7.5-km mesh (6936 MB)
Download the 7.5-km static file (6489 MB)

Download the 5-km mesh (15487 MB)
Download the 5-km static file (14508 MB)

Download the 4-km mesh (23721 MB)
Download the 4-km static file (21458 MB)

Download the 3.75-km mesh (27246 MB)
Download the 3.75-km static file (25242 MB)

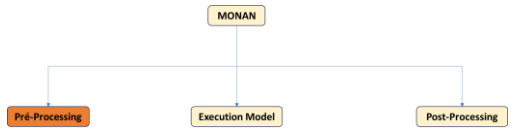
Download the 3-km mesh (42007 MB)
Download the 3-km static file (38624 MB)

Important notes for dense meshes

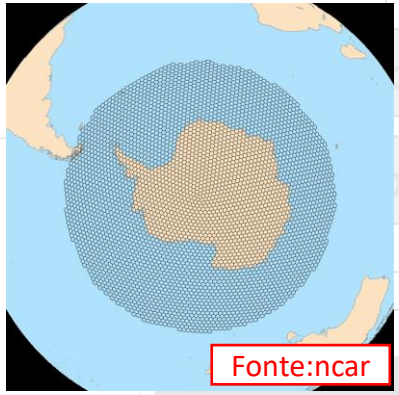
The 3-d fields that exist in the model at higher resolution can easily exceed the 4 GB limit imposed by the classic netCDF format. When creating atmospheric initial conditions (i.e., the "init.nc" file), and when writing output streams from the model with 3-d fields, **it is necessary to use an "io_type" that supports large variables, such as "pnetcdf,cdf5" or "netcdf4"**. For more information on selecting the "io_type" of a stream, refer to Chapter 5 in the Users' Guide.

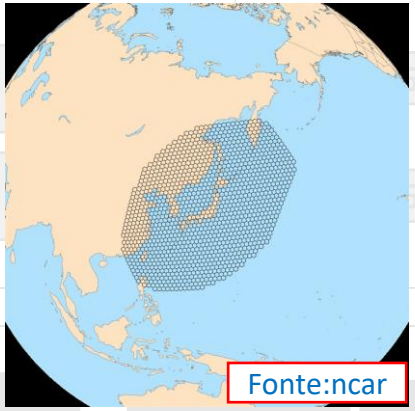
Note that when processing the GWDO static fields, each MPI task will need to allocate ~4 GB of additional memory to hold the global 30-arc-second terrain dataset. In many cases, under-subscribing batch nodes in order to avoid exceeding memory limits may be necessary.

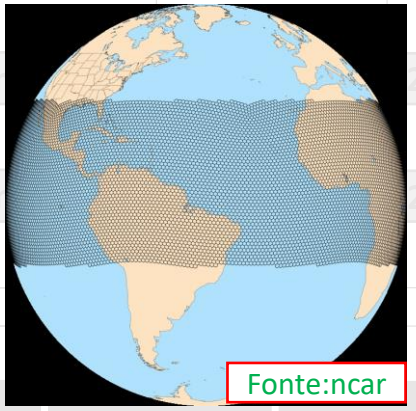
Pré-Processing

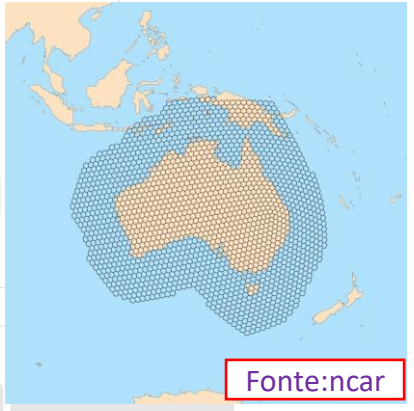


- Pré-Processing
  - databcs
    - meshes
      - variable_resolution
      - quasi_uniform
      - regional_domain
      - mesh_generation
  - datain
  - namelist
  - sources
  - tables
  - Variable_tables







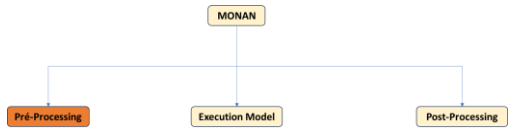


Various types of regions are supported to define areas: circles, ellipses, channels, and general polygons.

Antartida.circle.pts japan.ellipse.pts tropics.channel.pts Australia.custom.pts

Paulo Yoshio Kubota

Pré-Processing



For elliptical regions, the region definition looks like the following:

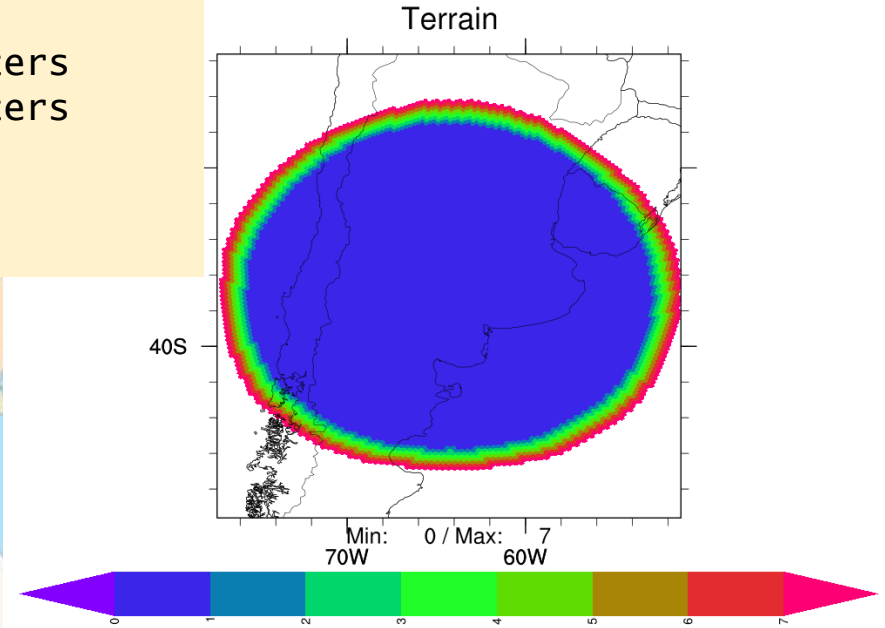
"Point" fornece a latitude e longitude no centro da elipse,

"Semi-major-axis" e "Semi-minor-axis" estão em metros,

"Orientation-angle" dá a rotação dos eixos da elipse.

```
Name: Sul
Type: ellipse
Point: -30.03306, -51.230000
Semi-major-axis: 1000000    # at Meters
Semi-minor-axis: 1000000    # at Meters
Orientation-angle: 45
```

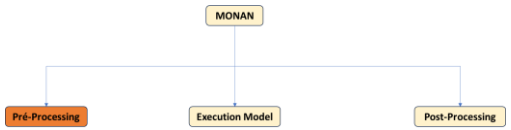
"Point" gives the latitude and longitude at the center of the ellipse, "Semi-major-axis" and "Semi-minor-axis" are in meters, and "Orientation-angle" gives the rotation of the axes of the ellipse

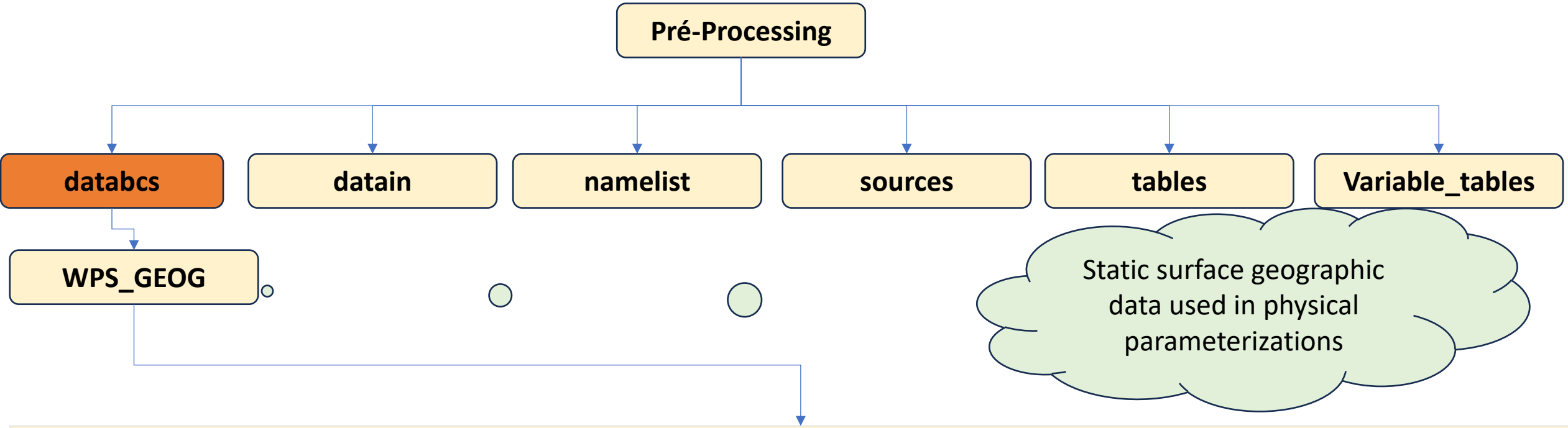


regional_domain

```
CentroOeste.ellipse.pts   PortoAlegre.ellipse.pts   Nordeste.ellipse.pts
Sudeste.ellipse.pts       Norte.ellipse.pts         Sul.ellipse.pts
Peru.ellipse.pts          Argentina.ellipse.pts
```

Pré-Processing





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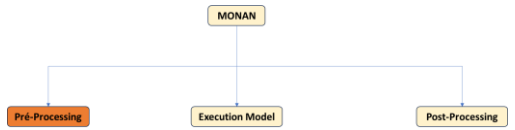
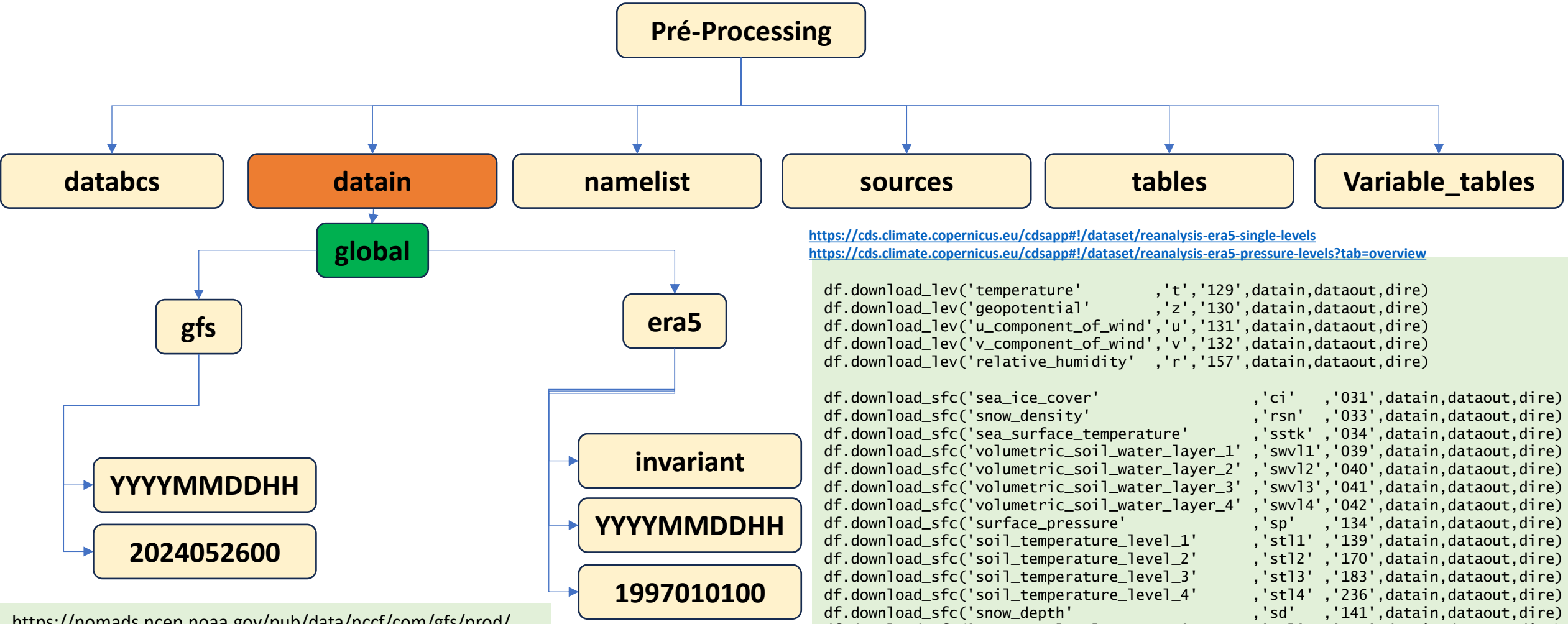
albedo_ncep	hasynw	hstdv	landuse_5m	nlcd2011_imp_ll_9s	soiltype_bot_10m	topo_10m
bnu_soiltype_bot	hasys	hzmax	maxsnowalb	nudapt44_1km	soiltype_bot_2m	topo_2m
bnu_soiltype_top	hasysw	islope	maxsnowalb_modis	NUDAPT44_1km	soiltype_bot_30s	topo_30s
clayfrac_5m	hasyw	lai_modis_10m	modis_landuse_20class_15s	orogwd_10m	soiltype_bot_5m	topo_5m
crop	hcnvx	lai_modis_30s	modis_landuse_20class_30s	orogwd_1deg	soiltype_top_10m	topo_gmted2010_30s
erod	hlennw	lake_depth	modis_landuse_20class_30s_with_lakes	orogwd_20m	soiltype_top_2m	varsso
greenfrac	hlens	landuse_10m	modis_landuse_21class_30s	orogwd_2deg	soiltype_top_30s	varsso_10m
greenfrac_fpar_modis	hlensw	landuse_2m	nlcd2006_ll_30s	orogwd_30m	soiltype_top_5m	varsso_2m
hangl	hlenw	landuse_30s	nlcd2006_ll_9s	sandfrac_5m	ssib_landuse_10m	varsso_5m

Pré-Processing





https://nomads.ncep.noaa.gov/pub/data/nccf/com/gfs/prod/

https://cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-single-levels
https://cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-pressure-levels?tab=overview

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df.download_lev('geopotential'       ,'z','130',datain,dataout,dire)
df.download_lev('u_component_of_wind','u','131',datain,dataout,dire)
df.download_lev('v_component_of_wind','v','132',datain,dataout,dire)
df.download_lev('relative_humidity'  ,'r','157',datain,dataout,dire)

df.download_sfc('sea_ice_cover'                 ,'ci'   ,'031',datain,dataout,dire)
df.download_sfc('snow_density'                  ,'rsn'  ,'033',datain,dataout,dire)
df.download_sfc('sea_surface_temperature'       ,'sstk' ,'034',datain,dataout,dire)
df.download_sfc('volumetric_soil_water_layer_1' ,'swvl1','039',datain,dataout,dire)
df.download_sfc('volumetric_soil_water_layer_2' ,'swvl2','040',datain,dataout,dire)
df.download_sfc('volumetric_soil_water_layer_3' ,'swvl3','041',datain,dataout,dire)
df.download_sfc('volumetric_soil_water_layer_4' ,'swvl4','042',datain,dataout,dire)
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df.download_sfc('soil_temperature_level_2'      ,'stl2' ,'170',datain,dataout,dire)
df.download_sfc('soil_temperature_level_3'      ,'stl3' ,'183',datain,dataout,dire)
df.download_sfc('soil_temperature_level_4'      ,'stl4' ,'236',datain,dataout,dire)
df.download_sfc('snow_depth'                    ,'sd'   ,'141',datain,dataout,dire)
df.download_sfc('mean_sea_level_pressure'       ,'msl'  ,'151',datain,dataout,dire)
df.download_sfc('10m_u_component_of_wind'       ,'10u'  ,'165',datain,dataout,dire)
df.download_sfc('10m_v_component_of_wind'       ,'10v'  ,'166',datain,dataout,dire)
df.download_sfc('2m_dewpoint_temperature'       ,'2d'   ,'167',datain,dataout,dire)
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```

Paulo Yoshio Kubota

Condições Iniciais e de Contorno do GFS para o MONAN regional.

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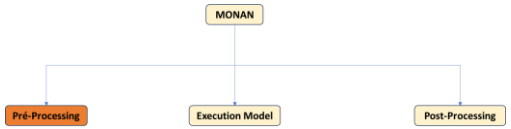
Pré-Processing

https://nomads.ncep.noaa.gov/pub/data/nccf/com/gfs/prod/



ncep gdas final analysis - | NCAR RDA Dataset d0830 | Index of /pub/data/nccf/c | Caixa de entrada (1.289) - | ChatGPT - Python

https://nomads.ncep.noaa.gov/pub/data/nccf/com/gfs/prod/gfs.20240728/00/atmos/

Index of /pub/data/nccf/com/gfs/prod/gfs.20240728/00/atmos

Name	Last modified	Size
Parent Directory		-
bufr.t00z/	28-Jul-2024 04:20	-
gfs.t00z.atmanl.nc	28-Jul-2024 03:41	13G
gfs.t00z.atmf000.nc	28-Jul-2024 03:34	6.3G
gfs.t00z.atmf001.nc	28-Jul-2024 03:35	6.4G
gfs.t00z.atmf002.nc	28-Jul-2024 03:35	6.3G
gfs.t00z.atmf003.nc	28-Jul-2024 03:37	6.4G
gfs.t00z.atmf004.nc	28-Jul-2024 03:36	6.4G
gfs.t00z.atmf005.nc	28-Jul-2024 03:36	6.4G
gfs.t00z.atmf006.nc	28-Jul-2024 03:39	6.4G
gfs.t00z.atmf007.nc	28-Jul-2024 03:36	6.5G
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gfs.t00z.atmf009.nc	28-Jul-2024 03:39	6.4G
gfs.t00z.atmf010.nc	28-Jul-2024 03:37	6.5G
gfs.t00z.atmf011.nc	28-Jul-2024 03:37	6.5G
gfs.t00z.atmf012.nc	28-Jul-2024 03:38	6.4G
gfs.t00z.bufrsnd.tar.gz	28-Jul-2024 04:20	174M
gfs.t00z.goessimpgrb2.0p25.f000	28-Jul-2024 03:39	3.7M
gfs.t00z.goessimpgrb2.0p25.f000.idx	28-Jul-2024 03:39	417
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gfs.t00z.goessimpgrb2.0p25.f012	28-Jul-2024 03:42	3.3M
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gfs.t00z.goessimpgrb2.0p25.f027	28-Jul-2024 03:47	3.7M

Link para obter dados globais do modelo GFS para criar as condições iniciais/contorno do modelo MONAN

Lista de interesse
Ideias

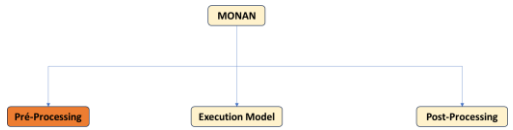
Pesquisar

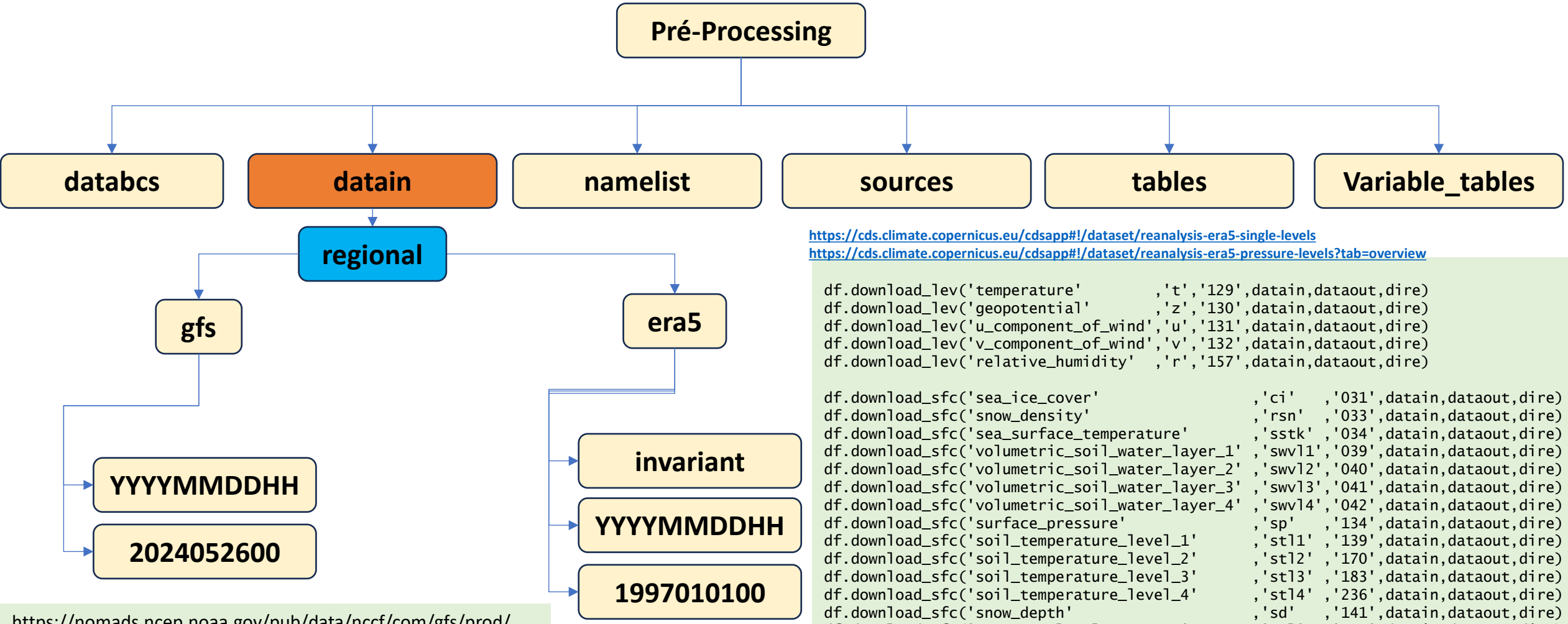
POR
PTB2

20:28
05/08/2024

Paulo Yoshio Kubota

Pré-Processing





https://nomads.ncep.noaa.gov/pub/data/nccf/com/gfs/prod/

https://cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-single-levels
https://cds.climate.copernicus.eu/cdsapp#!/dataset/reanalysis-era5-pressure-levels?tab=overview

```
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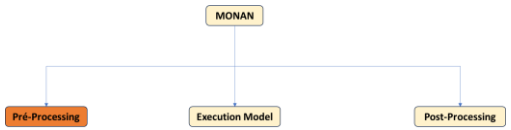
df.download_sfc('surface_pressure'              ,'sp'   ,'134',datain,dataout,dire)
df.download_sfc('soil_temperature_level_1'      ,'stl1' ,'139',datain,dataout,dire)
df.download_sfc('soil_temperature_level_2'      ,'stl2' ,'170',datain,dataout,dire)
df.download_sfc('soil_temperature_level_3'      ,'stl3' ,'183',datain,dataout,dire)
df.download_sfc('soil_temperature_level_4'      ,'stl4' ,'236',datain,dataout,dire)
df.download_sfc('snow_depth'                    ,'sd'   ,'141',datain,dataout,dire)
df.download_sfc('mean_sea_level_pressure'       ,'msl'  ,'151',datain,dataout,dire)
df.download_sfc('10m_u_component_of_wind'       ,'10u'  ,'165',datain,dataout,dire)
df.download_sfc('10m_v_component_of_wind'       ,'10v'  ,'166',datain,dataout,dire)
df.download_sfc('2m_dewpoint_temperature'       ,'2d'   ,'167',datain,dataout,dire)
df.download_sfc('2m_temperature'                ,'2t'   ,'168',datain,dataout,dire)
df.download_sfc('skin_temperature'              ,'skt'  ,'235',datain,dataout,dire)
```

Paulo Yoshio Kubota

Condições Iniciais e de Contorno do ERA5 para o MONAN regional.

Paulo Yoshio Kubota

Pré-Processing



Pré-Processing

databcs | datain | namelist | sources | tables | Variable_tables

datain → regional → runIC.bash

runIC.bash → GFS → YYYYMMDDHH → gfs.oper.f00.ll025sc.2024062400.grib

runIC.bash → ERA5 → invariantes | Atmosfera | Superfície → YYYYMMDDHH.grib → e5.oper.f00.ll025sc.2004032400.grib

Paulo Yoshio Kubota

Plataforma Copernicus, ERA5.

- https://cds.climate.copernicus.eu/api-how-to

For Windows users, please read How to install and use CDS API on Windows

For macOS users, please read How to install and use CDS API on macOS

For linux users, please proceed as follows:

1. Install the CDS API key
2. Install the CDS API client
3. Use the CDS API client for data access

Install the CDS API key

1. If you don't have an account, please self register at the CDS registration page and go to the steps below.
2. If you are not logged, please login and go to the step below.
3. Copy the code displayed beside, in the file **$HOME/.cdsapirc** *(in your Unix/Linux environment).*

```
url: https://cds.climate.copernicus.eu/api/v2
key: {uid}:{api-key}
```

Install the CDS API client

The CDS API client is a python based library. It provides support for both Python 2.7.x and Python 3.

You can Install the CDS API client via the package management system `pip`, by running on Unix/Linux the command shown in the box beside.

```
$ pip install cdsapi
```

1. Cadastro no site.
2. Configuração da chave de acesso pessoal no ~/.bashrc
3. Instalar aplicativo do Python: pip install cdsapi.

```
#!/usr/bin/env python
import cdsapi
c = cdsapi.Client()
c.retrieve("reanalysis-era5-pressure-levels",
    {
        "variable": "temperature",
        "pressure_level": "1000",
        "product_type": "reanalysis",
        "year": "2008",
        "month": "01",
        "day": "01",
        "time": "12:00",
        "format": "grib"
    }, "download.grib")
```

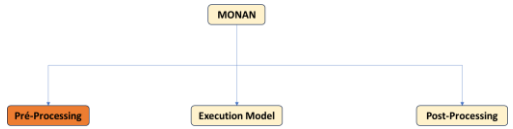
runIC.bash

```
#!/bin/bash -x
#------------------------------------------------------------------------------#
#                              DIMNT/INPE                                      #
#------------------------------------------------------------------------------#
#BOP
#
# !SCRIPT: runIC.bash
#
# !DESCRIPTION:
#       Script para gerar as condições inicias e de contorno para o  MONAN
#       Realiza as seguintes tarefas:
#       Baixa as condições iniciais (CI) do ERA5 e do GFS
#
# !CALLING SEQUENCE:
#
# ./runIC.bash
#
#  IC_HOME    : Lugar para baixar os dados
#  EXP_IBC     : Tipo de condição a ser usada. ERA5 OU GFS
#  EXPNAME  : Nome do experimento
#  LABELI      : Data inicial do experimento
#  LABELF      : Data final   do experimento
#  HOURS_STEP_BC: Passo de tempo em horas para baixar as CI
#  LAT_INI     : Latitude Inicial
#  LAT_FIN     : Latitude Final
#  LON_INI     : Longitude Inicial
#  LON_FIN     : Longitude Final

# !REVISION HISTORY:
# 02/08/2024:  Separado do runpre
#
# !REMARKS:
#
# !Criated by: Jhonatan A. A. Manco
```

```
 IC_HOME=/pesq/dados/bamc/public_jhona
#FURAÇÃO CATARINA
export EXP_IBC=ERA5 #GFS
# Data inicial
export LABELI=2004032400
# Data final
export LABELF=2004032800
#Nome do Experimento
export EXPNAME="CATARINA"
#Passo em horas para baixar as IC
HOURS_STEP_BC=1
# RECORTE CONTENDO A REGIÃO A RODAR
LAT_INI=20
LAT_FIN=-70
LON_INI=-100
LON_FIN=-10
```

Pré-Processing



runIC.bash

SCRIPTS

Initial_boundary_conditions.sh

Python_era5

main_download.py

dfunctions.py

```
#Program to download directly ERA5
sed -e "s,#datein#,${LABELI},g;\
     s,#dateout#,${LABELF},g; \
     s,#era5_data#,${ERA5_DIR},g;\
     s,#lat_init#,${LAT_INI},g;\
     s,#lat_fin#,${LAT_FIN},g;\
     s,#lon_init#,${LON_INI},g;\
     s,#lon_fin#,${LON_FIN},g;\
     s,#nh#,${ERA5_BCHOURSSTEP},g" \
     ${SCRDIR}/python_era5/main_download.py > \
     ${BNDDIR}/python/main_download_era5_${LABELI}_${LABELF}.py

echo "Condicao de contorno inexistente !"
echo "Sera baixada do ERA5"
echo "$0 ${LABELI}"

cd  ${BNDDIR}/python

#*****************************************************************
echo  "RUN: python main_download_era5_${LABELI}_${LABELF}.py"
#
python main_download_era5_${LABELI}_${LABELF}.py
#
#*****************************************************************
```

```
#Level variables
df.download_lev('temperature'        ,'t','129',date,dire,lat,lon)
df.download_lev('geopotential'       ,'z','130',date,dire,lat,lon)
df.download_lev('u_component_of_wind','u','131',date,dire,lat,lon)
df.download_lev('v_component_of_wind','v','132',date,dire,lat,lon)
df.download_lev('relative_humidity'  ,'r','157',date,dire,lat,lon)

#Surface variables
df.download_sfc('sea_ice_cover'                ,'ci'   ,'031',date,dire,lat,lon)
df.download_sfc('snow_density'                 ,'rsn'  ,'033',date,dire,lat,lon)
df.download_sfc('sea_surface_temperature'      ,'sstk' ,'034',date,dire,lat,lon)
df.download_sfc('volumetric_soil_water_layer_1' ,'swvl1','039',date,dire,lat,lon)
df.download_sfc('volumetric_soil_water_layer_2' ,'swvl2','040',date,dire,lat,lon)
df.download_sfc('volumetric_soil_water_layer_3' ,'swvl3','041',date,dire,lat,lon)
df.download_sfc('volumetric_soil_water_layer_4' ,'swvl4','042',date,dire,lat,lon)
df.download_sfc('surface_pressure'             ,'sp'   ,'134',date,dire,lat,lon)
df.download_sfc('soil_temperature_level_1'     ,'stl1' ,'139',date,dire,lat,lon)
df.download_sfc('soil_temperature_level_2'     ,'stl2' ,'170',date,dire,lat,lon)
df.download_sfc('soil_temperature_level_3'     ,'stl3' ,'183',date,dire,lat,lon)
df.download_sfc('soil_temperature_level_4'     ,'stl4' ,'236',date,dire,lat,lon)
df.download_sfc('snow_depth'                   ,'sd'   ,'141',date,dire,lat,lon)
df.download_sfc('mean_sea_level_pressure'      ,'msl'  ,'151',date,dire,lat,lon)
df.download_sfc('10m_u_component_of_wind'      ,'10u'  ,'165',date,dire,lat,lon)
df.download_sfc('10m_v_component_of_wind'      ,'10v'  ,'166',date,dire,lat,lon)
df.download_sfc('2m_dewpoint_temperature'      ,'2d'   ,'167',date,dire,lat,lon)
df.download_sfc('2m_temperature'               ,'2t'   ,'168',date,dire,lat,lon)
df.download_sfc('skin_temperature'             ,'skt'  ,'235',date,dire,lat,lon)

#invariant
df.download_sfc('geopotential'                 ,'z'    ,'129',date,dire,lat,lon)
df.download_sfc('land_sea_mask'                ,'lsm'  ,'172',date,dire,lat,lon)
```

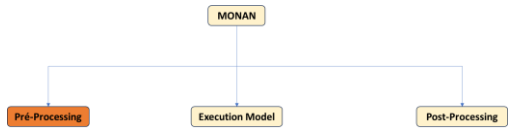
```
def download_lev(var,vname,vnum,datain,dire,lat,lon):

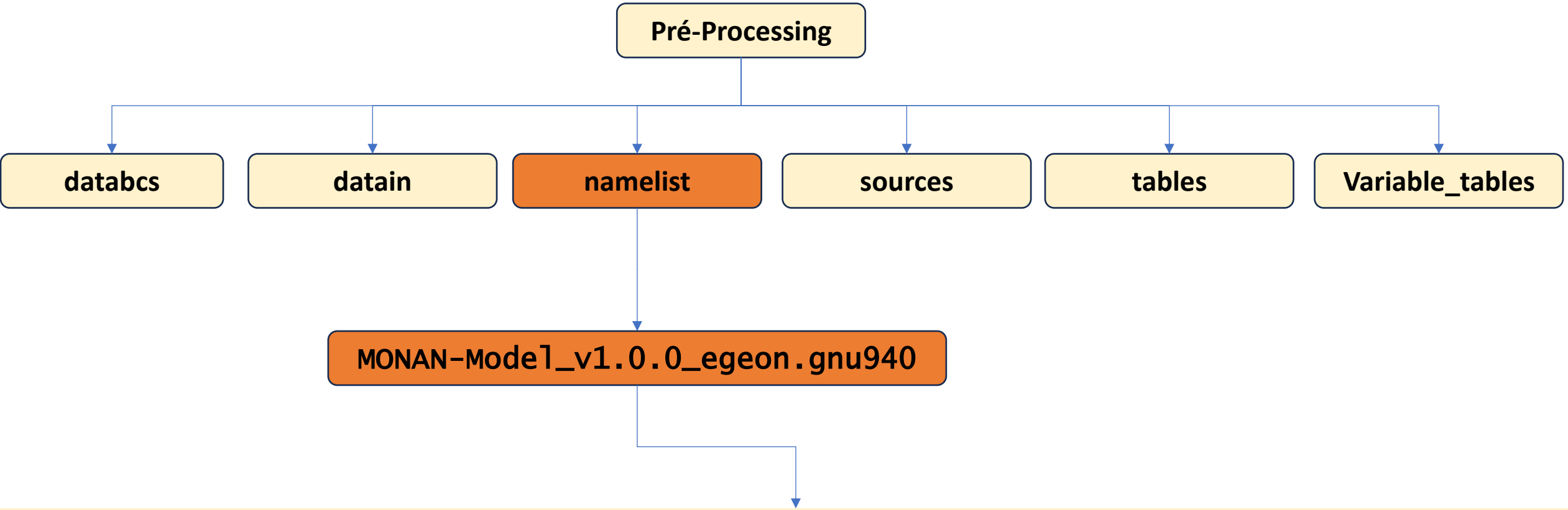
    name   ='e5.oper.an.pl.128_%s_%s.ll025sc.%s'%(vname,vnum,datain
    c.retrieve("reanalysis-era5-pressure-levels",
    {
    "variable": var,

    "pressure_level": [
                        '1000', '975', '950', '925', '900',
                        '875' , '850', '825', '800', '775',
                        '750' , '700', '650', '600', '550',
                        '500' , '450', '400', '350', '300',
                        '250' , '225', '200', '175', '150',
                        '125' , '100', '70' , '50' , '30' ,
                        '20'  , '10' , '7'  , '5'  , '3'  ,
                        '2'   , '1'  ,
                      ],
    'area': [
            lat[0], lon[0], lat[1],
            lon[1],
        ],
```

Paulo Yoshio Kubota

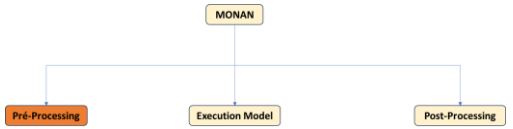
Pré-Processing

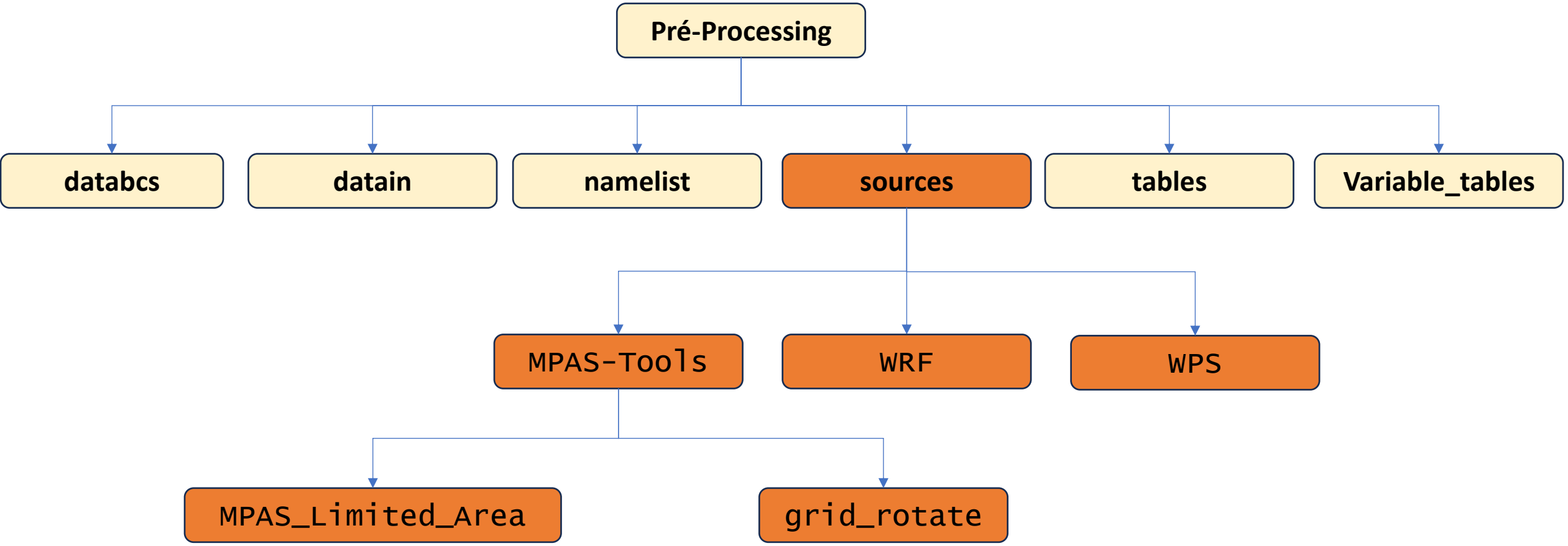





```
namelist.init_atmosphere.LBC.regional
namelist.init_atmosphere.SST
namelist.init_atmosphere.SST.global
namelist.init_atmosphere.SST.regional
namelist.init_atmosphere.STATIC
namelist.init_atmosphere.STATIC.global
namelist.init_atmosphere.STATIC.regional
namelist.init_atmosphere.TEMPLATE
namelist.init_atmosphere.TEMPLATE.global
namelist.init_atmosphere.TEMPLATE.regional
namelist.wps.LBC.regional
namelist.wps.SST
namelist.wps.TEMPLATE
namelist.wps.TEMPLATE.global
namelist.wps.TEMPLATE.regional
readme
streams.init_atmosphere.LBC.regional
streams.init_atmosphere.SST
streams.init_atmosphere.SST.global
streams.init_atmosphere.SST.regional
streams.init_atmosphere.STATIC
streams.init_atmosphere.STATIC.global
streams.init_atmosphere.STATIC.regional
streams.init_atmosphere.TEMPLATE
streams.init_atmosphere.TEMPLATE.global
streams.init_atmosphere.TEMPLATE.regional
```

Pré-Processing





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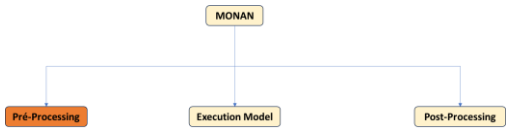
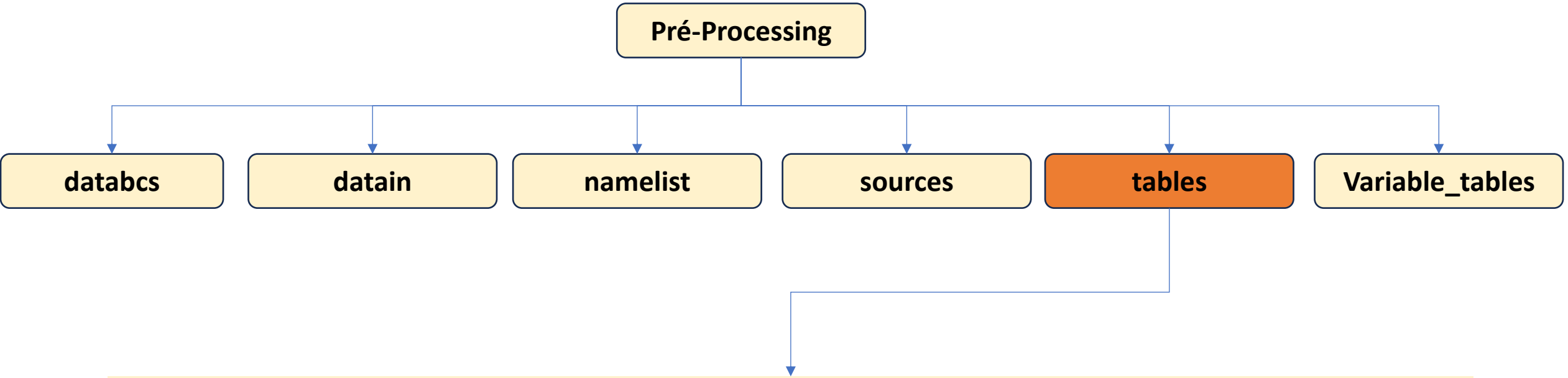
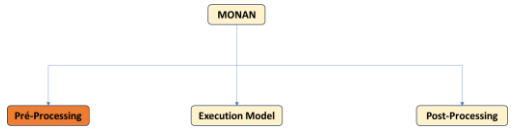
Pré-Processing

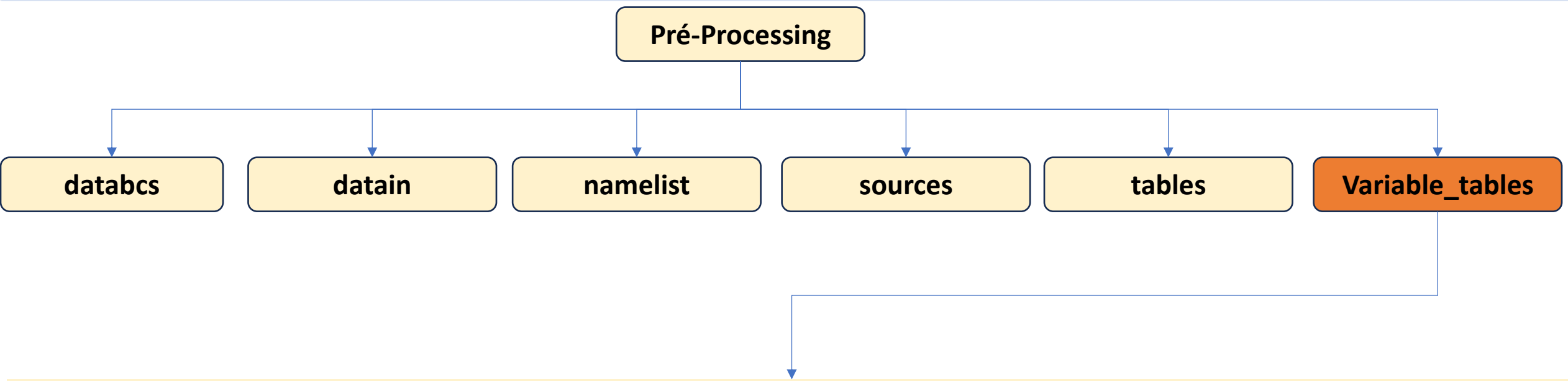





```
CAM_ABS_DATA.DBL       MP_THOMPSON_freezeH2O_DATA.DBL  OZONE_DAT.TBL     RRTMG_LW_DATA       SOILPARM.TBL
CAM_AEROPT_DATA.DBL    MP_THOMPSON_QIautQS_DATA.DBL    OZONE_LAT.TBL     RRTMG_LW_DATA.DBL   VEGPARM.TBL
GENPARM.TBL            MP_THOMPSON_QRacrQG_DATA.DBL    OZONE_PLEV.TBL    RRTMG_SW_DATA
LANDUSE.TBL            MP_THOMPSON_QRacrQS_DATA.DBL    readme            RRTMG_SW_DATA.DBL
```

Pré-Processing





link_grib.csh	Vtable.ARWp.UPP	Vtable.ERA-interim.ml	Vtable.ICONm	Vtable.NOGAPS	Vtable.SREF
readme	Vtable.ARW.UPP	Vtable.ERA-interim.pl	Vtable.ICONp	Vtable.NOGAPS_needs_GFS_soil	Vtable.SST
README	Vtable.AVN0P5WRF	Vtable.GFDL	Vtable.JMAGSM	Vtable.raphrrr	Vtable.TCRP
Vtable.AFWAICE	Vtable.AWIP	Vtable.GFS	Vtable.NAM	Vtable.RAP.hybrid.ncep	Vtable.UKMO_ENDGame
Vtable.AGRMETSNOW	Vtable.CFSR	Vtable.GFSENS	Vtable.NARR	Vtable.RAP.pressure.ncep	Vtable.UKMO_LANDSEA
Vtable.AGRMETSOIL	Vtable.CFSR_mean	Vtable.GFS_OZONE	Vtable.NavySST	Vtable.RAP.sigma.gsd	Vtable.AGRMETSOIL2
Vtable.ECMWF	Vtable.GODAS	Vtable.NCEP2	Vtable.RUCb	Vtable.AGRWRF	Vtable.ECMWF_sigma
Vtable.GSM	Vtable.NNRP	Vtable.RUCp	Vtable.UKMO_no_heights		

model-Processing

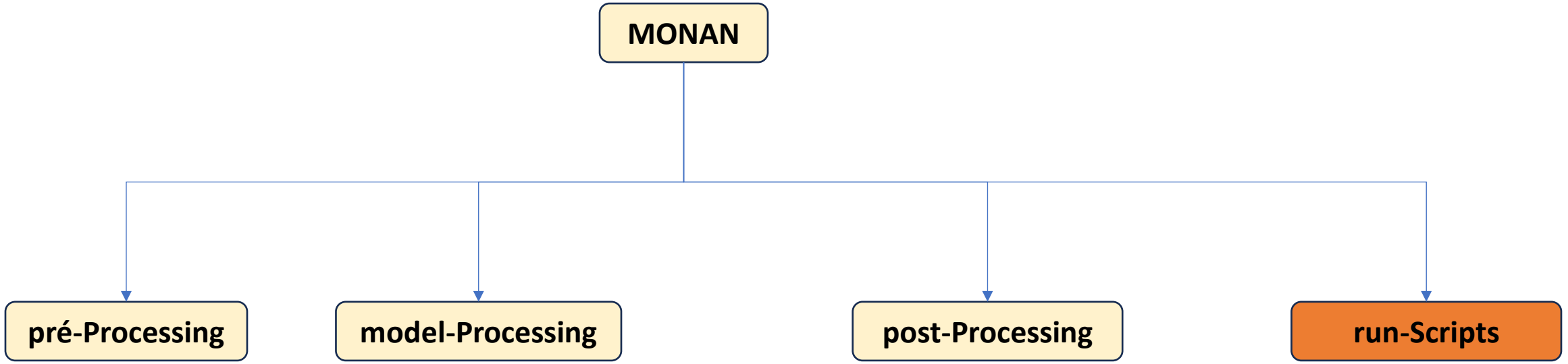
Step 13 – Execute Model Scripts Control

```
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional/run
```

check the directory

Step 13 – Execute Model Scripts Control

Execution Control

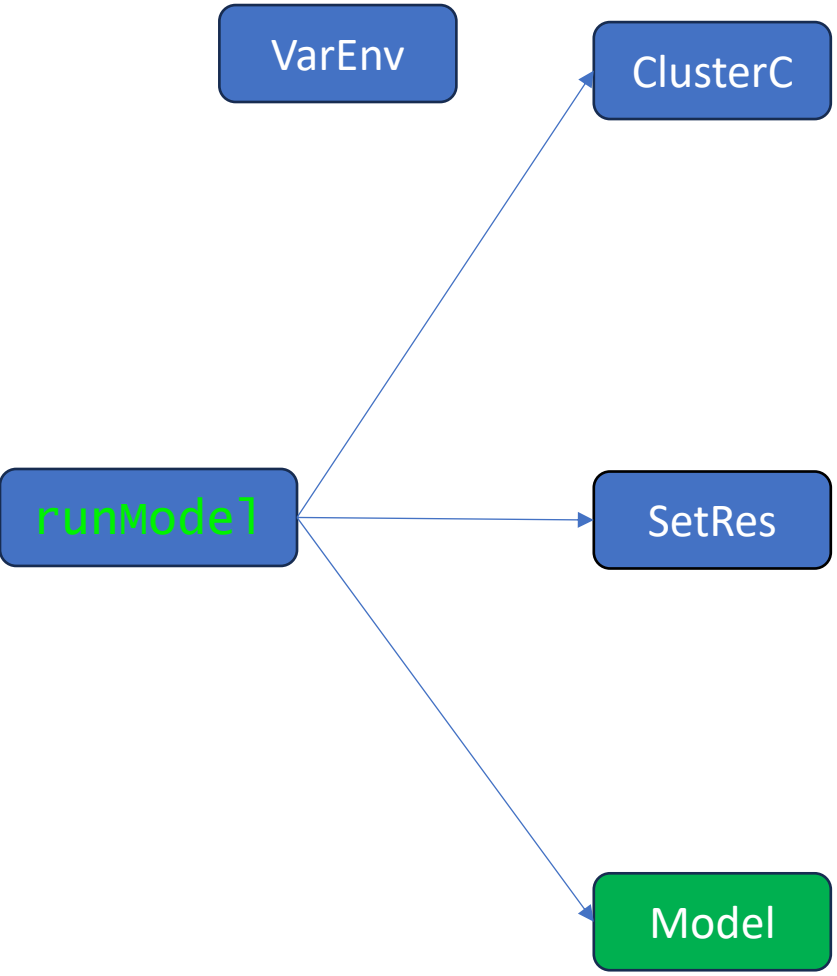



```
[aluno##@egeon-login1 run]$ ls
```

check the files

```
copy_data.bash                runModel.bash    scripts      readme
load_monan_app_modules.sh     runPost.bash     runPre.bash
```

runModel.bash



source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RunModel.bash

Step 14 – Execute Model Scripts Control

```
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional/run
```

check the directory

```
[aluno##@egeon-login1 run]$ ./runModel.bash
```

Execute the script without passing the arguments

```
[aluno##@egeon-login1 run]$ ./runModel.bash
.........................................
.........................................
.........................................
.
```

check the information

Paulo Yoshio Kubota

Step 14 – Execute Model Scripts Control

runModel.bash

./runModel.bash

```
+ '[' -z '' ']'
+ case "$-" in
+ __lmod_vx=x
+ '[' -n x ']'
+ set +x
Shell debugging temporarily silenced: export LMOD_SH_DBG_ON=1 for this output (/opt/ohpc/admin/lmod/lmod/init/bash)
Shell debugging restarted
+ unset __lmod_vx
+ '[' 0 -ne 7 ']'
+ usage
+ sed -n '/^# !CALLING SEQUENCE:/,/^# !/{p}' ./runModel.bash
+ head -n -1
# !CALLING SEQUENCE:
#
# ./runModel.bash  ${EXP_NAME} ${EXP_RES}   ${LABELI}  ${LABELF}  ${Domain}  ${AreaRegion}  ${TypeGrid}
#
#           o EXP_NAME   : Forcing: ERA5, CFSR, GFS, etc.
#           o EXP_RES    : mesh npts : 535554 etc
#           o LABELI     : Initial: date 2015030600
#           o LABELF     : End: date 2015030600
#           o Domain     : Domain: global or regional
#           o AreaRegion : PortoAlegre, Belem, global
#           o TypeGrid   : quasi_uniform or variable_resolution
#
# For benchmark:
#
# ./runModel.bash    GFS    163842   2024042700  2024050100  regional  Sul  variable_resolution
#
```

Step 15 – Execute Model Scripts Control

```
[aluno##@egeon-login1 run]$ ./runModel.bash GFS 163842 2024042700 2024050100  regional Peru  variable_resolution
```

- Sul
- Nordeste
- Norte
- Sudeste
- CentroOeste
- Peru
- Argentina

```
$ more Peru.ellipse.pts
```

```
Name: Peru
Type: ellipse
Point: -12.0431800, -77.0282400
Semi-major-axis: 1000000     # Raio at Meters
Semi-minor-axis: 1000000     # Raio at Meters
Orientation-angle: 45
```

Step 15 – Execute Model Scripts Control

```
[aluno##@egeon-login1 run]$ ./runModel.bash  GFS 163842 2024042700  2024050100  regional Argentina  variable_resolution
```

- Sul
- Nordeste
- Norte
- Sudeste
- CentroOeste
- Peru
- Argentina

```
$ more Argentina.ellipse.pts
```

```
Name: Argentina
Type: ellipse
Point: -36.6203, -64.2906
Semi-major-axis: 1000000    # Raio at Meters
Semi-minor-axis: 1000000    # Raio at Meters
Orientation-angle: 45
```

Step 16 – runModel.bash

```
&physics
    config_sst_update = false                    ! if updating sea-ice and SST with an surface.nc file,
                                                 ! set to true, and edit the 'surface' stream in the
                                                 ! streams.atmosphere file accordingly
    config_sstdiurn_update = false
    config_deepsoiltemp_update = false
    config_radtlw_interval = '00:30:00'          !time interval between calls to parameterization of long-wave radiation 'DD_HH:MM:SS' or 'none' (default: 00_00:30:00)
    config_radtsw_interval = '00:30:00'          !time interval between calls to parameterization of short-wave radiation 'DD_HH:MM:SS' or 'none' (default: 00_00:30:00)
    config_pbl_interval = 'none'                 !time interval between calls to parameterization of pbl layer (hidden by default) 'DD_HH:MM:SS' or 'none' (default: none)
    config_conv_interval = 'none'          !time interval between calls to parameterization of convection (hidden by default) 'DD_HH:MM:SS' or 'none' (default: none)
    config_camrad_abs_update = '06:00:00'        !time interval between updates of absorption/emission coeffs in CAM rad (hidden by default) 'DD_HH:MM:SS' or 'none' (default:
                                                  !06:00:00)
    config_greeness_update = '24:00:00'          !time interval between updates of greeness fraction (hidden by default) 'DD_HH:MM:SS' or 'none' (default: 24:00:00)
    config_bucket_update = '00:05:00'            !time interval between updates of accumulated rain and radiation diagnostics 'DD_HH:MM:SS' or 'none' (default: none)
    config_physics_suite = 'mesoscale_reference' !Choice of physics suite 'mesoscale_reference','convection_permitting','none' (default:mesoscale_reference)
    config_microp_scheme = 'mp_wsm6'             !configuration for cloud microphysics schemes (hidden by default)
                                                 !'suite','mp_wsm6','mp_thompson','mp_kessler','off' (default: suite)
    config_convection_scheme = 'cu_grell_freitas' !configuration for convection schemes (hidden by default)
                                                 !'suite','cu_kain_fritsch','cu_tiedtke','cu_ntiedtke','cu_grell_freitas','off' (default: suite)
    config_radt_cld_scheme = 'suite'             !configuration for calculation of horizontal cloud fraction (hidden by default)
                                                 !'suite','cld_fraction','cld_incidence' (default: suite)
    config_radt_lw_scheme = 'suite'              !configuration for long-wave radiation schemes (hidden by default)
                                                 !'suite','rrtmg_lw','cam_lw','off' (default: suite)
    config_radt_sw_scheme = 'suite'              !configuration for short-wave radiation schemes (hidden by default)
                                                 ! 'suite','rrtmg_sw','cam_sw','off' (default: suite)
    config_lsm_scheme = 'suite'                  !configuration for land-surface schemes (hidden by default)
                                                 !'suite','noah','off' (default: suite)
    config_gwdo_scheme = 'suite'                 !configuration of gravity wave drag over orography (hidden by default)
                                                 !'suite','bl ysu gwdo','off' (default: suite)
    config_sfclayer_scheme = 'sf_monin_obukhov'  !configuration for surface layer-scheme (hidden by default)
                                                 ! 'suite','sf_monin_obukhov','sf_mynn','off' (default: suite)
    config_pbl_scheme =  'bl_mynn'               !'suite'                  !configuration for planetary boundary layer schemes (hidden by default)
                                                 !'suite','bl_ysu','bl_mynn','off' (default: suite)
/
```

Step 16 – runModel.bash

```
(base) [paulo.kubota@egeon-login1 GFS]$ more streams.atmosphere
```

```
<streams>
<immutable_stream name="input"
                  type="input"
                  filename_template="Sul.1024002.init.nc"
                  input_interval="initial_only" />
<immutable_stream name="restart"
                  type="input;output"
                  filename_template="restart.$Y-$M-$D_$h.$m.$s.nc"
                  input_interval="initial_only"
                  output_interval="1_00:00:00" />
<stream name="output"
        type="output"
        filename_template="history.$Y-$M-$D_$h.$m.$s.nc"
        output_interval="24:00:00" >

        <file name="stream_list.atmosphere.output"/>
</stream>
<stream name="diagnostics"
        type="output"
        filename_template="diag.$Y-$M-$D_$h.$m.$s.nc"
        output_interval="1:00:00" >

        <file name="stream_list.atmosphere.diagnostics"/>
</stream>
<immutable_stream name="iau"
                  type="input"
                  filename_template="Sul.1024002.AmB.$Y-$M-$D_$h.$m.$s.nc"
                  filename_interval="none"
                  packages="iau"
                  input_interval="initial_only" />
<immutable_stream name="lbc_in"
                  type="input"
                  filename_template="lbc.$Y-$M-$D_$h.$m.$s.nc"
                  filename_interval="input_interval"
                  packages="limited_area"
                  input_interval="3:00:00" />

</streams>
```

Step 17 – Choice of cases

runModel.bash

```
Group-1
[aluno##@egeon-login1 run]$./runModel.bash  GFS 163842 2024042700 2024042800  regional  Sul          variable_resolution
Group-2
[aluno##@egeon-login1 run]$./runModel.bash  GFS 163842 2024042700 2024042800  regional  Sudeste      variable_resolution
Group-3
[aluno##@egeon-login1 run]$./runModel.bash  GFS 163842 2024042700 2024042800  regional  Nordeste     variable_resolution
Group-4
[aluno##@egeon-login1 run]$../runModel.bash  GFS 163842 2024042700 2024042800  regional  Norte       variable_resolution
Group-5
[aluno##@egeon-login1 run]$./runModel.bash  GFS 163842 2024042700 2024042800  regional CentroOeste  variable_resolution
Group-6
[aluno##@egeon-login1 run]$./runModel.bash  GFS 163842 2024042700 2024042800  regional  Peru         variable_resolution
Group-7
[aluno##@egeon-login1 run]$./runModel.bash  GFS 163842 2024042700 2024042800  regional  Argentina    variable_resolution
```

Step 17 – Choice of cases

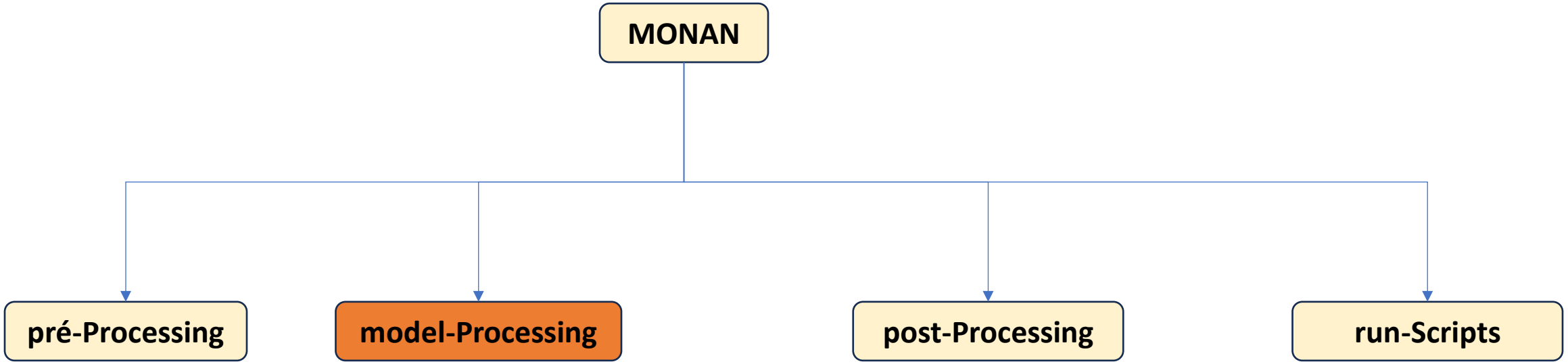
runModel.bash

```
Group-1
[aluno##@egeon-login1 run]$./runModel.bash  GFS 163842 2024042700 2024042800  regional  Sul          variable_resolution
Group-2
[aluno##@egeon-login1 run]$./runModel.bash  GFS 163842 2024042700 2024042800  regional  Sudeste      variable_resolution
Group-3
[aluno##@egeon-login1 run]$./runModel.bash  GFS 163842 2024042700 2024042800  regional  Nordeste     variable_resolution
Group-4
[aluno##@egeon-login1 run]$../runModel.bash GFS 163842 2024042700 2024042800  regional  Norte        variable_resolution
Group-5
[aluno##@egeon-login1 run]$./runModel.bash  GFS 163842 2024042700 2024042800  regional  Centrooeste  variable_resolution
Group-6
[aluno##@egeon-login1 run]$./runModel.bash  GFS 163842 2024042700 2024042800  regional  Peru         variable_resolution
Group-7
[aluno##@egeon-login1 run]$./runModel.bash  GFS 163842 2024042700 2024042800  regional  Argentina    variable_resolution
```

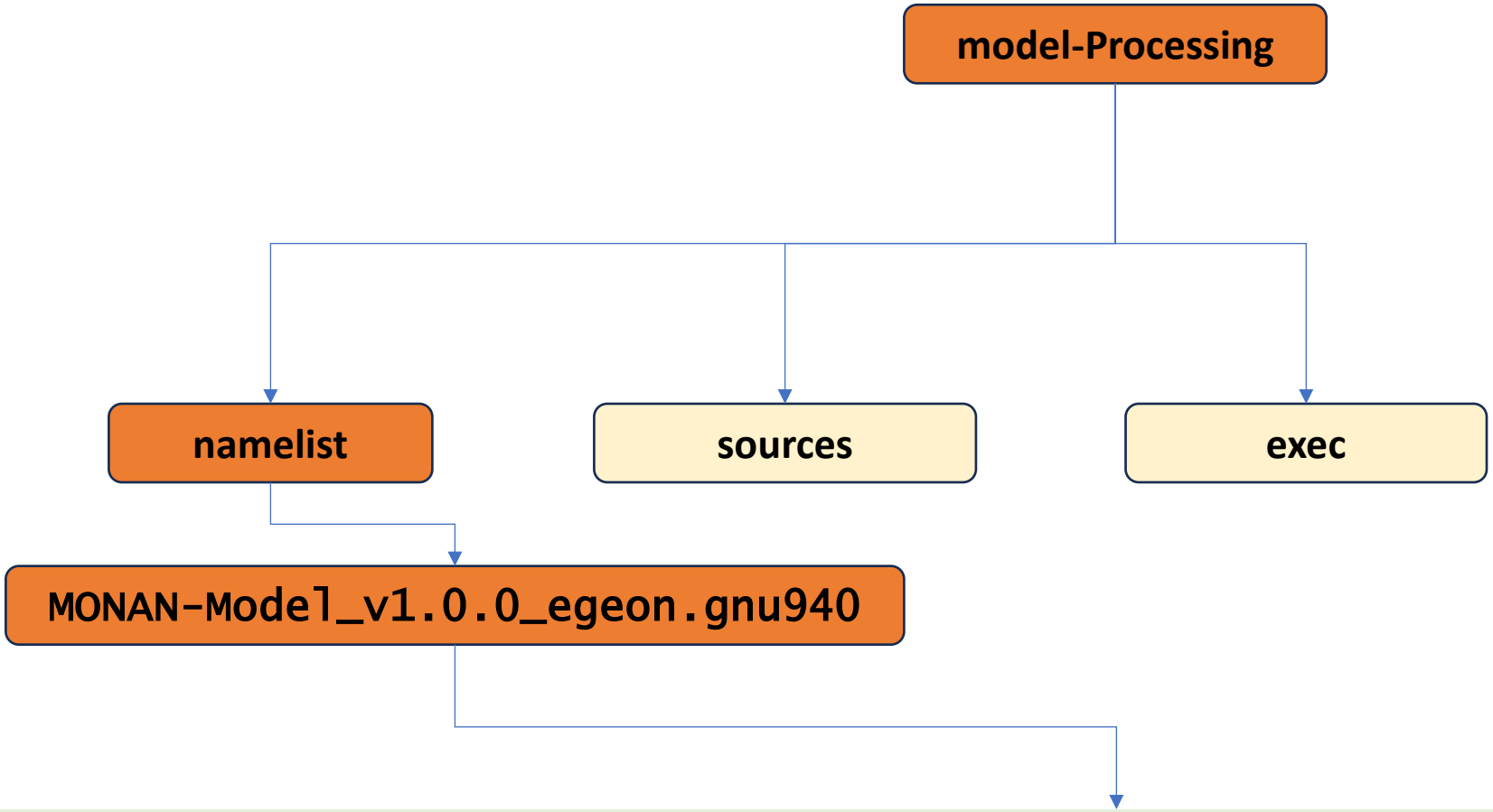
To run the model

“Choose the same option used in the Pre-processing”

Model-Processing

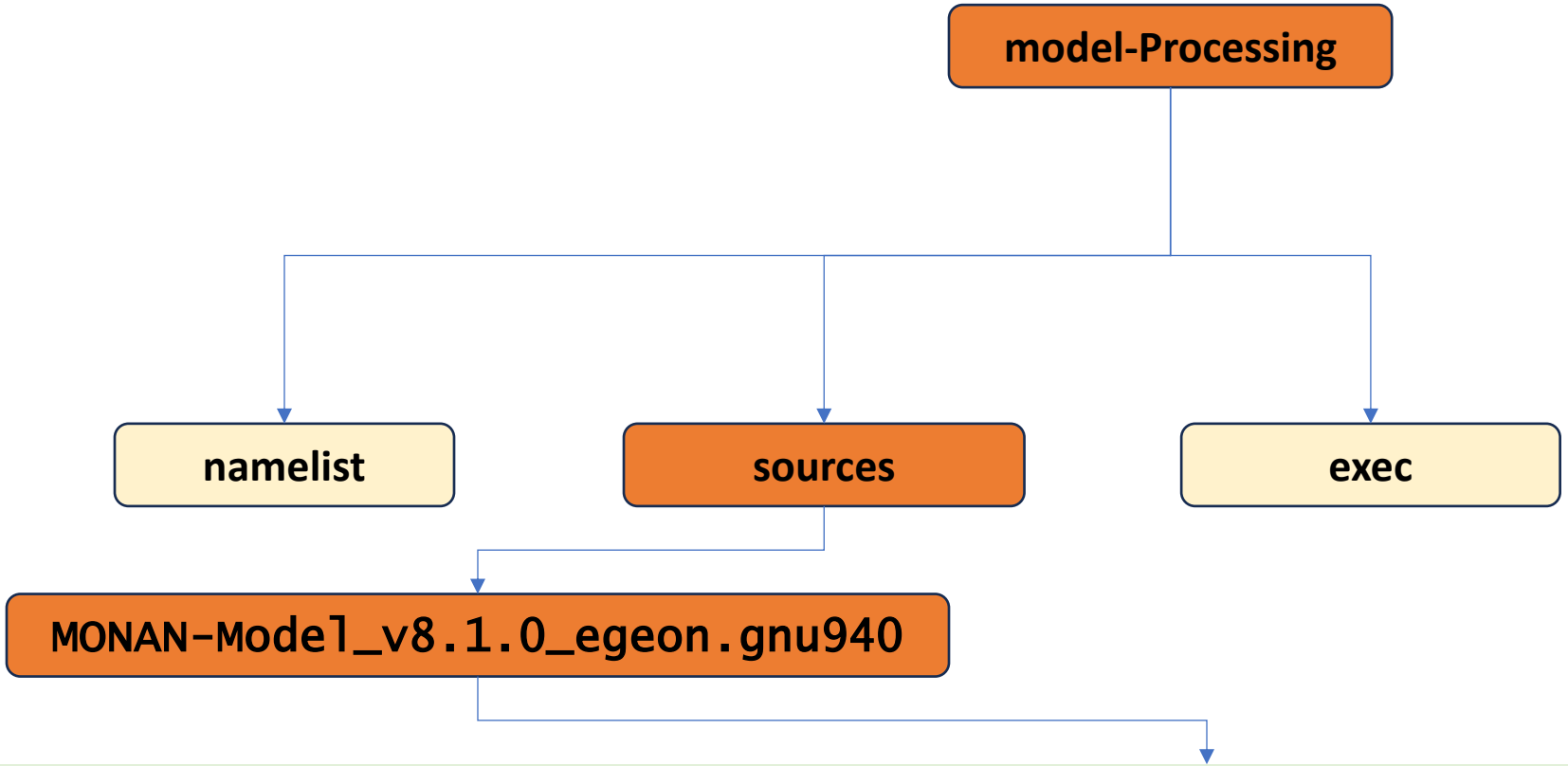


Model-Processing



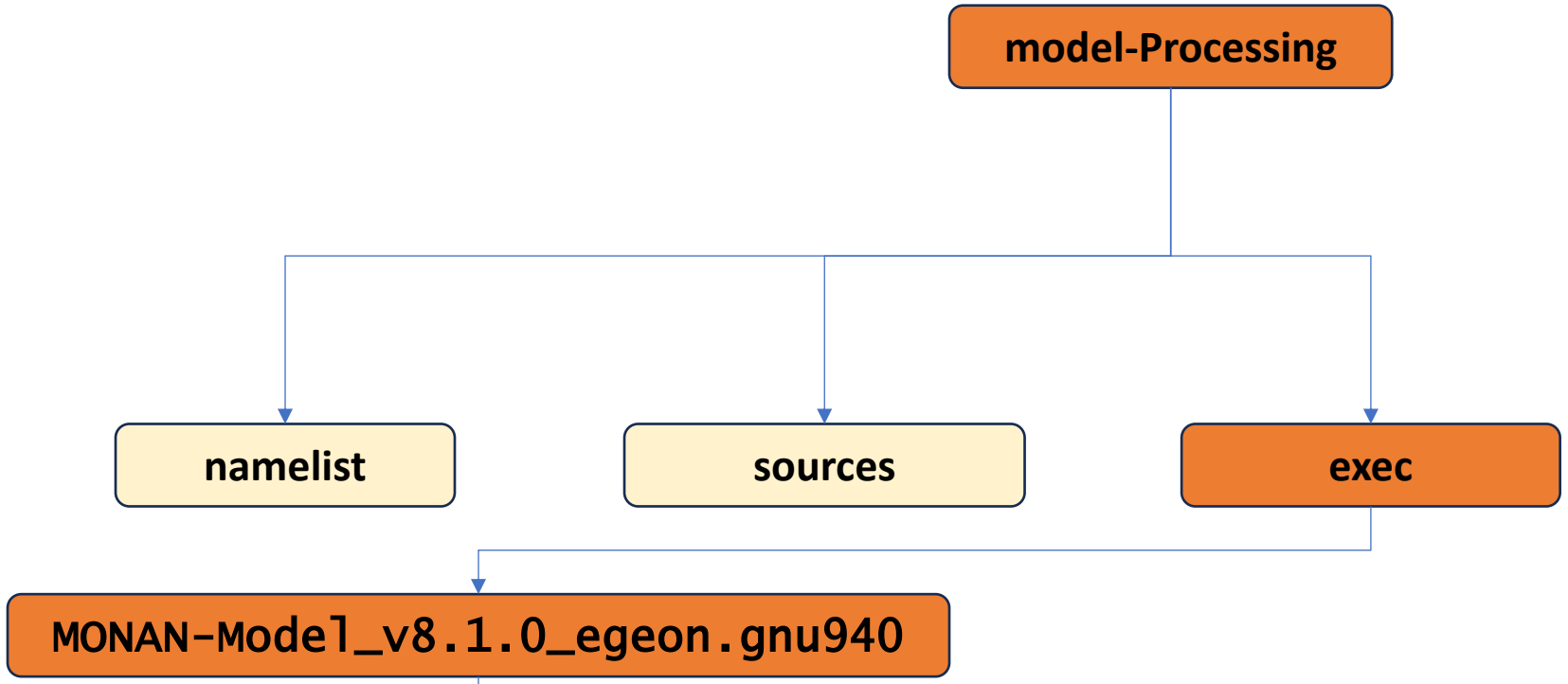

```
namelist.atmosphere.BENCH                  streams.atmosphere                          stream_list.atmosphere.output
readme                                     streams.atmosphere.BENCH                    stream_list.atmosphere.surface
namelist.atmosphere.TEMPLATE.regional      stream_list.atmosphere.diagnostics          streams.atmosphere.TEMPLATE.global
namelist.atmosphere.TEMPLATE.global        streams.atmosphere.TEMPLATE.regional
```

Model-Processing




```
bin              load_monan_app_modules.sh  pio1.f90    stream_list.atmosphere.diagnostics  testing_and_setup
default_inputs   Makefile                   pio2.f90    stream_list.atmosphere.output
docs             make.sh                    readme      stream_list.atmosphere.surface
INSTALL          namelist.atmosphere        README.md   streams.atmosphere
LICENSE          namelist.init_atmosphere   src         streams.init_atmosphere
```

Model-Processing




```
Exec/atmosphere_model
Exec/build_tables
Exec/init_atmosphere_model
```

runModel.bash

streams.atmosphere

namelist.atmosphere

Sul.1024002.init.nc

lbc.2024-04-27_21.00.00.nc

```
time mpirun -np $SLURM_NTASKS -env UCX_NET_DEVICES=mlx5_0:1 -genvall ./atmosphere_model
```

/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/model/runs/GFS/**monanprd**

```
diag.2024-04-27_00.00.00.nc  diag.2024-04-28_02.00.00.nc  diag.2024-04-29_04.00.00.nc  diag.2024-04-30_06.00.00.nc
diag.2024-04-27_01.00.00.nc  diag.2024-04-28_03.00.00.nc  diag.2024-04-29_05.00.00.nc  diag.2024-04-30_07.00.00.nc
diag.2024-04-27_02.00.00.nc  diag.2024-04-28_04.00.00.nc  diag.2024-04-29_06.00.00.nc  diag.2024-04-30_08.00.00.nc
diag.2024-04-27_03.00.00.nc  diag.2024-04-28_05.00.00.nc  diag.2024-04-29_07.00.00.nc  diag.2024-04-30_09.00.00.nc
diag.2024-04-27_04.00.00.nc  diag.2024-04-28_06.00.00.nc  diag.2024-04-29_08.00.00.nc  diag.2024-04-30_10.00.00.nc
diag.2024-04-27_05.00.00.nc  diag.2024-04-28_07.00.00.nc  diag.2024-04-29_09.00.00.nc  diag.2024-04-30_11.00.00.nc
diag.2024-04-27_06.00.00.nc  diag.2024-04-28_08.00.00.nc  diag.2024-04-29_10.00.00.nc  diag.2024-04-30_12.00.00.nc
diag.2024-04-27_07.00.00.nc  diag.2024-04-28_09.00.00.nc  diag.2024-04-29_11.00.00.nc  diag.2024-04-30_13.00.00.nc
diag.2024-04-27_08.00.00.nc  diag.2024-04-28_10.00.00.nc  diag.2024-04-29_12.00.00.nc  diag.2024-04-30_14.00.00.nc
diag.2024-04-27_09.00.00.nc  diag.2024-04-28_11.00.00.nc  diag.2024-04-29_13.00.00.nc  diag.2024-04-30_15.00.00.nc
diag.2024-04-27_10.00.00.nc  diag.2024-04-28_12.00.00.nc  diag.2024-04-29_14.00.00.nc  diag.2024-04-30_16.00.00.nc
diag.2024-04-27_11.00.00.nc  diag.2024-04-28_13.00.00.nc  diag.2024-04-29_15.00.00.nc  diag.2024-04-30_17.00.00.nc
diag.2024-04-27_12.00.00.nc  diag.2024-04-28_14.00.00.nc  diag.2024-04-29_16.00.00.nc  diag.2024-04-30_18.00.00.nc
diag.2024-04-27_13.00.00.nc  diag.2024-04-28_15.00.00.nc  diag.2024-04-29_17.00.00.nc  diag.2024-04-30_19.00.00.nc
diag.2024-04-27_14.00.00.nc  diag.2024-04-28_16.00.00.nc  diag.2024-04-29_18.00.00.nc  diag.2024-04-30_20.00.00.nc
diag.2024-04-27_15.00.00.nc  diag.2024-04-28_17.00.00.nc  diag.2024-04-29_19.00.00.nc  diag.2024-04-30_21.00.00.nc
diag.2024-04-27_16.00.00.nc  diag.2024-04-28_18.00.00.nc  diag.2024-04-29_20.00.00.nc  diag.2024-04-30_22.00.00.nc
diag.2024-04-27_17.00.00.nc  diag.2024-04-28_19.00.00.nc  diag.2024-04-29_21.00.00.nc  diag.2024-04-30_23.00.00.nc
diag.2024-04-27_18.00.00.nc  diag.2024-04-28_20.00.00.nc  diag.2024-04-29_22.00.00.nc  diag.2024-05-01_00.00.00.nc
diag.2024-04-27_19.00.00.nc  diag.2024-04-28_21.00.00.nc  diag.2024-04-29_23.00.00.nc  history.2024-04-27_00.00.00.nc
diag.2024-04-27_20.00.00.nc  diag.2024-04-28_22.00.00.nc  diag.2024-04-30_00.00.00.nc  history.2024-04-28_00.00.00.nc
diag.2024-04-27_21.00.00.nc  diag.2024-04-28_23.00.00.nc  diag.2024-04-30_01.00.00.nc  history.2024-04-29_00.00.00.nc
diag.2024-04-27_22.00.00.nc  diag.2024-04-29_00.00.00.nc  diag.2024-04-30_02.00.00.nc  history.2024-04-30_00.00.00.nc
diag.2024-04-27_23.00.00.nc  diag.2024-04-29_01.00.00.nc  diag.2024-04-30_03.00.00.nc  history.2024-05-01_00.00.00.nc
diag.2024-04-28_00.00.00.nc  diag.2024-04-29_02.00.00.nc  diag.2024-04-30_04.00.00.nc  Sul.1024002.init.nc
diag.2024-04-28_01.00.00.nc  diag.2024-04-29_03.00.00.nc  diag.2024-04-30_05.00.00.nc
```

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Post-Processing

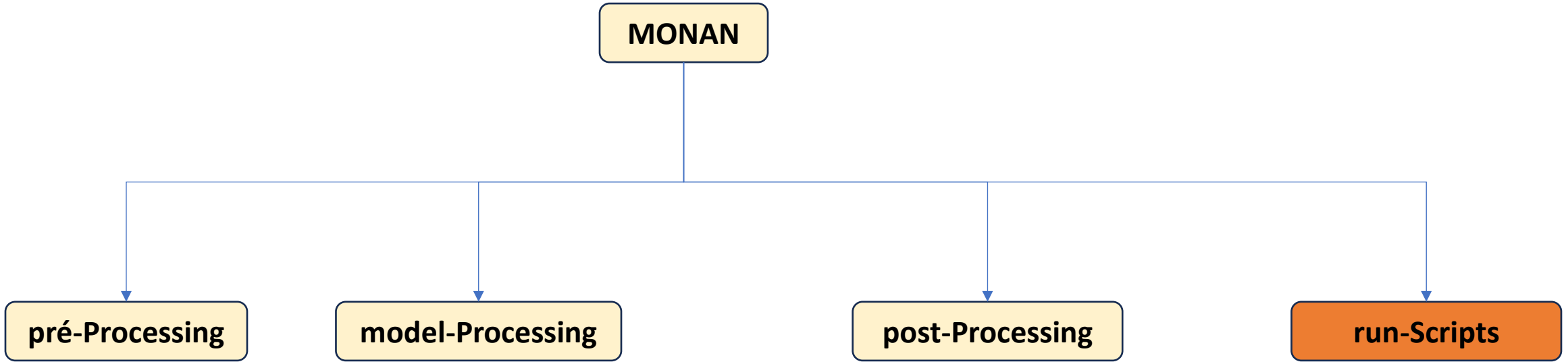
Step 18 – Execute Post-processing Scripts Control

```
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional/run
```

check the directory

Step 18 – Execute Post-processing Scripts Control

Execution Control

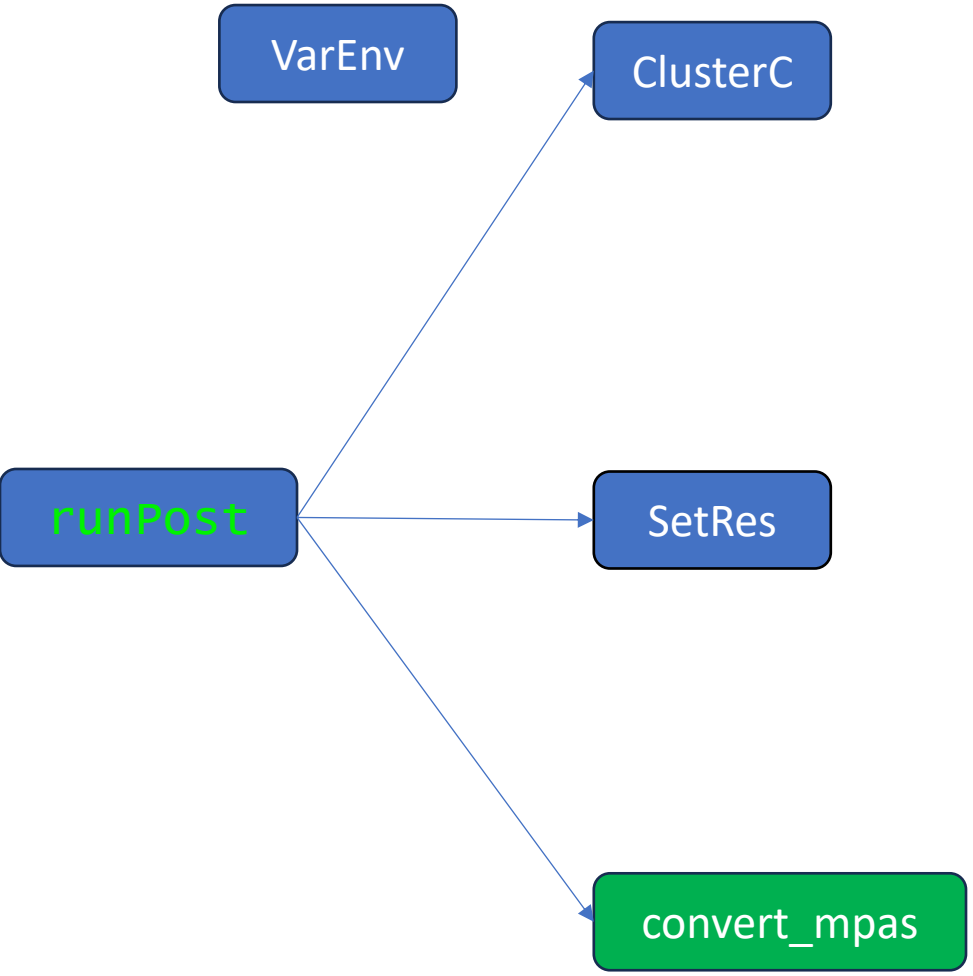



```
[aluno##@egeon-login1 run]$ ls
```

check the files

```
copy_data.bash                runModel.bash    scripts      readme
load_monan_app_modules.sh     runPost.bash     runPre.bash
```

runPost.bash



source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RunPost.bash

Step 19 – Execute Post-processing Scripts Control

```
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional/run
```

check the directory

```
[aluno##@egeon-login1 run]$ ./runPost.bash
```

Execute the script without passing the arguments

```
[aluno##@egeon-login1 run]$ ./runPost.bash
.........................................
.........................................
.........................................
.
```

check the information

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Step 19 – Execute Post-processing Scripts Control runPost.bash

./runPost.bash

```
+ '[' 0 -ne 7 ']'
+ usage
+ sed -n '/^# !CALLING SEQUENCE:/,/^# !/{p}' ./runPost.bash
+ head -n -1
# !CALLING SEQUENCE:
#
#   ./runPost.bash  ${EXP_NAME} ${EXP_RES}   ${LABELI}  ${LABELF}  ${Domain}  ${AreaRegion}  ${TypeGrid}
#
#
# For GFS datasets
#
#        ./runPost.bash  GFS 535554   2024042700  2024050100  regional  PortoAlegre  variable_resolution
#
#           o EXP_NAME   : Forcing: ERA5, CFSR, GFS, etc.
#           o EXP_RES    : mesh npts : 535554 etc
#           o LABELI     : Initial: date 2015030600
#           o LABELF     : End: date 2015030600
#           o Domain     : Domain: global or regional
#           o AreaRegion : PortoAlegre, Belem, global
#           o TypeGrid   : quasi_uniform or variable_resolution
#
#
# For benchmark:
#
#
# ./runPost.bash    GFS   2621442   2024042700  2024050100  regional  Sul  quasi_uniform
# ./runPost.bash    GFS   1024002   2024042700  2024050100  regional  Sul  quasi_uniform
#
#
# ./runPost.bash    GFS    535554   2024042700  2024050100  regional  Sul  variable_resolution
# ./runPost.bash    GFS    163842   2024042700  2024050100  regional  Sul  variable_resolution
#
+ exit 1
```

Step 19 – Execute Post-processing Scripts Control

```
[aluno##@egeon-login1 run]$ ./runPost.bash GFS 163842 2024042700 2024050100  regional Peru  variable_resolution
```


```
Sul
Nordeste
Norte
Sudeste
CentroOeste
Peru
Argentina
```

```
$ more Peru.ellipse.pts
```

```
Name: Peru
Type: ellipse
Point: -12.0431800, -77.0282400
Semi-major-axis: 1000000     # Raio at Meters
Semi-minor-axis: 1000000     # Raio at Meters
Orientation-angle: 45
```

Step 19 – Execute Post-processing Scripts Control

```
[aluno##@egeon-login1 run]$ ./runPost.bash  GFS 163842 2024042700  2024050100  regional Argentina  variable_resolution
```

- Sul
- Nordeste
- Norte
- Sudeste
- CentroOeste
- Peru
- Argentina

```
$ more Argentina.ellipse.pts
```

```
Name: Argentina
Type: ellipse
Point: -36.6203, -64.2906
Semi-major-axis: 1000000    # Raio at Meters
Semi-minor-axis: 1000000    # Raio at Meters
Orientation-angle: 45
```

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Step 19 – Execute Post-processing Scripts Control

runPost.bash

```
exclude_Fields
include_fields
```

```
$ more convert_mpas.nml
```

```
&config_convert_mpas
 verticalCoord = 'Pressure'    !  'MPAS_Model' or
'Pressure '
 nVertLevels = 55
 nOznLevels  = 59
 nMonths     = 12
 nSoilLevels = 4
 nIsobaricLev= 27
/
```

```
$ more target_domain
```

```
nlat = 220
nlon = 220
startlat = -11.5
startlon = -58.5
endlat = 10.5
endlon = -38.5
```

Step 20 – Choice of cases

runPost.bash

```
Group-1
[aluno##@egeon-login1 run]$./runPost.bash  GFS 163842 2024042700  2024042800   regional  Sul         variable_resolution
Group-2
[aluno##@egeon-login1 run]$./runPost.bash  GFS 163842 2024042700 2024042800   regional  Sudeste     variable_resolution
Group-3
[aluno##@egeon-login1 run]$./runPost.bash  GFS 163842 2024042700  2024042800  regional  Nordeste    variable_resolution
Group-4
[aluno##@egeon-login1 run]$./runPost.bash  GFS 163842 2024042700  2024042800   regional  Norte       variable_resolution
Group-5
[aluno##@egeon-login1 run]$./runPost.bash  GFS 163842 2024042700  2024042800   regional  CentroOeste variable_resolution
Group-6
[aluno##@egeon-login1 run]$./runPost.bash  GFS 163842 2024042700  2024042800   regional  Peru        variable_resolution
Group-7
[aluno##@egeon-login1 run]$./runPost.bash GFS 163842 2024042700  2024042800   regional  Argentina   variable_resolution
```

Step 20 – Choice of cases

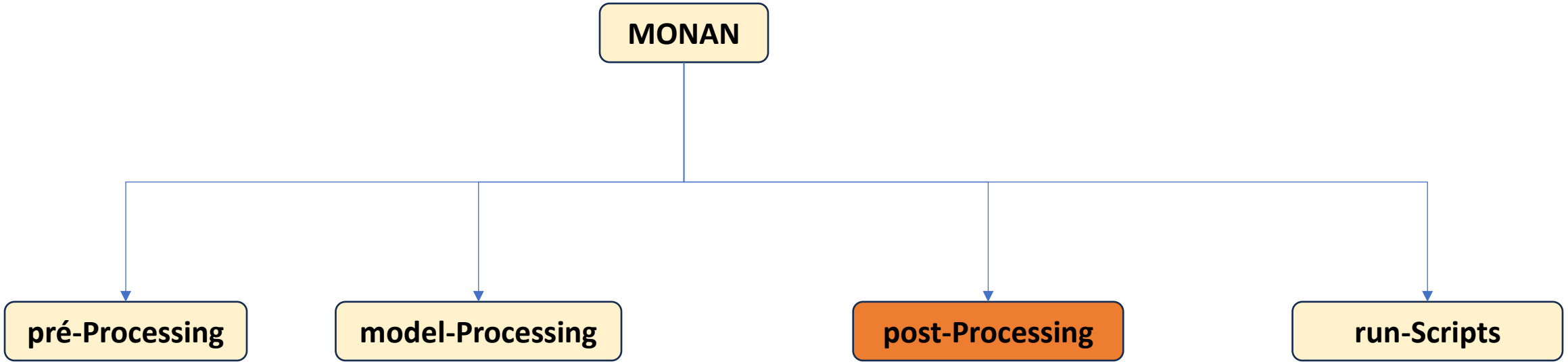
runPost.bash

```
Group-1
[aluno##@egeon-login1 run]$./runPost.bash  GFS 163842 2024042700  2024042800  regional  Sul          variable_resolution
Group-2
[aluno##@egeon-login1 run]$./runPost.bash  GFS 163842 2024042700 2024042800  regional  Sudeste      variable_resolution
Group-3
[aluno##@egeon-login1 run]$./runPost.bash  GFS 163842 2024042700  2024042800  regional  Nordeste     variable_resolution
Group-4
[aluno##@egeon-login1 run]$./runPost.bash  GFS 163842 2024042700  2024042800  regional  Norte        variable_resolution
Group-5
[aluno##@egeon-login1 run]$./runPost.bash  GFS 163842 2024042700  2024042800  regional  CentroOeste variable_resolution
Group-6
[aluno##@egeon-login1 run]$./runPost.bash  GFS 163842 2024042700  2024042800  regional  Peru         variable_resolution
Group-7
[aluno##@egeon-login1 run]$./runPost.bash GFS 163842 2024042700  2024042800  regional  Argentina    variable_resolution
```

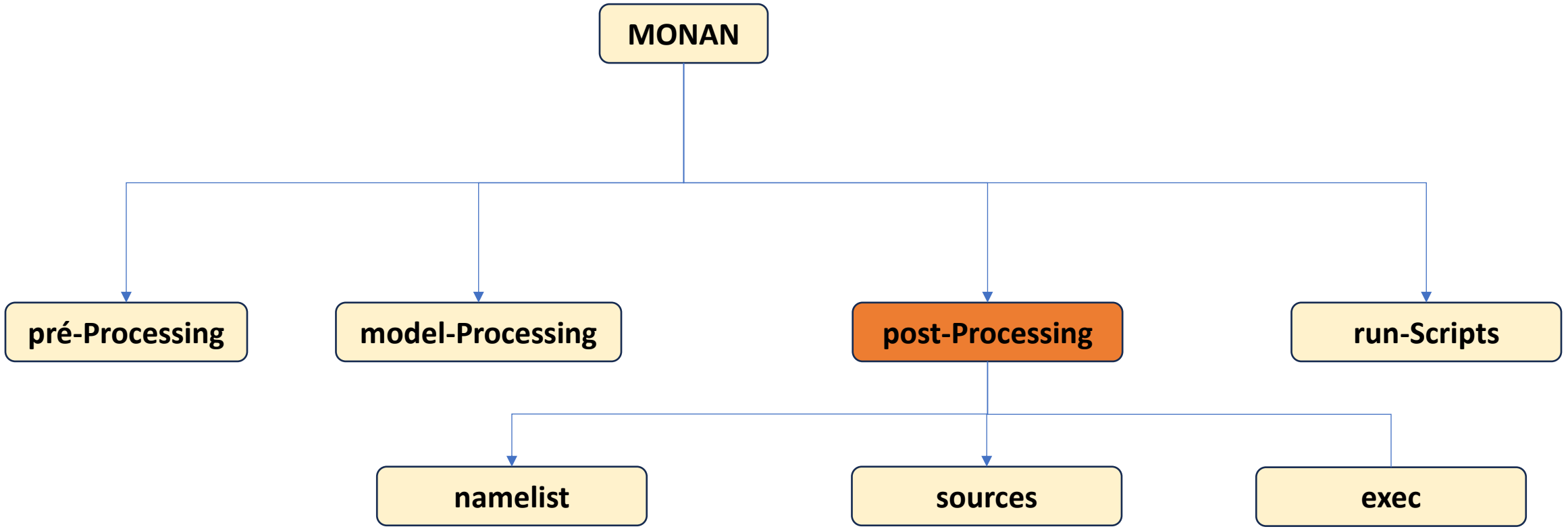
To run the runPost.bash

"Choose the same option used in the Pre-processing"

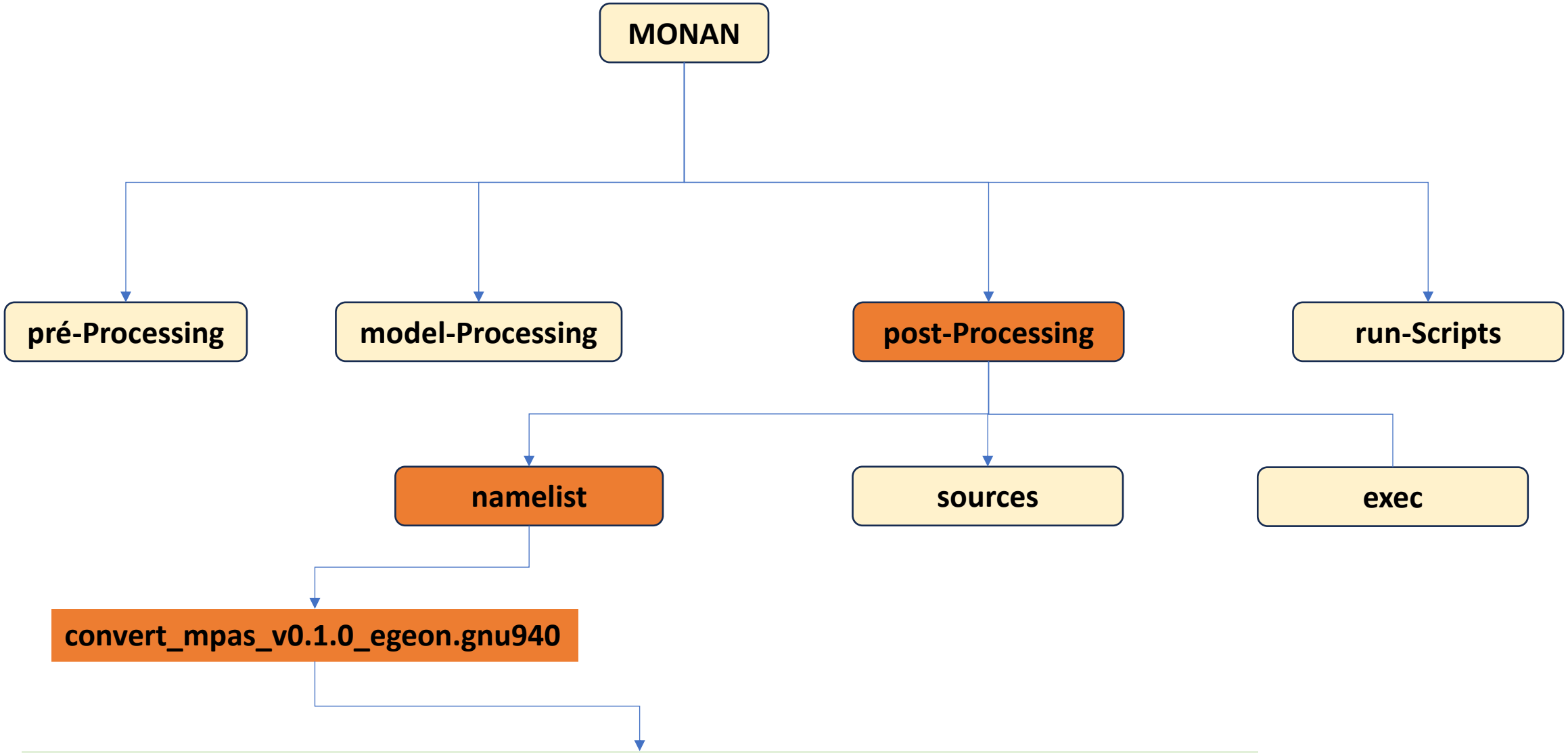
Post-Processing



Post-Processing

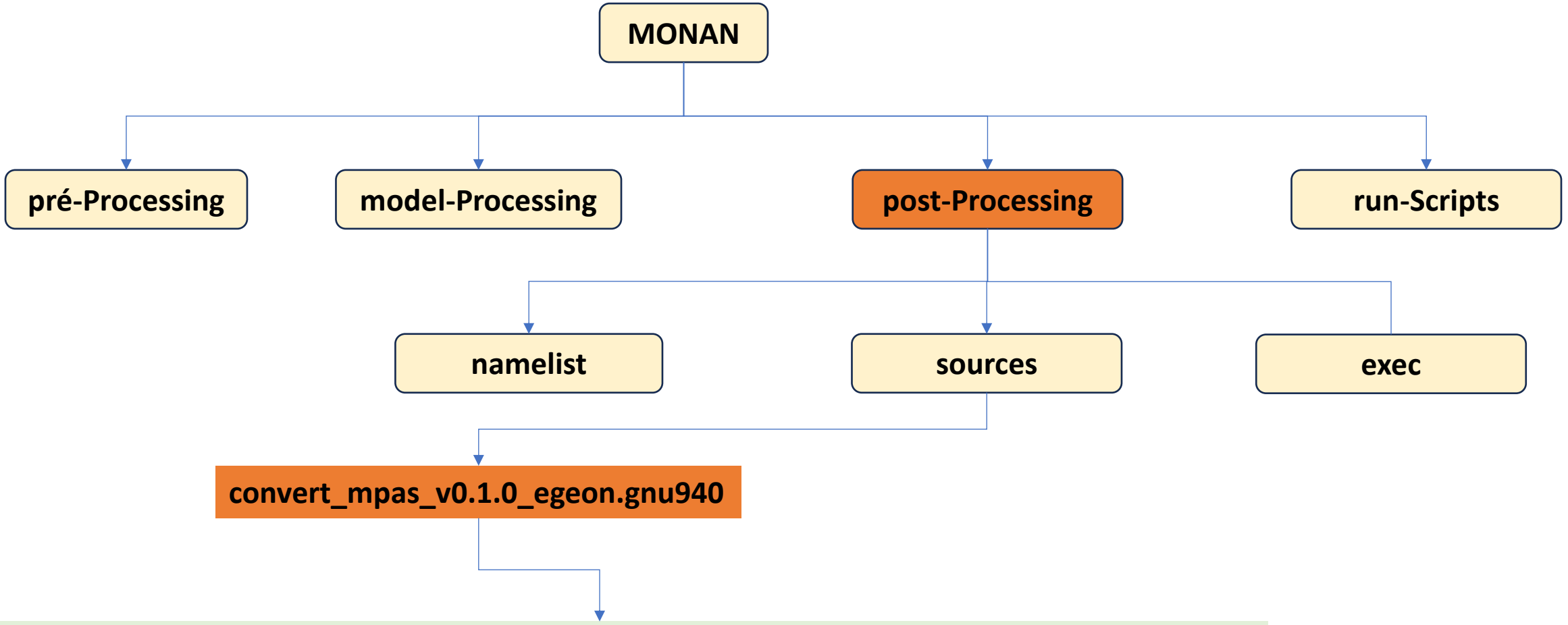


Post-Processing




```
convert_mpas.nml        exclude_fields.history  target_domain
include_fields.diag     exclude_fields.diag     include_fields.history  readme
```

Post-Processing




```
load_module_convert_mpas.bash  Makefile  make.sh README.md  src
```

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Step 21 – Execute Post-processing Scripts Control runPost.bash

/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/model/runs/GFS/monanprd

```
diag.2024-04-27_00.00.00.nc  diag.2024-04-28_02.00.00.nc  diag.2024-04-29_04.00.00.nc  diag.2024-04-30_06.00.00.nc
diag.2024-04-27_01.00.00.nc  diag.2024-04-28_03.00.00.nc  diag.2024-04-29_05.00.00.nc  diag.2024-04-30_07.00.00.nc
diag.2024-04-27_02.00.00.nc  diag.2024-04-28_04.00.00.nc  diag.2024-04-29_06.00.00.nc  diag.2024-04-30_08.00.00.nc
diag.2024-04-27_03.00.00.nc  diag.2024-04-28_05.00.00.nc  diag.2024-04-29_07.00.00.nc  diag.2024-04-30_09.00.00.nc
diag.2024-04-27_04.00.00.nc  diag.2024-04-28_06.00.00.nc  diag.2024-04-29_08.00.00.nc  diag.2024-04-30_10.00.00.nc
diag.2024-04-27_05.00.00.nc  diag.2024-04-28_07.00.00.nc  diag.2024-04-29_09.00.00.nc  diag.2024-04-30_11.00.00.nc
diag.2024-04-27_06.00.00.nc  diag.2024-04-28_08.00.00.nc  diag.2024-04-29_10.00.00.nc  diag.2024-04-30_12.00.00.nc
.....................................
```

convert_mpas.nml

target_domain

exclude_Fields
include_fields

```
time mpirun -np $SLURM_NTASKS -env UCX_NET_DEVICES=mlx5_0:1 -genvall ./convert_mpas
```

/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/pos/runs/GFS/postprd

```
MONAN_DIAG_R_POS_ERA5_2019052500_2019052500.mm.x4.163842L55.nc  MONAN_DIAG_R_POS_ERA5_2019052500_2019052513.mm.x4.163842L55.nc
MONAN_DIAG_R_POS_ERA5_2019052500_2019052501.mm.x4.163842L55.nc  MONAN_DIAG_R_POS_ERA5_2019052500_2019052514.mm.x4.163842L55.nc
MONAN_DIAG_R_POS_ERA5_2019052500_2019052502.mm.x4.163842L55.nc  MONAN_DIAG_R_POS_ERA5_2019052500_2019052515.mm.x4.163842L55.nc
MONAN_DIAG_R_POS_ERA5_2019052500_2019052503.mm.x4.163842L55.nc  MONAN_DIAG_R_POS_ERA5_2019052500_2019052516.mm.x4.163842L55.nc
MONAN_DIAG_R_POS_ERA5_2019052500_2019052504.mm.x4.163842L55.nc  MONAN_DIAG_R_POS_ERA5_2019052500_2019052517.mm.x4.163842L55.nc
MONAN_DIAG_R_POS_ERA5_2019052500_2019052505.mm.x4.163842L55.nc  MONAN_DIAG_R_POS_ERA5_2019052500_2019052518.mm.x4.163842L55.nc
```

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Step 21 – Execute Post-processing Scripts Control runPost.bash

MONAN_DIAG_G_MOD_GFS_YYYYMMDDHH_yyyymmddhh.mm.xRESL55.nc
--

Name of the model : MONAN
Type of output table (frequency) : DIAG, HISTORY, etc
Type for horizontal domain : G for global; R for regional.
Type of model format available : MOD for model, POS for post processed output files
Type of Initial condition source used : GFS, ERA5, etc,
Initial condition date : YYYYMMDDHH,
Forecast final date : yyyymmddhh,
Resolution : x1.1024002,
Number of levels : 55.
File format : .nc

Step 22 – Plot your data using the GrADS software

```
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional/run
```

check the directory

```
[aluno##@egeon-login1 run]$  source load_monan_app_modules.sh
```

Load modules

change directory

```
[aluno##@egeon-login1 run]$ cd /mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/pos/runs/GFS/postprd
```

```
[aluno##@egeon-login1 postprd]$ grads
```

Run GrADS

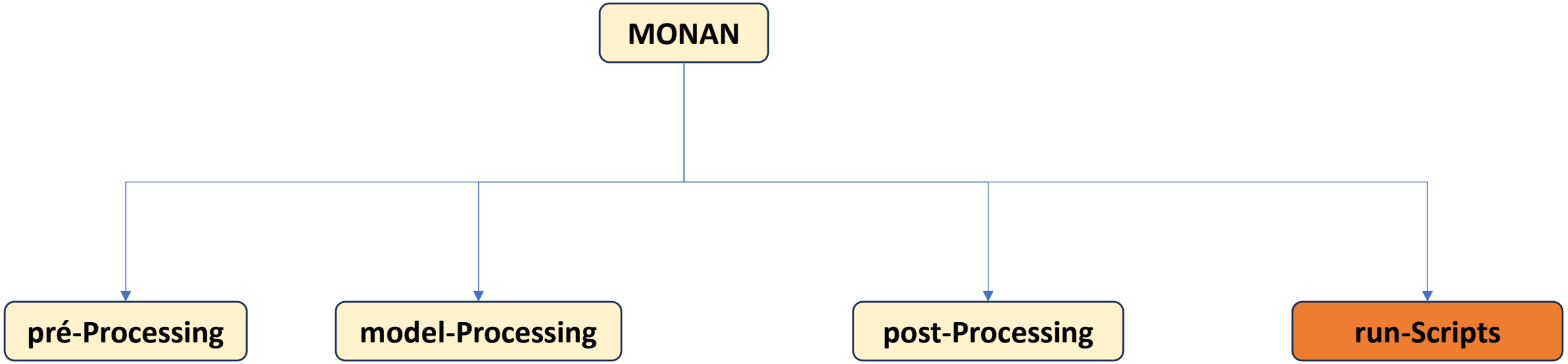
```
ga-> open template.ctl
Scanning description file:  template.ctl
Data file mpas.%y4-%m2-%d2_%h2.00.00.nc is open as file 1
LON set to -53.3923 -27.6127
LAT set to -22.2893 3.49033
LEV set to 100000 100000
Time values set: 2010:10:16:0 2010:10:16:0
E set to 1 1
ga->d temp
```

Monan Regional Model Trainning

13:30-16:45 - Parte2

Execution Control

Execution Control



Some case studies of meteorological events

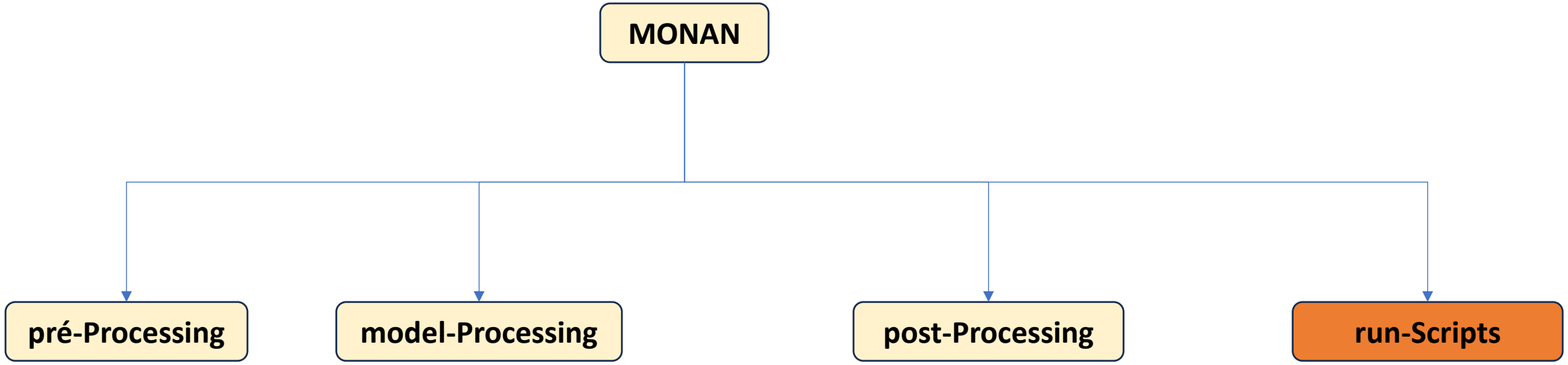
Step 24 – Execution Control

```
[aluno##@egeon-login1 aluno##]$ cd  /mnt/beegfs/aluno##/monan_regional/run
```

change directory

```
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional/run
```

check the directory




```
[aluno##@egeon-login1 run]$ ls
copy_data.bash              runModel.bash   scripts      readme
load_monan_app_modules.sh   runPost.bash    runPre.bash
```

Step 8 – Execute Pre-processing Scripts Control

"Choose one of the cases and execute the entire procedure to run the: Pre-Processing/Model-Processing/Post-Processing"

Step 25 – Execute Pre-processing Scripts Control

```
#./runPre.bash EXP_NAME EXP_RES   LABELI      LABELF      Domain    AreaRegion   TypeGrid
#
#           o EXP_NAME   : Forcing: ERA5, CFSR, GFS, etc.
#           o EXP_RES    : Resolution: 1024002 (24km), 2621442
#           o LABELI     : Initial: date 2015030600
#           o LABELF     : End:     date 2015030600
#           o Domain     : global  or regional
#           o AreaRegion : PortoAlegre
#           o TypeGrid   : quasi_uniform or variable_resolution
#
#
# For benchmark:
.....................................................................................
#  Case-1 : Hurricane Catarina
#
# ./runPre.bash    ERA5  163842   2004032400  2004032800  regional  Sul       variable_resolution
#
#.....................................................................................
# Case-2 : meteorological instability line LI-NORDESTE
#
# ./runPre.bash    ERA5  163842   2010101600  2010102000  regional  Nordeste  variable_resolution
#
.....................................................................................
# Case-3 : meteorological instability line LI-NORTE
#
# ./runPre.bash    ERA5  163842   2013043000  2013050400  regional  Norte     variable_resolution
#
.....................................................................................
# Case-4 : meteorological easterly wave  NORDESTE
#
# ./runPre.bash    ERA5  163842   2019052500  2019052900  regional  Nordeste  variable_resolution
#
```

Step 26 – Execute Model-processing Scripts Control

```
# ./runModel.bash  ${EXP_NAME} ${EXP_RES}   ${LABELI}  ${LABELF}  ${Domain}  ${AreaRegion}  ${TypeGrid}
#
#           o EXP_NAME   : Forcing: ERA5, CFSR, GFS, etc.
#           o EXP_RES    : mesh npts : 535554 etc
#           o LABELI     : Initial: date 2015030600
#           o LABELF     : End: date 2015030600
#           o Domain     : Domain: global or regional
#           o AreaRegion : PortoAlegre, Belem, global
#           o TypeGrid   : quasi_uniform or variable_resolution
#
# For benchmark:
.....................................................................................
#  Case-1 : Hurricane Catarina
#
# ./runModel.bash    ERA5  163842   2004032400  2004032800  regional  Sul       variable_resolution
#
#.....................................................................................
# Case-2 : meteorological instability line LI-NORDESTE
#
# ./runModel.bash    ERA5  163842   2010101600  2010102000  regional  Nordeste  variable_resolution
#
.....................................................................................
# Case-3 : meteorological instability line LI-NORTE
#
# ./runModel.bash    ERA5  163842   2013043000  2013050400  regional  Norte     variable_resolution
#
.....................................................................................
# Case-4 : meteorological easterly wave  NORDESTE
#
# ./runModel.bash    ERA5  163842   2019052500  2019052900  regional  Nordeste  variable_resolution
#
```

Step 27 – Execute Prot-processing Scripts Control

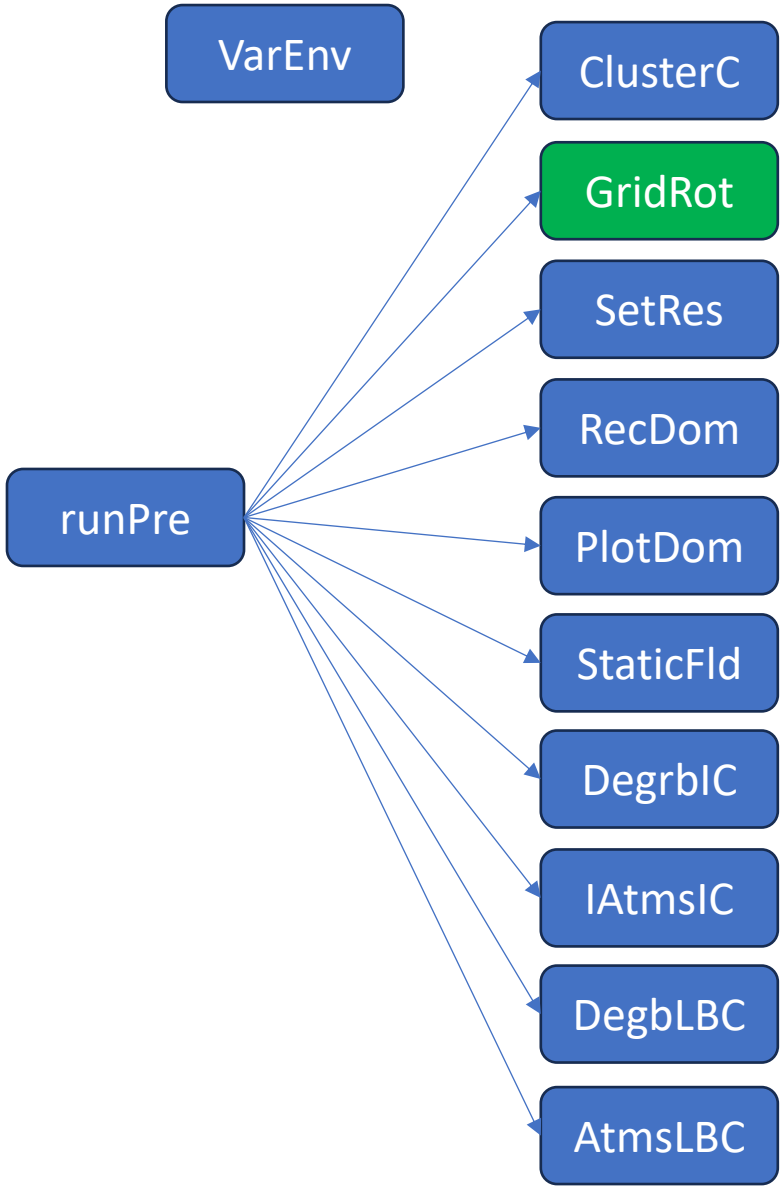
```
#./runPost.bash EXP_NAME EXP_RES   LABELI      LABELF      Domain    AreaRegion   TypeGrid
#
#           o EXP_NAME   : Forcing: ERA5, CFSR, GFS, etc.
#           o EXP_RES    : Resolution: 1024002 (24km), 2621442
#           o LABELI     : Initial: date 2015030600
#           o LABELF     : End:     date 2015030600
#           o Domain     : global  or regional
#           o AreaRegion : PortoAlegre
#           o TypeGrid   : quasi_uniform or variable_resolution
#
#
# For benchmark:
.....................................................................................
#  Case-1 : Hurricane Catarina
#
# ./runPost.bash    ERA5  163842   2004032400  2004032800  regional  Sul       variable_resolution
#
#.....................................................................................
# Case-2 : meteorological instability line LI-NORDESTE
#
# ./runPost.bash    ERA5  163842   2010101600  2010102000  regional  Nordeste  variable_resolution
#
.....................................................................................
# Case-3 : meteorological instability line LI-NORTE
#
# ./runPost.bash    ERA5  163842   2013043000  2013050400  regional  Norte     variable_resolution
#
.....................................................................................
# Case-4 : meteorological easterly wave  NORDESTE
#
# ./runPost.bash    ERA5  163842   2019052500  2019052900  regional  Nordeste  variable_resolution
#
```

BASH
&
Description of the MONAN-Regional model scripts

Paulo Yoshio Kubota

runPre.bash

The script “runPre.bash” invokes the functions

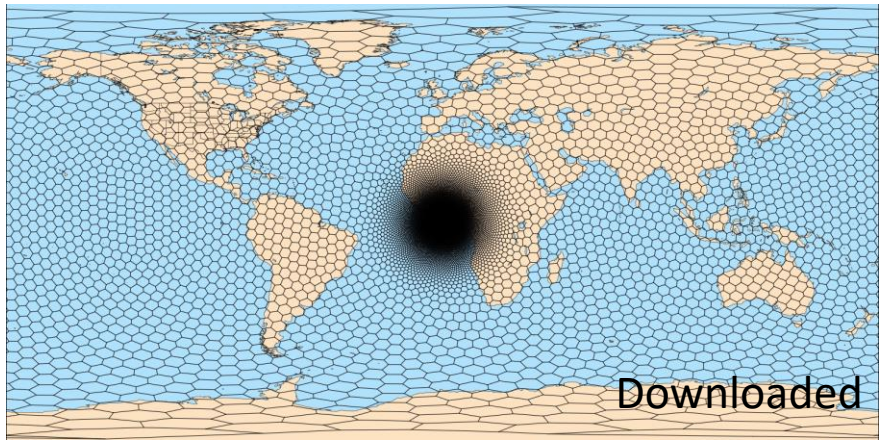


source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_GridRotate.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RecDomain.bash
source scripts/Function_PlotDomain.bash
source scripts/Function_Static.sh
source scripts/Function_Degrib_IC_GFS.bash
source scripts/Function_InitAtmos_IC_GFS.bash
source scripts/Function_Degrib_LBC_GFS.bash
source scripts/Function_InitAtmos_LBC_GFS.bash

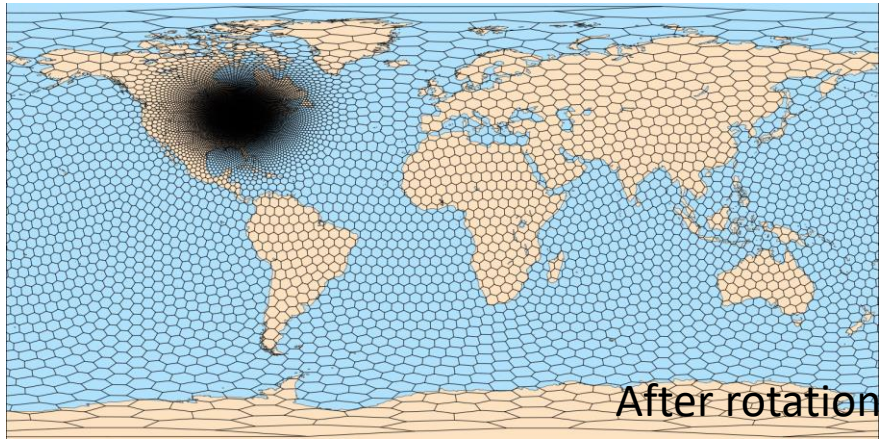
Criando malhas de área limitada: Região circular com refinamento

Criar malhas de área limitada a partir de malhas "pai(global)" de resolução variável funciona igualmente bem...

1.Rotacione o refinamento para uma região de interesse usando a ferramenta grid_rotate descrita anteriormente.



grid_rotate



source scripts/Function_GridRotate.bash

```
cat<<EOF>${path_exe}/namelist.input
&input
   config_original_latitude_degrees = 0
   config_original_longitude_degrees = 0

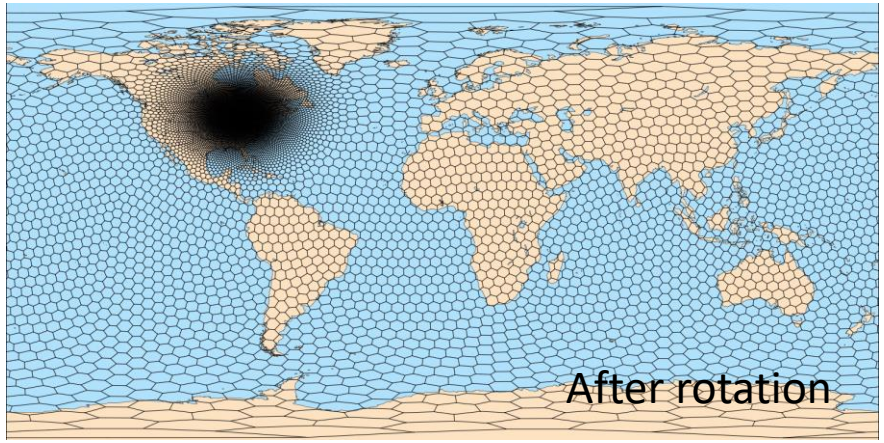
   config_new_latitude_degrees = ${clat}
   config_new_longitude_degrees = ${clon}
   config_birdseye_rotation_counter_clockwise_degrees = 0
/
EOF
```

```
./grid_rotate  ${input_filename} ${output_filename}
```

Criando malhas de área limitada: Região circular com refinamento

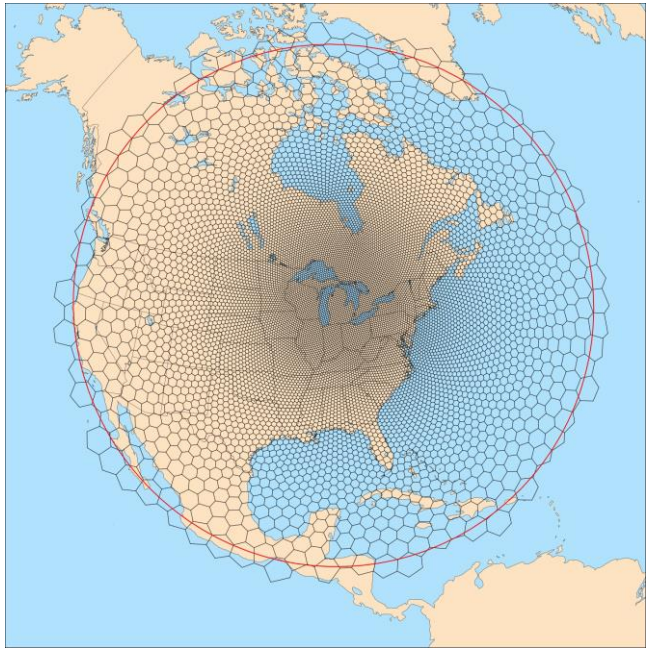
Criar malhas de área limitada a partir de malhas "pai(global)" de resolução variável funciona igualmente bem...

1.Rotacione o refinamento para uma região de interesse usando a ferramenta grid_rotate descrita anteriormente.



MPAS-Limited-Area

2.Extraia uma malha de área limitada usando a ferramenta MPAS-Limited-Area.



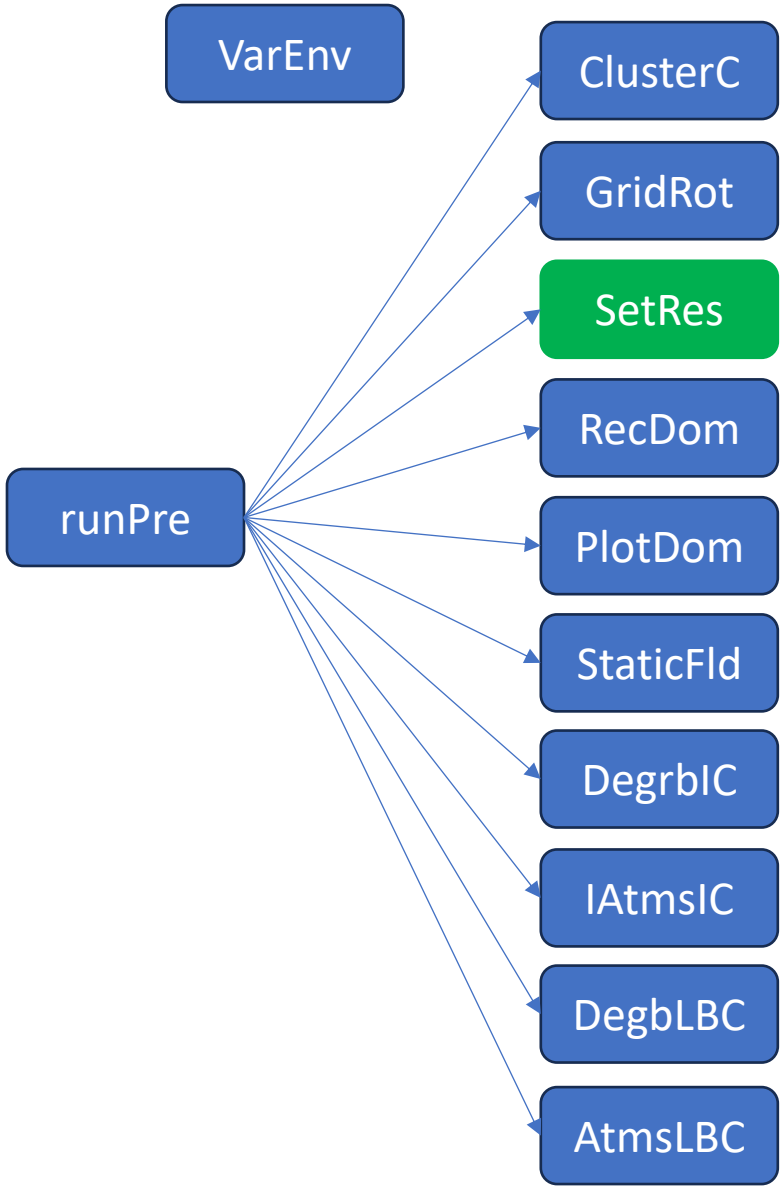
```
create_region    ${AreaRegion}.ellipse.pts    ${RES_KM}/g${frac}.${EXP_RES}.grid.nc
```

```
more Sul.ellipse.pts
```

```
Name: Sul
Type: ellipse
Point: -30.03306, -51.230000
Semi-major-axis: 1000000    # Raio at Meters
Semi-minor-axis: 1000000    # Raio at Meters
Orientation-angle: 45
```

runPre.bash

The script “runPre.bash” invokes the functions



source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_GridRotate.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RecDomain.bash
source scripts/Function_PlotDomain.bash
source scripts/Function_Static.sh
source scripts/Function_Degrib_IC_GFS.bash
source scripts/Function_InitAtmos_IC_GFS.bash
source scripts/Function_Degrib_LBC_GFS.bash
source scripts/Function_InitAtmos_LBC_GFS.bash

runPre.bash

The script “runPre.bash” invokes the functions

```
if [ ${TypeGrid} = 'variable_resolution' ]; then

case "`echo ${EXP_RES} | awk '{print $1/1 }'`" in
  835586)RES_KM='060_003km';frac=20;len_disp=3000  ;;
  535554)RES_KM='060_015km';frac=4 ;len_disp=15000 ;;
  163842)RES_KM='092_025km';frac=4 ;len_disp=25000 ;;
esac

else

case "`echo ${EXP_RES} | awk '{print $1/1 }'`" in
65536002)RES_KM='003_km';frac=1;len_disp=3000   ;;
 2621442)RES_KM='015_km';frac=1;len_disp=15000  ;;
 1024002)RES_KM='024_km';frac=1;len_disp=24000  ;;
  655362)RES_KM='030_km';frac=1;len_disp=30000  ;;
  256002)RES_KM='048_km';frac=1;len_disp=48000  ;;
  163842)RES_KM='060_km';frac=1;len_disp=60000  ;;
   40962)RES_KM='120_km';frac=1;len_disp=120000 ;;
   10242)RES_KM='240_km';frac=1;len_disp=240000 ;;
    4002)RES_KM='384_km';frac=1;len_disp=384000 ;;
    2562)RES_KM='480_km';frac=1;len_disp=480000 ;;
esac
fi
```

```
source scripts/Function_SetResolution.bash
```

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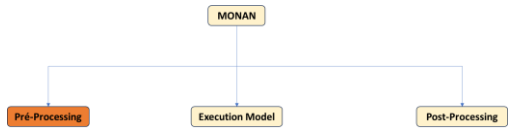
Pré-Processing



a) Estrutura do Curso
- Divida o curso em módulos ou unidades.
- Cada módulo deve abordar um tópico específico.

Pré-Processing

databcs | **datain** | **namelist** | **sources** | **tables** | **Variable_tables**

meshes

https://mpas-dev.github.io/atmosphere/atmosphere_meshes.html

variable_resolution
- **global**: 060-003km | 060-010km | 015-003km | 046-012km | 060-015km
- **regional**: 060-003km | 060-010km | 015-003km | 046-012km | 060-015km

quasi_uniform
- **global**: 003_km | 015_km | 024_km | 030_km | 120_km
- **regional**: 003_km | 015_km | 024_km | 030_km | 120km

regional_domain

mesh_generation

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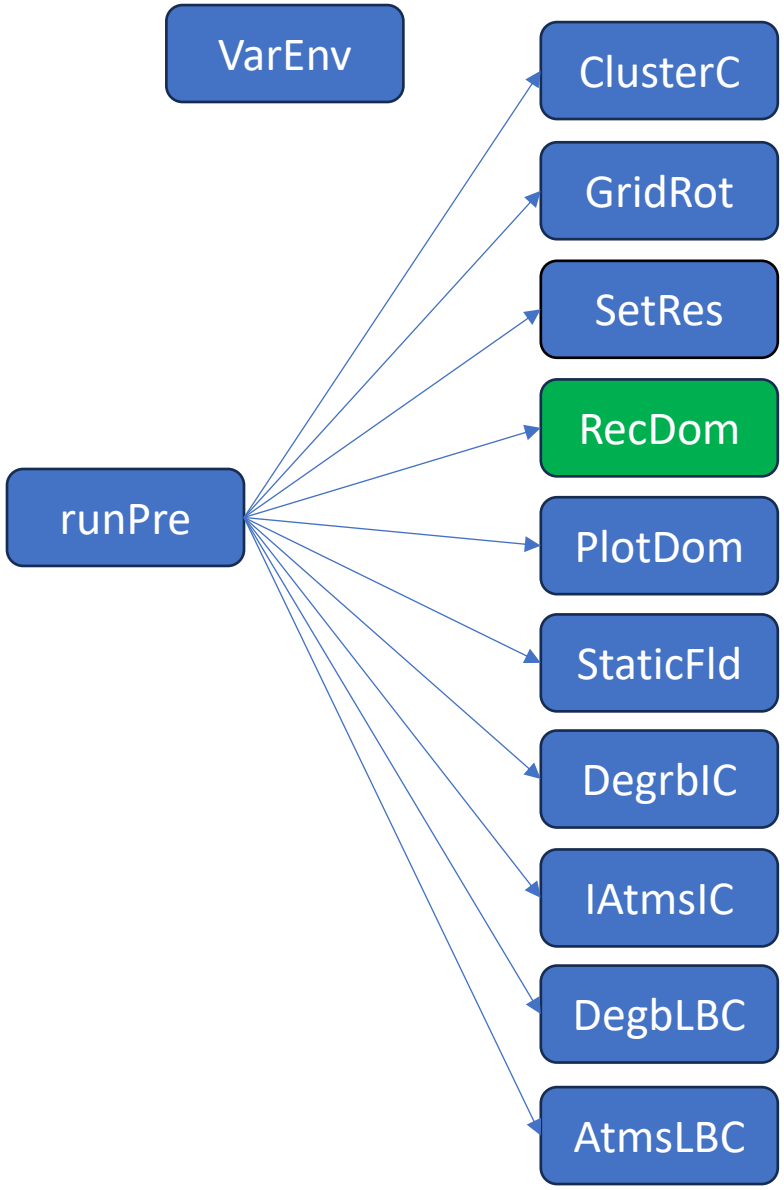
runPre.bash

The script “runPre.bash” invokes the functions



source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_GridRotate.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RecDomain.bash
source scripts/Function_PlotDomain.bash
source scripts/Function_Static.sh
source scripts/Function_Degrib_IC_GFS.bash
source scripts/Function_InitAtmos_IC_GFS.bash
source scripts/Function_Degrib_LBC_GFS.bash
source scripts/Function_InitAtmos_LBC_GFS.bash

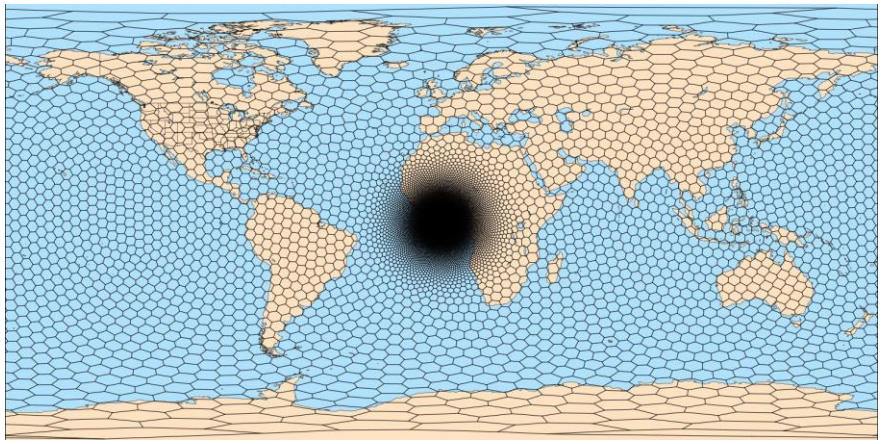
Running Regional MPAS

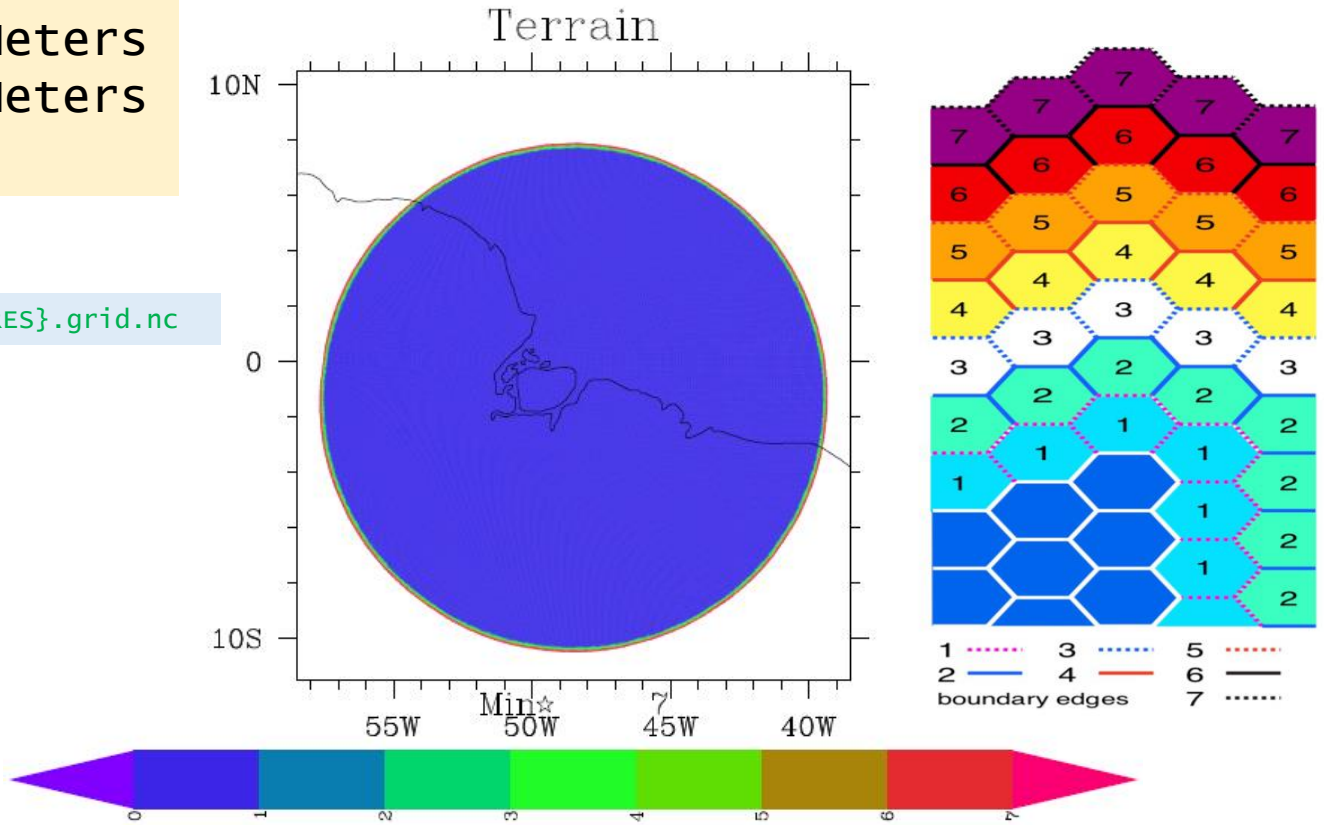
more regional/003_km/Belem.ellipse.pts

```
Name: Belem
Type: ellipse
Point: -1.3, -48.5
Semi-major-axis: 1000000     # Raio at Meters
Semi-minor-axis: 1000000     # Raio at Meters
Orientation-angle: 45
```

source scripts/Function_RecDomain.bash

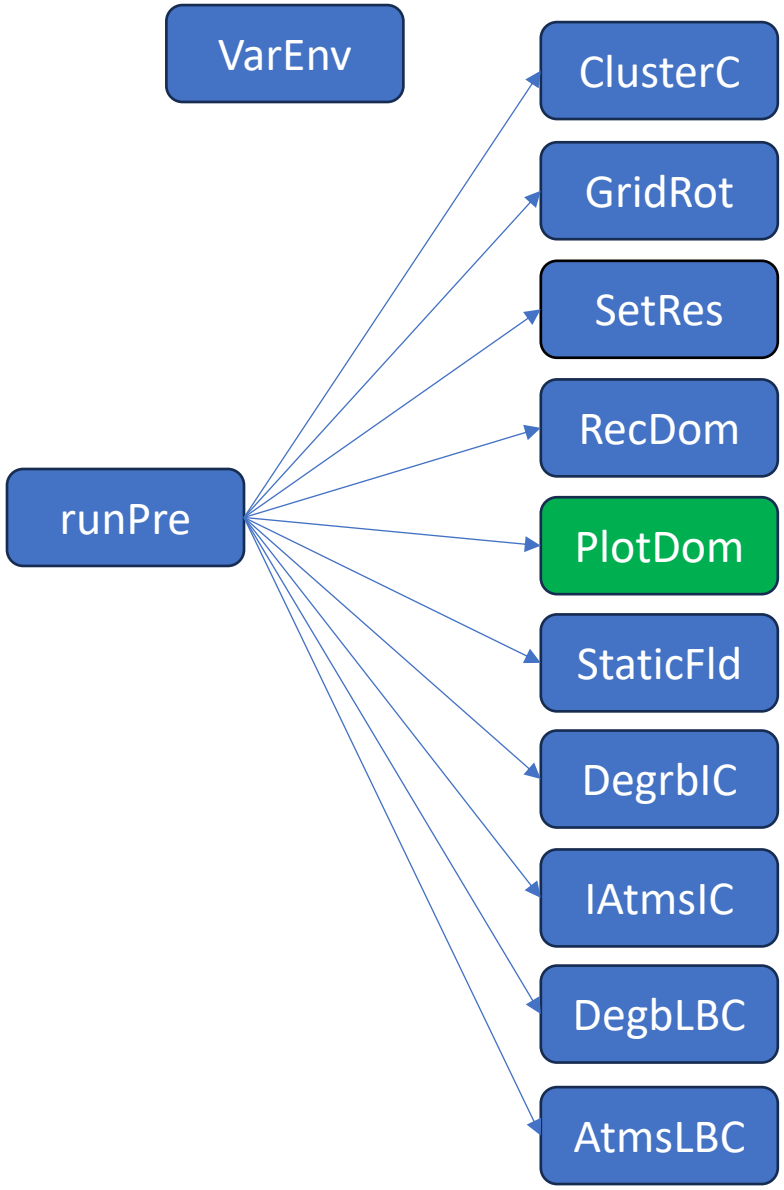
```
create_region    ${AreaRegion}.ellipse.pts    ${RES_KM}/g${frac}.${EXP_RES}.grid.nc
```





runPre.bash

The script “runPre.bash” invokes the functions



source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_GridRotate.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RecDomain.bash
source scripts/Function_PlotDomain.bash
source scripts/Function_Static.sh
source scripts/Function_Degrib_IC_GFS.bash
source scripts/Function_InitAtmos_IC_GFS.bash
source scripts/Function_Degrib_LBC_GFS.bash
source scripts/Function_InitAtmos_LBC_GFS.bash

Running Regional MPAS

```
sed -e "s,#FILEDATA#,${FILEDATA},g;s,#startlon#,${startlon},g;s,#endlon#,${endlon},g;s,#startlat#,${startlat},g;s,#endlat#,${endlat},g" \
        ${DIR_MESH}/plot_region.ncl > ${pathin}/plot_region.ncl
```

```
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
;
; Main script
;
;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;;
begin

  t = stringtointeger(getenv("T"))
;  fname = getenv("FNAME")
;  fname = "PortoAlegre.grid.nc"
  fname = "#FILEDATA#"
  f = addfile(fname,"r")

;
; Useful parameters
;

; Font size for cell labels:
cellLabelSize = 0.0025

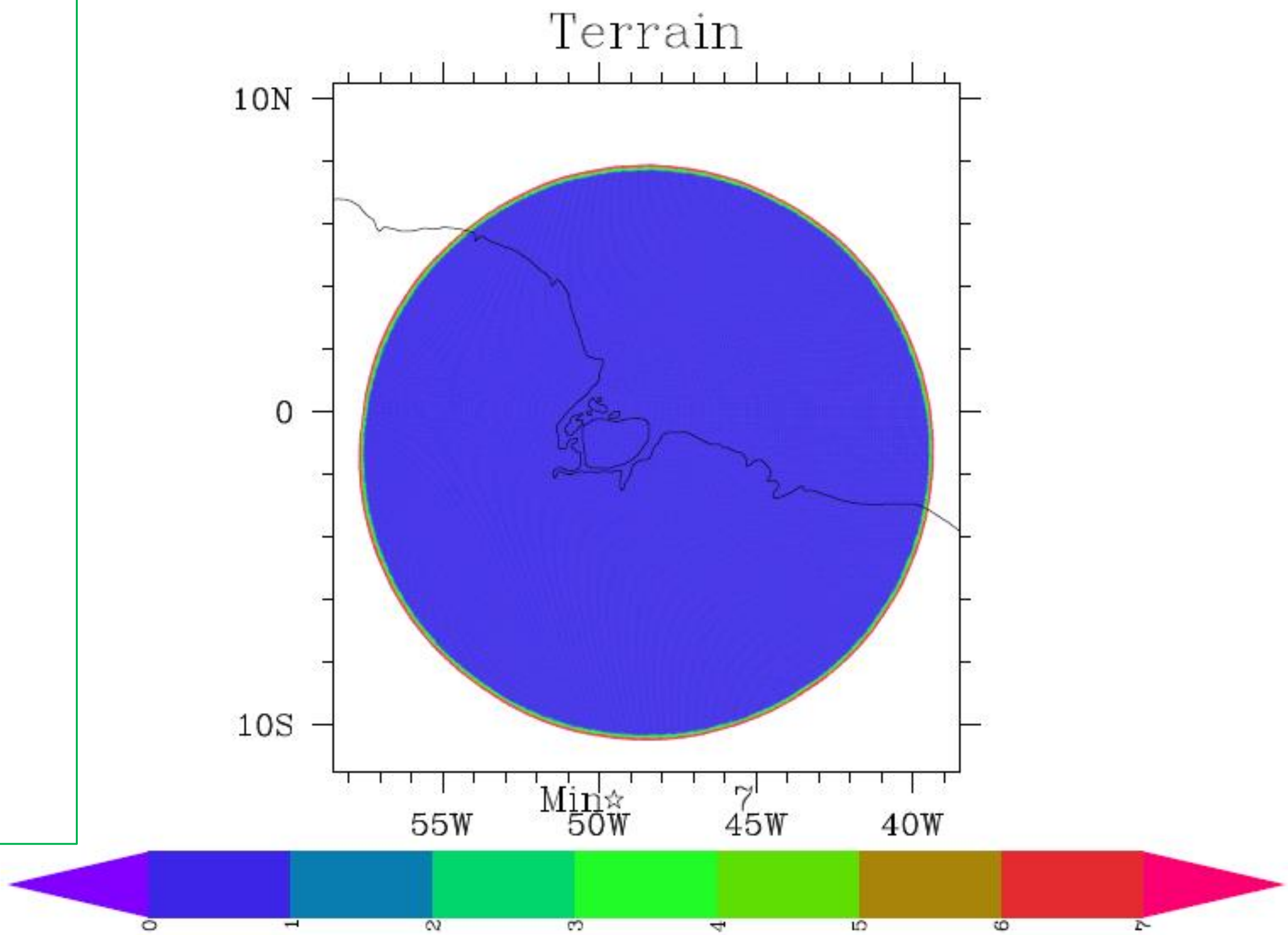
; Whether cell indices are 0-based or 1-based:
indexBase = 1

; The bounding box for the plot
mapLeft   =  #startlon# ;-90.0    ; longitude
mapRight  =  #endlon#   ;-30.0    ; longitude
mapBottom =  #startlat# ;-60.0    ; latitude
mapTop    =  #endlat#   ;-10.0    ; latitude

; The field to be plotted
h   = f->bdyMaskCell(:)
```

AreaRegional.ellipse.pts

source scripts/Function_PlotDomain.bash



${path_ncl}/ncl ${pathin}/plot_region.ncl

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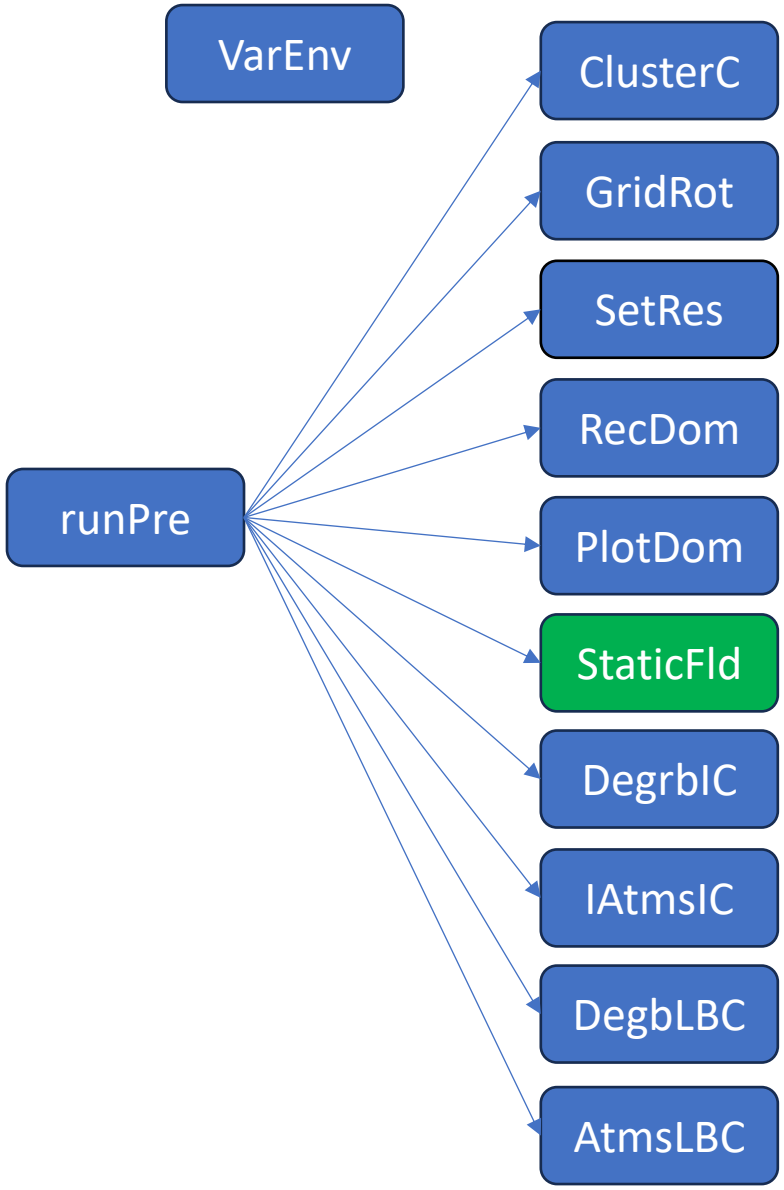
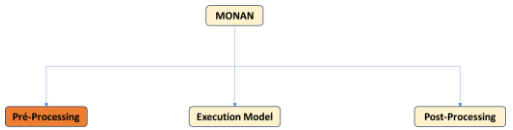
runPre.bash

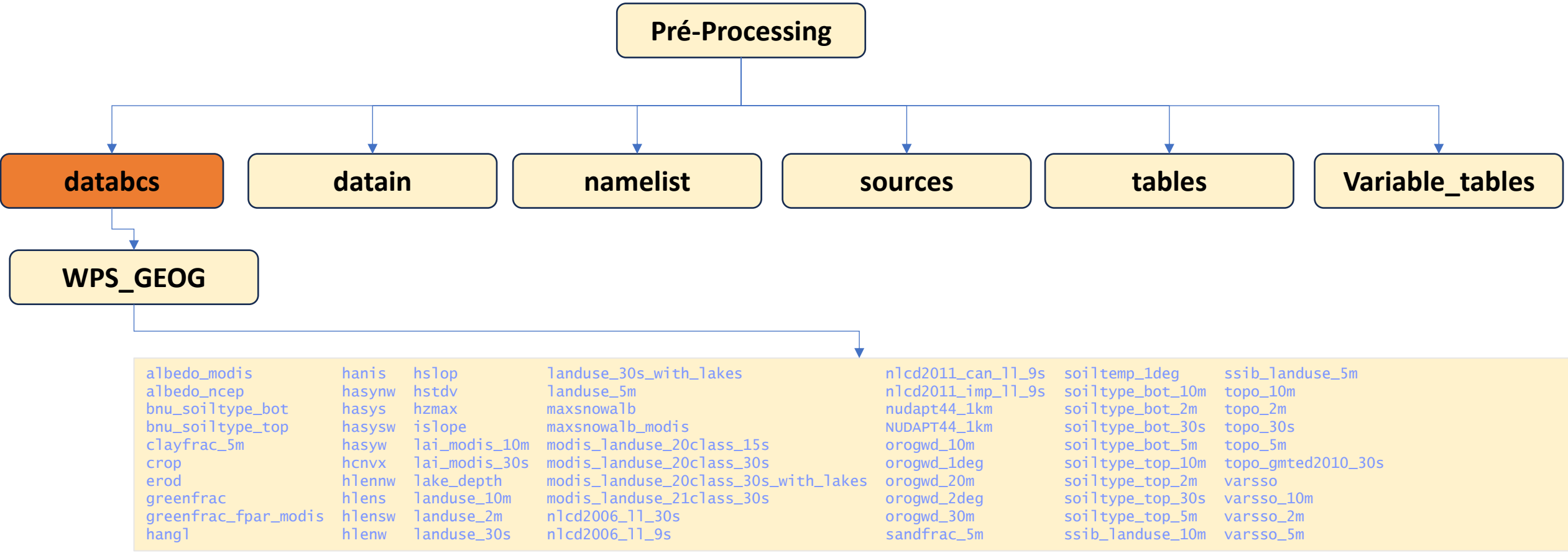
The script “runPre.bash” invokes the functions



source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_GridRotate.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RecDomain.bash
source scripts/Function_PlotDomain.bash
source scripts/Function_Static.sh
source scripts/Function_Degrib_IC_GFS.bash
source scripts/Function_InitAtmos_IC_GFS.bash
source scripts/Function_Degrib_LBC_GFS.bash
source scripts/Function_InitAtmos_LBC_GFS.bash

Pré-Processing





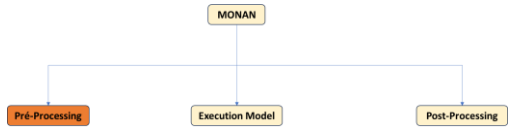
albedo_modis	hanis	hslop	landuse_30s_with_lakes	nlcd2011_can_ll_9s	soiltemp_1deg	ssib_landuse_5m
albedo_ncep	hasynw	hstdv	landuse_5m	nlcd2011_imp_ll_9s	soiltype_bot_10m	topo_10m
bnu_soiltype_bot	hasys	hzmax	maxsnowalb	nudapt44_1km	soiltype_bot_2m	topo_2m
bnu_soiltype_top	hasysw	islope	maxsnowalb_modis	NUDAPT44_1km	soiltype_bot_30s	topo_30s
clayfrac_5m	hasyw	lai_modis_10m	modis_landuse_20class_15s	orogwd_10m	soiltype_bot_5m	topo_5m
crop	hcnvx	lai_modis_30s	modis_landuse_20class_30s	orogwd_1deg	soiltype_top_10m	topo_gmted2010_30s
erod	hlennw	lake_depth	modis_landuse_20class_30s_with_lakes	orogwd_20m	soiltype_top_2m	varsso
greenfrac	hlens	landuse_10m	modis_landuse_21class_30s	orogwd_2deg	soiltype_top_30s	varsso_10m
greenfrac_fpar_modis	hlensw	landuse_2m	nlcd2006_ll_30s	orogwd_30m	soiltype_top_5m	varsso_2m
hangl	hlenw	landuse_30s	nlcd2006_ll_9s	sandfrac_5m	ssib_landuse_10m	varsso_5m

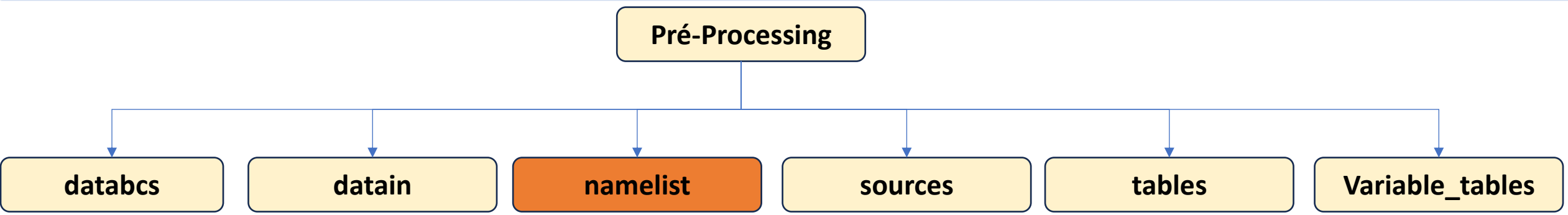
source scripts/Function_Static.sh

```
namelist.init_atmosphere
streams.init_atmosphere
```

Paulo Yoshio Kubota

Pré-Processing





streams.init_atmosphere

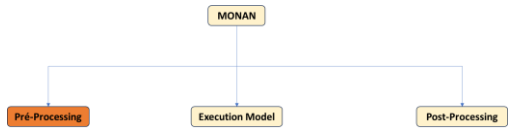
```
<streams>
<immutable_stream name="input"
                  type="input"
                  filename_template="Sul.1024002.grid.nc"
                  input_interval="initial_only" />

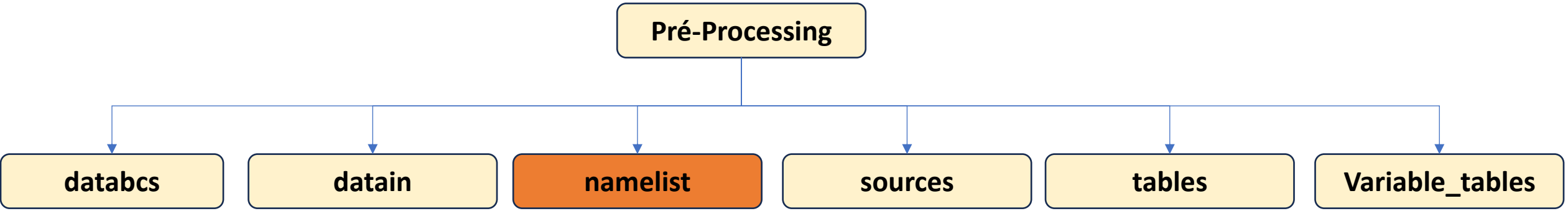
<immutable_stream name="output"
                  type="output"
                  filename_template="Sul.1024002.static.nc"
                  packages="initial_conds"
                  output_interval="initial_only" />

<immutable_stream name="surface"
                  type="output"
                  filename_template="Sul.1024002.sfc_update.nc"
                  filename_interval="none"
                  packages="sfc_update"
                  output_interval="86400" />

</streams>
```

Pré-Processing



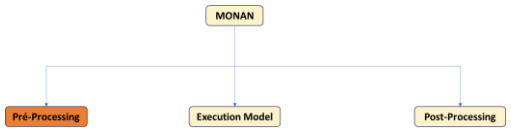


namelist.init_atmosphere

```
&nhyd_model
    config_init_case = 7    ! necessary
    config_theta_adv_order = 3
    config_coef_3rd_order = 0.25
    config_interface_projection = 'linear_interpolation'
/
&dimensions
    config_nvertlevels = 1
    config_nsoillevels = 1
    config_nfglevels = 1
    config_nfgsoillevels = 1
/
&data_sources
    config_geog_data_path =
'/mnt/beegfs/paulo.kubota/tmp/monan_regional/pre/databcs/WPS_GEOG/'
    config_met_prefix = 'CFSR'    ! not necessary to static files
    config_sfc_prefix = 'SST'
    config_fg_interval = 86400
    config_landuse_data = 'MODIFIED_IGBP_MODIS_NOAH'
    config_topo_data = 'GMTED2010'
    config_vegfrac_data = 'MODIS'
    config_albedo_data = 'MODIS'
    config_maxsnowalbedo_data = 'MODIS'
    config_supersample_factor = 3
    config_30s_supersample_factor = 1
    config_use_specumd = false
/
```

```
&vertical_grid
    config_ztop = 30000.0
    config_nsmterrain = 1
    config_smooth_surfaces = true
    config_dzmin = 0.3
    config_nsm = 30
    config_tc_vertical_grid = true
    config_blend_bdy_terrain = false
/
&interpolation_control
    config_extrap_airtemp = 'lapse-rate'
/
&preproc_stages
    config_static_interp = true
    config_native_gwd_static = true
    config_vertical_grid = false
    config_met_interp = false
    config_input_sst = false
    config_frac_seaice = false
/
&io
    config_pio_num_iotasks = 0
    config_pio_stride = 1
/
&decomposition
    config_block_decomp_file_prefix = 'Sul.1024002.graph.info.part.'
/
```

Pré-Processing



Pré-Processing

- **databcs**
  - **WPS_GEOG**
- **datain**
- **namelist**
- **sources**
- **tables**
- **Variable_tables**

albedo_modis	hanis	hslop	landuse_30s_with_lakes	nlcd2011_can_ll_9s	soiltemp_1deg	ssib_landuse_5m
albedo_ncep	hasynw	hstdv	landuse_5m	nlcd2011_imp_ll_9s	soiltype_bot_10m	topo_10m
bnu_soiltype_bot	hasys	hzmax	maxsnowalb	nudapt44_1km	soiltype_bot_2m	topo_2m
bnu_soiltype_top	hasysw	islope	maxsnowalb_modis	NUDAPT44_1km	soiltype_bot_30s	topo_30s
clayfrac_5m	hasyw	lai_modis_10m	modis_landuse_20class_15s	orogwd_10m	soiltype_bot_5m	topo_5m
crop	hcnvx	lai_modis_30s	modis_landuse_20class_30s	orogwd_1deg	soiltype_top_10m	topo_gmted2010_30s
erod	hlennw	lake_depth	modis_landuse_20class_30s_with_lakes	orogwd_20m	soiltype_top_2m	varsso
greenfrac	hlens	landuse_10m	modis_landuse_21class_30s	orogwd_2deg	soiltype_top_30s	varsso_10m
greenfrac_fpar_modis	hlensw	landuse_2m	nlcd2006_ll_30s	orogwd_30m	soiltype_top_5m	varsso_2m
hangl	hlenw	landuse_30s	nlcd2006_ll_9s	sandfrac_5m	ssib_landuse_10m	varsso_5m

```
time mpirun -np $SLURM_NTASKS -env UCX_NET_DEVICES=mlx5_0:1 -genvall ./init_atmosphere_model
```

namelist.init_atmosphere
streams.init_atmosphere

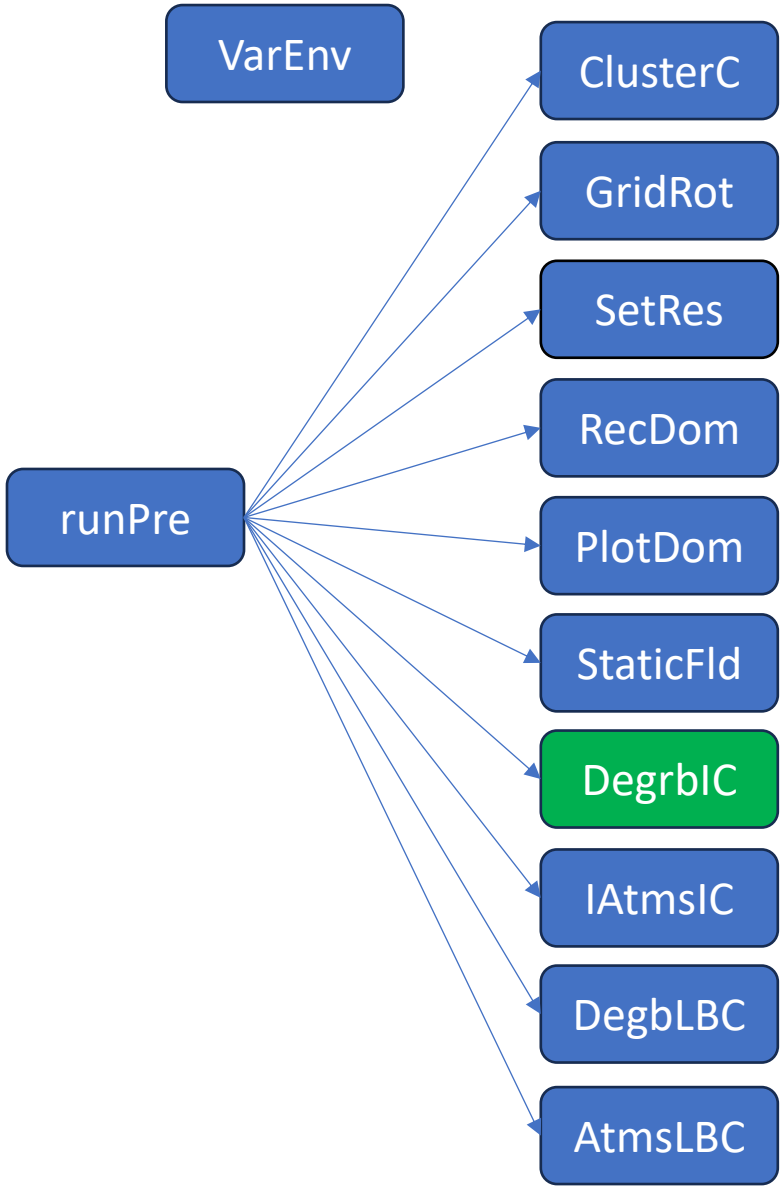
```
/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/pre/runs/GFS/
```

```
Sul.535554.static.nc
```

Paulo Yoshio Kubota

runPre.bash

The script “runPre.bash” invokes the functions



source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_GridRotate.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RecDomain.bash
source scripts/Function_PlotDomain.bash
source scripts/Function_Static.sh
source scripts/Function_Degrib_IC_GFS.bash
source scripts/Function_InitAtmos_IC_GFS.bash
source scripts/Function_Degrib_LBC_GFS.bash
source scripts/Function_InitAtmos_LBC_GFS.bash

runPre.bash

source scripts/Function_Degrib_IC_GFS.bash

more namelist.wps

```
&share
 wrf_core = 'ARW',
 max_dom = 1,
 start_date = '2024-04-27_00:00:00',
 end_date   = '2024-04-27_00:00:00',
 interval_seconds = 10800,
 io_form_geogrid = 2,
 debug_level = 0,
/

&geogrid
/

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

&metgrid
/
```

gfs.t00z.pgrb2.0p25.f000.2024042700.grib2

link_grib.csh

Standards the file name of the input for pre-processing

GRIBFILE.AAA

Getting the variable to create initial condition for MONAN

mpirun -np 1 ./ungrib.exe

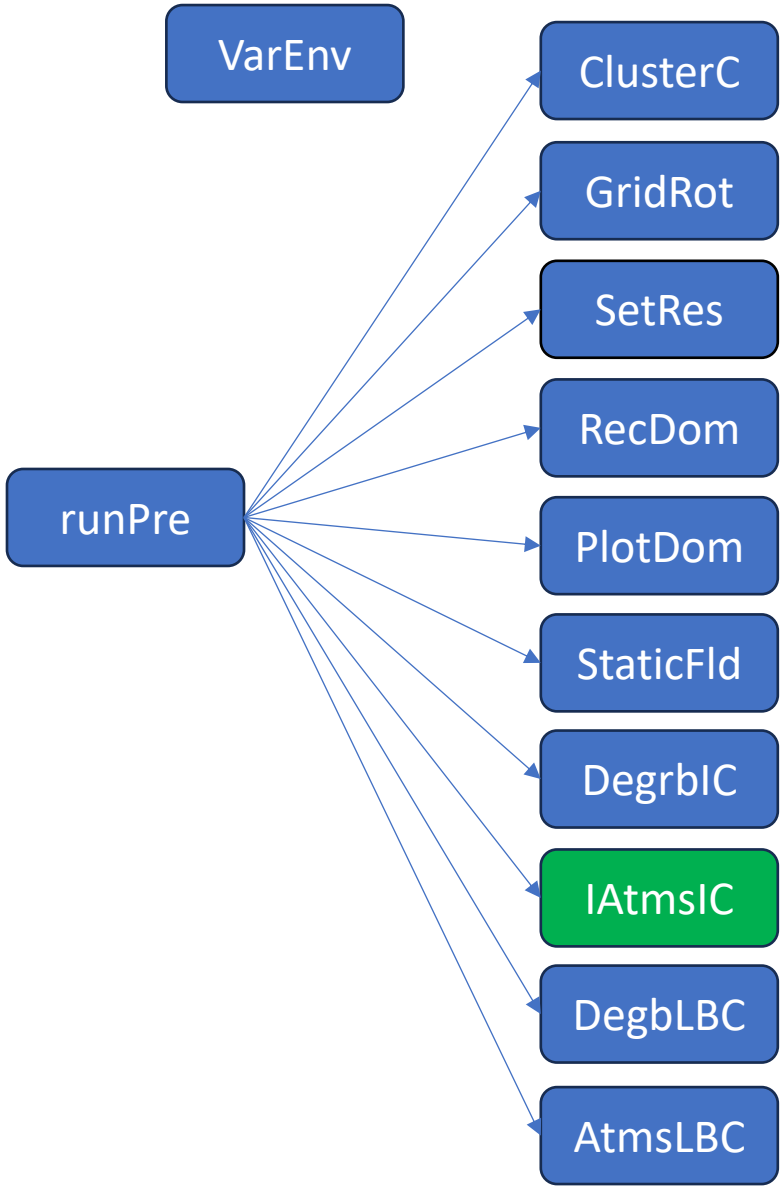
/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/pre/runs/GFS/

FILE:2024-04-27_00

Paulo Yoshio Kubota

runPre.bash

The script “runPre.bash” invokes the functions




```
source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_GridRotate.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RecDomain.bash
source scripts/Function_PlotDomain.bash
source scripts/Function_Static.sh
source scripts/Function_Degrib_IC_GFS.bash
source scripts/Function_InitAtmos_IC_GFS.bash
source scripts/Function_Degrib_LBC_GFS.bash
source scripts/Function_InitAtmos_LBC_GFS.bash
```

runPre.bash

The script “runPre.bash” invokes the functions

source scripts/Function_InitAtmos_IC_GFS.bash

```
more streams.init_atmosphere.TEMPLATE.regional
```

```
<streams>
<immutable_stream name="input"
                  type="input"
                  filename_template="#x1#.#RESNPTS#.static.nc"
                  input_interval="initial_only" />

<immutable_stream name="output"
                  type="output"
                  filename_template="#x1#.#RESNPTS#.init.nc"
                  packages="initial_conds"
                  output_interval="initial_only" />

<immutable_stream name="surface"
                  type="output"
                  filename_template="#x1#.#RESNPTS#.sfc_update.nc"
                  filename_interval="none"
                  packages="sfc_update"
                  output_interval="86400" />

</streams>
```

FILE3:2024-04-27_00

Sul.535554.static.nc

"Interpolation of the variables of the initial condition to the resolution of the Voronoi mesh"

```
mpirun -np $SLURM_NTASKS -env UCX_NET_DEVICES=mlx5_0:1 -genvall ./init_atmosphere_model
```

Sul.1024002.init.nc

Paulo Yoshio Kubota

runPre.bash

The script “runPre.bash” invokes the functions

```
&nhyd_model
    config_init_case = 7            ! creating a real-data initial conditions
file
    config_start_time = '#LABELI#'
    config_stop_time = '#LABELI#'
    config_theta_adv_order = 3
    config_coef_3rd_order = 0.25
/
&dimensions
    config_nvertlevels = 55  !number of vertical levels to be used in MPAS
    config_nsoillevels = 4   !number of soil layers to be used in MPAS
    config_nfglevels = 38    !number of vertical levels in intermediate file
    config_nfgsoillevels = 4 !number of soil layers in intermediate file
/
&data_sources
    config_geog_data_path = '#GEODAT#'
    config_met_prefix = 'FILE3'
    config_sfc_prefix = 'SST'
    config_fg_interval = 86400
    config_landuse_data = 'MODIFIED_IGBP_MODIS_NOAH'
    config_topo_data = 'GMTED2010'
    config_use_spechumd = true
/
&vertical_grid
    config_ztop = 30000.0                   !model top height (m)
    config_nsmterrain = 1                   !number of smoothing passes for
terrain
    config_smooth_surfaces = true           !whether to smooth zeta surface
    config_dzmin = 0.3
    config_nsm = 30
    config_tc_vertical_grid = true
    config_blend_bdy_terrain = true
/
```

source scripts/Function_InitAtmos_IC_GFS.bash

FILE3:2024-04-27_00

Sul.535554.static.nc

"Interpolation of the variables of the initial condition to the resolution of the Voronoi mesh"

```
mpirun -np $SLURM_NTASKS -env UCX_NET_DEVICES=mlx5_0:1 -genvall ./init_atmosphere_model
```

/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/pre/runs/GFS/

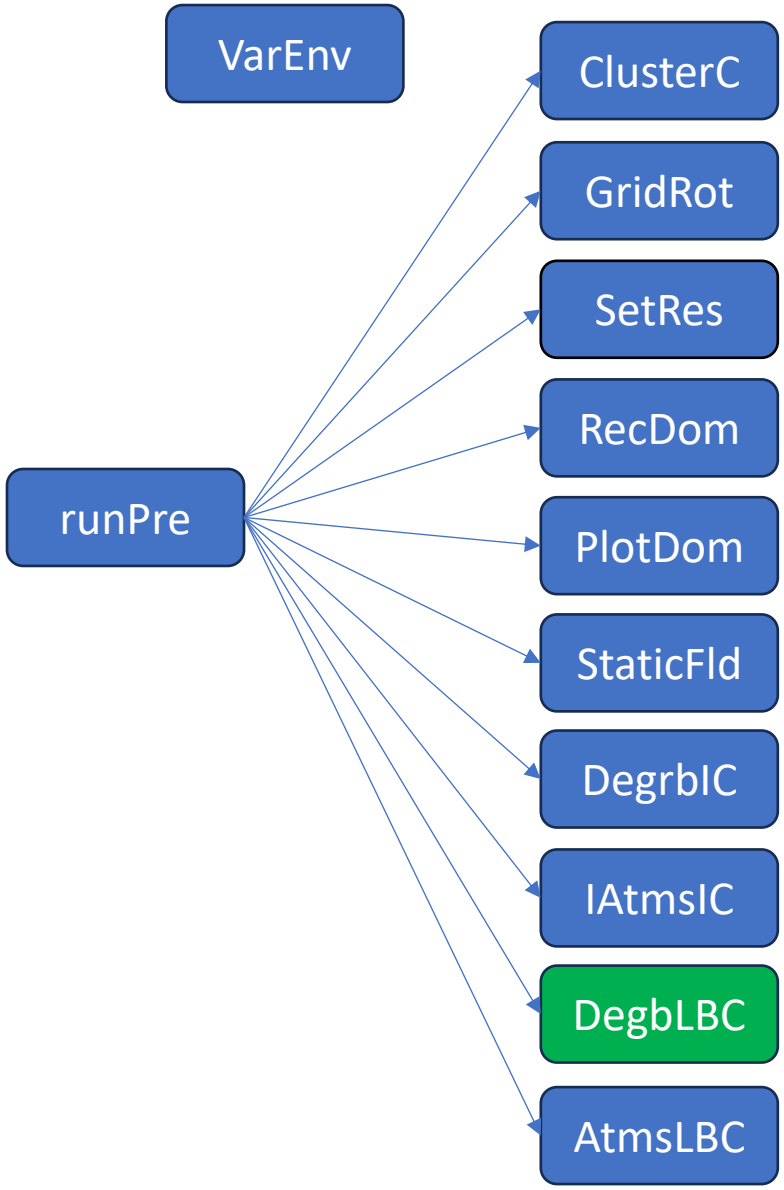
Sul.1024002.init.nc

```
time mpirun -np $SLURM_NTASKS -env UCX_NET_DEVICES=mlx5_0:1 -genvall ./init_atmosphere_model
```

Paulo Yoshio Kubota

runPre.bash

The script “runPre.bash” invokes the functions



source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_GridRotate.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RecDomain.bash
source scripts/Function_PlotDomain.bash
source scripts/Function_Static.sh
source scripts/Function_Degrib_IC_GFS.bash
source scripts/Function_InitAtmos_IC_GFS.bash
source scripts/Function_Degrib_LBC_GFS.bash
source scripts/Function_InitAtmos_LBC_GFS.bash

runPre.bash

The script “runPre.bash” invokes the functions

source scripts/Function_Degrib_LBC_GFS.bash

`gfs.t00z.pgrb2.0p25.f000.**********.grib2`

more namelist.wps

```
&share
 wrf_core = 'ARW',
 max_dom = 1,
 start_date = '2024-04-27_00:00:00',
 end_date   = '2024-05-01_00:00:00',
 interval_seconds = 10800,
 io_form_geogrid = 2,
 debug_level = 0,
/
&geogrid
/
&ungrib
 out_format = 'WPS',
 prefix = 'GFS',
/

&metgrid
/
```

`link_grib.csh`

Standards the file name of the input for pre-processing

`GRIBFILE.***`

`mpirun -np 1 ./ungrib.exe`

Getting the variable to create boundary condition for MONAN

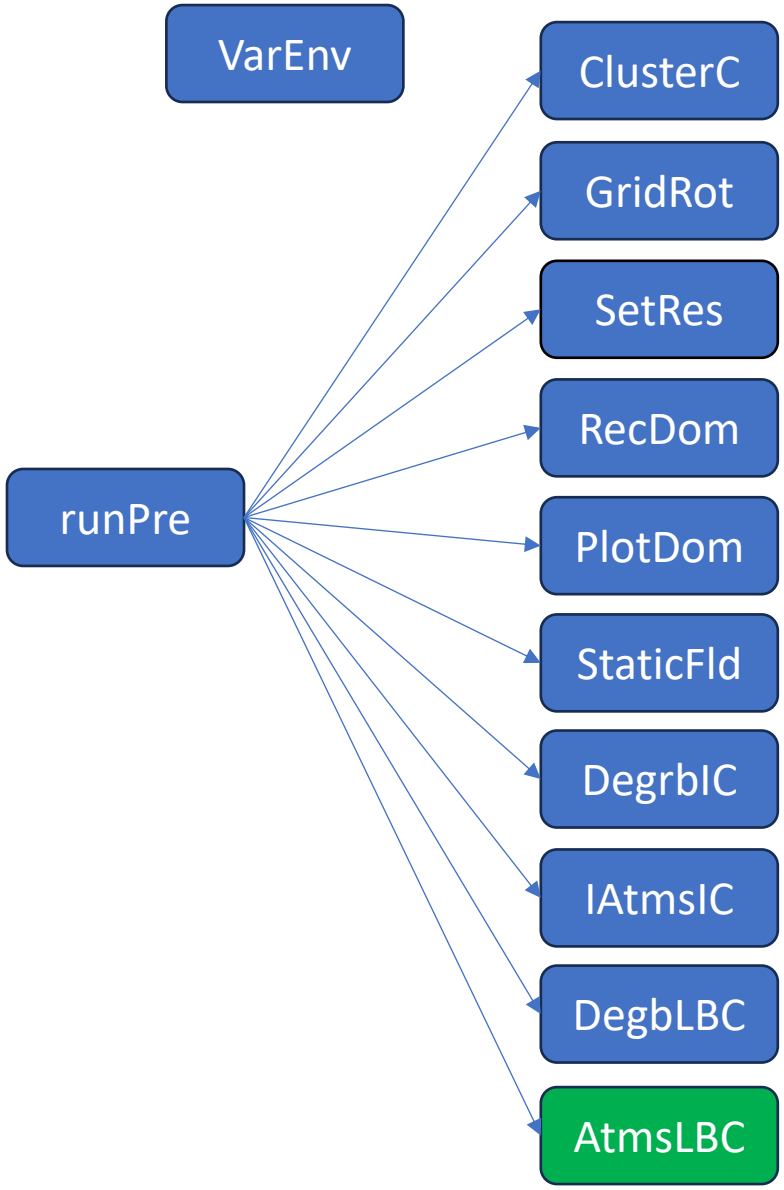
`/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/pre/runs/GFS/`

```
FILE:2024-04-27_00 FILE:2024-04-27_03 FILE:2024-04-27_06 FILE:2024-04-27_09 FILE:2024-04-27_12 FILE:2024-04-27_15
FILE:2024-04-27_18 FILE:2024-04-27_21 FILE:2024-04-28_00 FILE:2024-04-28_03 FILE:2024-04-28_06 FILE:2024-04-28_09
FILE:2024-04-28_12 FILE:2024-04-28_15 FILE:2024-04-28_18 FILE:2024-04-28_21 FILE:2024-04-29_00 FILE:2024-04-29_03
FILE:2024-04-29_06 FILE:2024-04-29_09 FILE:2024-04-29_12 FILE:2024-04-29_15 FILE:2024-04-29_18 FILE:2024-04-29_21
FILE:2024-04-30_00 FILE:2024-04-30_03 FILE:2024-04-30_06 FILE:2024-04-30_09 FILE:2024-04-30_12 FILE:2024-04-30_15
FILE:2024-04-30_18 FILE:2024-04-30_31 FILE:2024-05-01_00
```

Paulo Yoshio Kubota

runPre.bash

The script “runPre.bash” invokes the functions



source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_GridRotate.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RecDomain.bash
source scripts/Function_PlotDomain.bash
source scripts/Function_Static.sh
source scripts/Function_Degrib_IC_GFS.bash
source scripts/Function_InitAtmos_IC_GFS.bash
source scripts/Function_Degrib_LBC_GFS.bash
source scripts/Function_InitAtmos_LBC_GFS.bash

runPre.bash

The script “runPre.bash” invokes the functions

more streams.init_atmosphere.LBC.regional

```
<streams>
<immutable_stream name="input"
                  type="input"
                  filename_template="#x1#.#RESNPTS#.init.nc"
                  input_interval="initial_only" />


<immutable_stream name="lbc"
                  type="output"
                  filename_template="lbc.$Y-$M-$D_$h.$m.$s.nc"
                  filename_interval="output_interval"
                  packages="lbcs"
                  output_interval="3:00:00" />

</streams>
```

/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/pre/runs/GFS/

```
FILE:2024-04-27_00 FILE:2024-04-27_03 FILE:2024-04-27_06 FILE:2024-04-27_09
FILE:2024-04-27_12 FILE:2024-04-27_15 FILE:2024-04-27_18 FILE:2024-04-27_21
FILE:2024-04-28_00 FILE:2024-04-28_03 FILE:2024-04-28_06 FILE:2024-04-28_09
FILE:2024-04-28_12 FILE:2024-04-28_15 FILE:2024-04-28_18 FILE:2024-04-28_21
FILE:2024-04-29_00 FILE:2024-04-29_03 FILE:2024-04-29_06 FILE:2024-04-29_09
FILE:2024-04-29_12 FILE:2024-04-29_15 FILE:2024-04-29_18 FILE:2024-04-29_21
FILE:2024-04-30_00 FILE:2024-04-30_03 FILE:2024-04-30_06 FILE:2024-04-30_09
FILE:2024-04-30_12 FILE:2024-04-30_15 FILE:2024-04-30_18 FILE:2024-04-30_31
FILE:2024-05-01_00
```

```
time mpirun -np $SLURM_NTASKS -env UCX_NET_DEVICES=mlx5_0:1 -genvall ./init_atmosphere_model
```

runPre.bash

The script “runPre.bash” invokes the functions

more namelist.init_atmosphere.LBC.regional

```
&nhyd_model
    config_init_case = 9            ! the LBCs processing case
    config_start_time = '#LABELI#'
    config_stop_time = '#LABELF#'
    config_theta_adv_order = 3
    config_coef_3rd_order = 0.25
/
&dimensions
    config_nvertlevels = 55     !number of vertical levels to be used in MPAS
    config_nsoillevels = 4      !number of soil layers to be used in MPAS
    config_nfglevels = 38       !number of vertical levels in intermediate file
    config_nfgsoillevels = 4    !number of soil layers in intermediate file
/
&data_sources
    config_geog_data_path = '#GEODAT#'
    config_met_prefix = 'GFS'
    config_sfc_prefix = 'SST'
    config_fg_interval = 10800
    config_landuse_data = 'MODIFIED_IGBP_MODIS_NOAH'
    config_topo_data = 'GMTED2010'
    config_use_spechumd = true
/
&vertical_grid
    config_ztop = 30000.0             !model top height (m)
    config_nsmterrain = 1             !number of smoothing passes for terrain
    config_smooth_surfaces = true      !whether to smooth zeta surfaces
    config_dzmin = 0.3
    config_nsm = 30
    config_tc_vertical_grid = true
    config_blend_bdy_terrain = true
/
```

```
&interpolation_control
    config_extrap_airtemp = 'linear'
/
&preproc_stages
    config_static_interp = false            !only static files
    config_native_gwd_static = false        !only static files
    config_vertical_grid = true             !only these three stages should be enabled
    config_met_interp = true                !only these three stages should be enabled
    config_input_sst = false                !only sst files
    config_frac_seaice = true               !only these three stages should be enabled
/
&io
    config_pio_num_iotasks = 0
    config_pio_stride = 1
/
```

```
time mpirun -np $SLURM_NTASKS -env UCX_NET_DEVICES=mlx5_0:1 -genvall ./init_atmosphere_model
```

runPre.bash

The script “runPre.bash” invokes the functions

/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/pre/runs/GFS/

```
FILE:2024-04-27_00 FILE:2024-04-27_03 FILE:2024-04-27_06 FILE:2024-04-27_09
FILE:2024-04-27_12 FILE:2024-04-27_15 FILE:2024-04-27_18 FILE:2024-04-27_21
FILE:2024-04-28_00 FILE:2024-04-28_03 FILE:2024-04-28_06 FILE:2024-04-28_09
FILE:2024-04-28_12 FILE:2024-04-28_15 FILE:2024-04-28_18 FILE:2024-04-28_21
FILE:2024-04-29_00 FILE:2024-04-29_03 FILE:2024-04-29_06 FILE:2024-04-29_09
FILE:2024-04-29_12 FILE:2024-04-29_15 FILE:2024-04-29_18 FILE:2024-04-29_21
FILE:2024-04-30_00 FILE:2024-04-30_03 FILE:2024-04-30_06 FILE:2024-04-30_09
FILE:2024-04-30_12 FILE:2024-04-30_15 FILE:2024-04-30_18 FILE:2024-04-30_31
FILE:2024-05-01_00
```

```
time mpirun -np $SLURM_NTASKS -env UCX_NET_DEVICES=mlx5_0:1 -genvall ./init_atmosphere_model
```

/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/pre/runs/GFS/

```
lbc.2024-04-27_21.00.00.nc  lbc.2024-04-29_12.00.00.nc  lbc.2024-04-28_00.00.00.nc  lbc.2024-04-29_15.00.00.nc
lbc.2024-04-28_03.00.00.nc  lbc.2024-04-29_18.00.00.nc  lbc.2024-04-28_06.00.00.nc  lbc.2024-04-29_21.00.00.nc
lbc.2024-04-28_09.00.00.nc  lbc.2024-04-30_00.00.00.nc  lbc.2024-04-28_12.00.00.nc  lbc.2024-04-30_03.00.00.nc
lbc.2024-04-27_00.00.00.nc  lbc.2024-04-28_15.00.00.nc  lbc.2024-04-30_06.00.00.nc  lbc.2024-04-27_03.00.00.nc
lbc.2024-04-28_18.00.00.nc  lbc.2024-04-30_09.00.00.nc  lbc.2024-04-27_06.00.00.nc  lbc.2024-04-28_21.00.00.nc
lbc.2024-04-30_12.00.00.nc  lbc.2024-04-27_09.00.00.nc  lbc.2024-04-29_00.00.00.nc  lbc.2024-04-30_15.00.00.nc
lbc.2024-04-27_12.00.00.nc  lbc.2024-04-29_03.00.00.nc  lbc.2024-04-30_18.00.00.nc  lbc.2024-04-27_15.00.00.nc
lbc.2024-04-29_06.00.00.nc  lbc.2024-04-30_21.00.00.nc  lbc.2024-04-27_18.00.00.nc  lbc.2024-04-29_09.00.00.nc
lbc.2024-05-01_00.00.00.nc
```

Step 28 – Execute Model Scripts Control

BASH

&

Description of the MONAN-Regional model scripts

```
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional/run
```

check the directory

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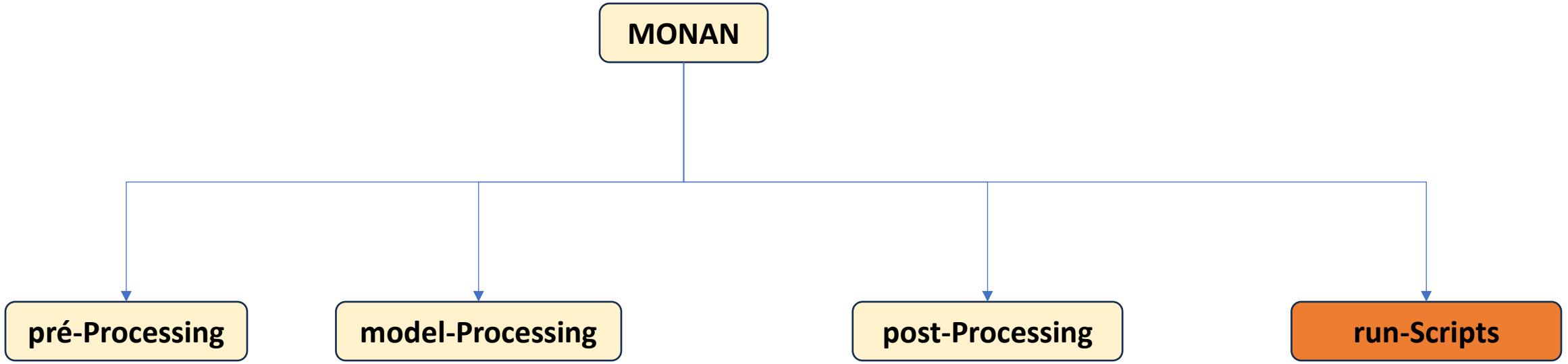
Step 28 – Execute Model Scripts Control

Execution Control



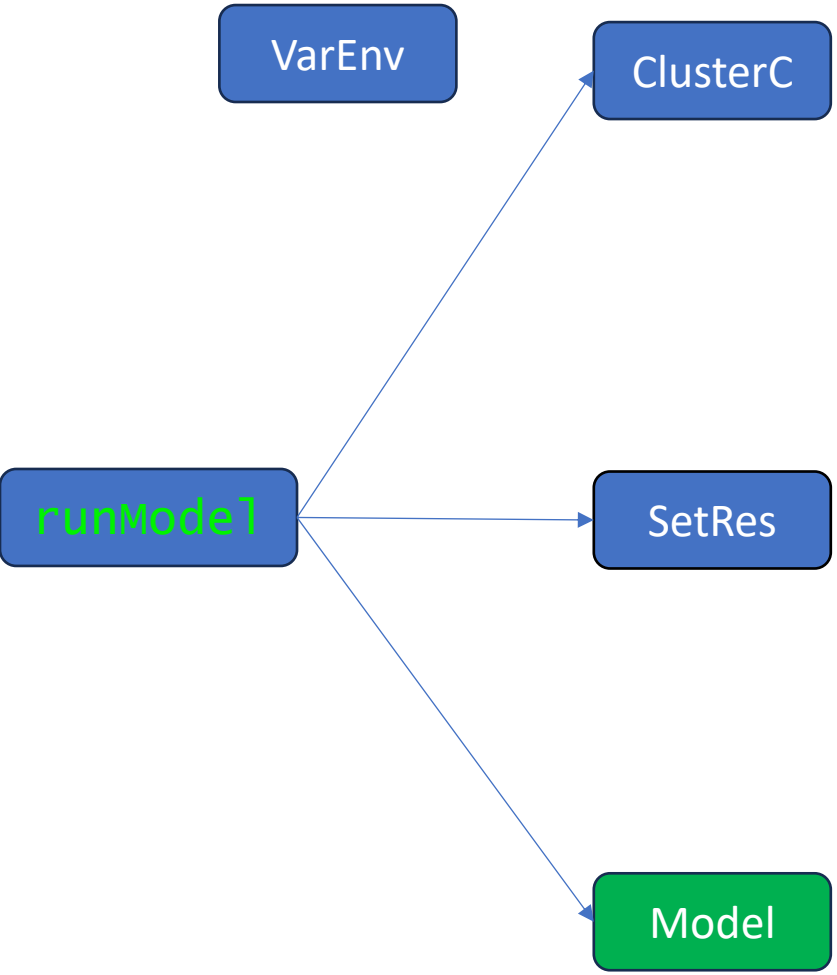

```
[aluno##@egeon-login1 run]$ ls
```

check the files

```
copy_data.bash                runModel.bash    scripts      readme
load_monan_app_modules.sh     runPost.bash     runPre.bash
```

runModel.bash

The script “runModel.bash” invokes the functions



source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RunModel.bash

runModel.bash

streams.atmosphere

namelist.atmosphere

Sul.1024002.init.nc

lbc.2024-04-27_21.00.00.nc

```
time mpirun -np $SLURM_NTASKS -env UCX_NET_DEVICES=mlx5_0:1 -genvall ./atmosphere_model
```

/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/model/runs/ERA5/monanprd/

```
diag.YYYY-MM-DD_HH.mm.ss.nc  history.YYYY-MM-DD_HH.mm.ss.nc
Sul.1024002.init.nc
```

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Step 29 – Execute Post-processing Scripts Control

BASH

&

Description of the MONAN-Regional model scripts

```
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional/run
```

check the directory

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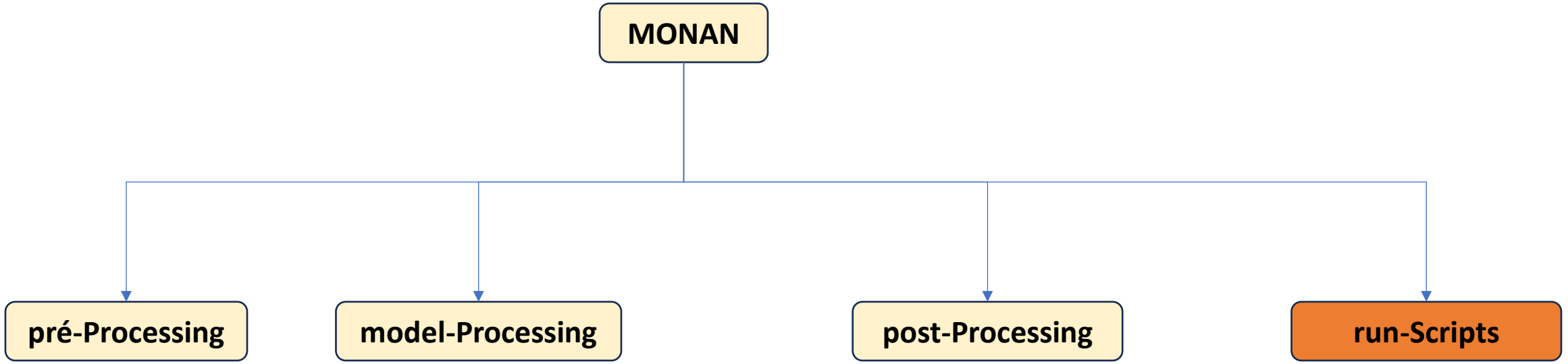
Step 29 – Execute Post-processing Scripts Control

Execution Control

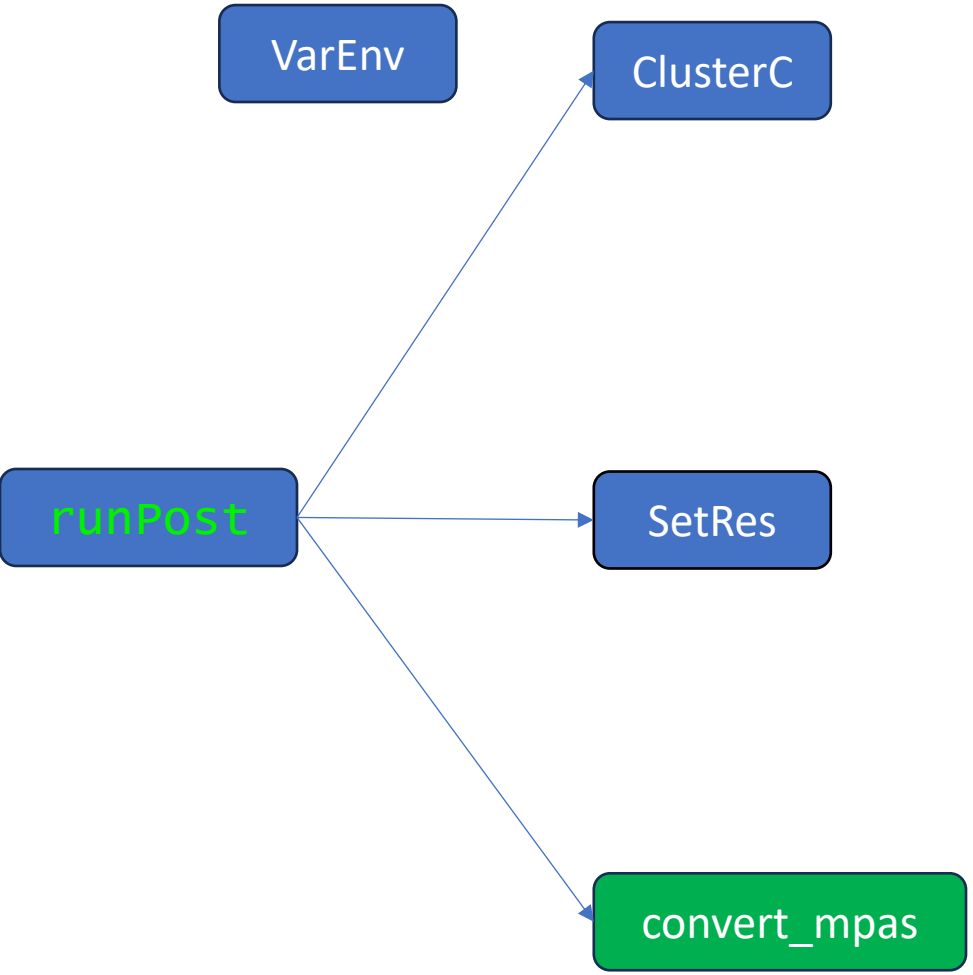



```
[aluno##@egeon-login1 run]$ ls
```

check the files

```
copy_data.bash                runModel.bash    scripts      readme
load_monan_app_modules.sh     runPost.bash     runPre.bash
```

runPost.bash



source scripts/VarEnvironmental.bash
source scripts/Function_SetClusterConfig.bash
source scripts/Function_SetResolution.bash
source scripts/Function_RunPost.bash

Step 30 – Execute Post-processing Scripts Control

```
[aluno##@egeon-login1 run]$ pwd
/mnt/beegfs/aluno##/monan_regional/run
```

check the directory

```
[aluno##@egeon-login1 run]$ ./runPost.bash
```

Execute the script without passing the arguments

```
[aluno##@egeon-login1 run]$ ./runPost.bash
.........................................
.........................................
.........................................
.
```

check the information

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Step 30 – Execute Post-processing Scripts Control runPost.bash

./runPost.bash

```
+ '[' 0 -ne 7 ']'
+ usage
+ sed -n '/^# !CALLING SEQUENCE:/,/^# !/{p}' ./runPost.bash
+ head -n -1
# !CALLING SEQUENCE:
#
#   ./runPost.bash  ${EXP_NAME} ${EXP_RES}   ${LABELI}  ${LABELF}  ${Domain}  ${AreaRegion}  ${TypeGrid}
#
#
# For GFS datasets
#
#        ./runPost.bash  GFS 535554   2024042700  2024050100  regional  PortoAlegre  variable_resolution
#
#           o EXP_NAME   : Forcing: ERA5, CFSR, GFS, etc.
#           o EXP_RES    : mesh npts : 535554 etc
#           o LABELI     : Initial: date 2015030600
#           o LABELF     : End: date 2015030600
#           o Domain     : Domain: global or regional
#           o AreaRegion : PortoAlegre, Belem, global
#           o TypeGrid   : quasi_uniform or variable_resolution
#
#
# For benchmark:
#
#
# ./runPost.bash    GFS   2621442   2024042700  2024050100  regional  Sul  quasi_uniform
# ./runPost.bash    GFS   1024002   2024042700  2024050100  regional  Sul  quasi_uniform
#
#
# ./runPost.bash    GFS    535554   2024042700  2024050100  regional  Sul  variable_resolution
# ./runPost.bash    GFS    163842   2024042700  2024050100  regional  Sul  variable_resolution
#
+ exit 1
```

Step 30 – Execute Post-processing Scripts Control

runPost.bash

```
exclude_Fields
include_fields
```

```
$ more convert_mpas.nml
```

```
&config_convert_mpas
 verticalCoord = 'Pressure'    !  'MPAS_Model' or
'Pressure '
 nVertLevels = 55
 nOznLevels  = 59
 nMonths     = 12
 nSoilLevels = 4
 nIsobaricLev= 27
/
```

```
$ more target_domain
```

```
nlat = 220
nlon = 220
startlat = -11.5
startlon = -58.5
endlat = 10.5
endlon = -38.5
```

Step 10 – Execute Post-processing Scripts Control runPost.bash

/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/model/runs/ERA5/monanprd/

diag.YYYY-MM-DD_HH.mm.ss.nc history.YYYY-MM-DD_HH.mm.ss.nc Sul.1024002.init.nc

convert_mpas.nml

target_domain

exclude_Fields
include_fields

```
time mpirun -np $SLURM_NTASKS -env UCX_NET_DEVICES=mlx5_0:1 -genvall ./convert_mpas
```

/mnt/beegfs/aluno##/monan_regional/YYYYMMDDHH/pos/runs/ERA5/postprd

```
MONAN_DIAG_R_POS_ERA5_2019052500_2019052500.mm.x4.163842L55.nc  MONAN_DIAG_R_POS_ERA5_2019052500_2019052513.mm.x4.163842L55.nc
MONAN_DIAG_R_POS_ERA5_2019052500_2019052501.mm.x4.163842L55.nc  MONAN_DIAG_R_POS_ERA5_2019052500_2019052514.mm.x4.163842L55.nc
MONAN_DIAG_R_POS_ERA5_2019052500_2019052502.mm.x4.163842L55.nc  MONAN_DIAG_R_POS_ERA5_2019052500_2019052515.mm.x4.163842L55.nc
MONAN_DIAG_R_POS_ERA5_2019052500_2019052503.mm.x4.163842L55.nc  MONAN_DIAG_R_POS_ERA5_2019052500_2019052516.mm.x4.163842L55.nc
MONAN_DIAG_R_POS_ERA5_2019052500_2019052504.mm.x4.163842L55.nc  MONAN_DIAG_R_POS_ERA5_2019052500_2019052517.mm.x4.163842L55.nc
MONAN_DIAG_R_POS_ERA5_2019052500_2019052505.mm.x4.163842L55.nc  MONAN_DIAG_R_POS_ERA5_2019052500_2019052518.mm.x4.163842L55.nc
```

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