

CRCM5

practical training

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Login to your computer:

Options -> Connexion à distance -> Entrez le nom de la machine distante ...

pascal.sca.uqam.ca

Open a terminal:

Applications -> Utilities -> Terminal

Connect to marvin:

ssh -X 132.208.132.89

Set and Check your environment

Set environment to use the correct libraries
(You have to do this only this one time)

```
bascule rmn10 mvapich2
```

Check that your environment is now set correctly
Check ~/.profile

```
cd  
ls -l .profile  
.profile -> /home/armnlib2/.profile
```

Check soumet

```
cd ~/ovbin  
ls -l soumet  
soumet -> /home/data/site/ovbin/soumet_mvapich2
```

Check PATH

```
which mpif90  
/home/mvapich2_mpd/bin/mpif90  
(/home/openmpi-1.4.1_pgi/bin/mpif90)
```

Set model environment

Also these steps you have to do only ones:

Create the **execution directory** (under which the model will be running):

```
mkdir ~/MODEL_EXEC_RUN
```

```
mkdir -p /local/fiber1/${USER}/gemclim/EXECDIR
```

```
In -s /local/fiber1/${USER}/gemclim/EXECDIR ~/MODEL_EXEC_RUN/headnode
```

Create a directory for the **listings** at runtime:

```
mkdir ~/listings
```

```
mkdir -p /local/sata2/${USER}/gemclim/listings
```

```
In -s /local/sata2/${USER}/gemclim/listings ~/listings/headnode
```

Check:

```
cd
```

```
ls -ld */headnode
```

```
MODEL_EXEC_RUN/headnode -> /local/fiber1/.../EXECDIR
```

```
listings/headnode -> /local/sata2/.../listings
```

Set up the **model environment** to use the right model version

Add CLASS version to your ~/.profile_usr:

```
export CLASS_VERSION=3.50
```

Source your .profile_usr:

```
./~/.profile_usr
```

Set your model environment

(**each time** you open a new window or in your .profile_usr):

```
./r.sm.dot gemclim 3.3.2
```

This command adds some paths to your \$PATH variable and sets the \$gemclim to the directory in which you can find the model source code and scripts, i.e.:

```
ls -l $gemclim
```

```
RCS_CLASS
```

CLASS source code

```
RCS_DYN
```

dynamic routines

```
RCS_PHY
```

physic routines

```
scripts
```

(Great spot to find examples for 'r.diag' and 'editfst'!)

Create your own executables

The following needs to be done only **once per “Abs-directory”**.

Create a directory for the executables:

```
mkdir -p ~/gemclim/v_3.3.2/Abs/bcmk  
cd ~/gemclim/v_3.3.2/Abs/bcmk
```

Set up a current experiment:

```
cp /home/winger/gemclim/BCMK/v_3.3.2_clim/Exper_cour/.exper_cour .
```

Create some symbolic links to save space in your \$HOME:

```
absdir=/local/sata2/${USER}/gemclim/Abs/v_3.3.2/bcmk  
mkdir -p ${absdir}/malib${ARCH}  
ln -s ${absdir}/malib${ARCH}  
ln -s ${absdir}/maingemclimdm_${ARCH}_3.3.2.Abs  
ln -s ${absdir}/maingemclimntr_${ARCH}_3.3.2.Abs
```

Check:

```
ls -al  
.  
_exper_cour  
maingemclimdm_Linux_x86-64_pgi611_3.3.2.Abs -> ...  
maingemclimntr_Linux_x86-64_pgi611_3.3.2.Abs -> ...  
malibLinux_x86-64_pgi611 -> ...
```

Create your own executables

The following needs to be done **each time you modify the code**:

Build a make file:

r.make_exp

(Ignore clib_interface.cdk warning)

Check:

ls -al

Makefile

arbre_de_dependance

make_cdk

Create the absolutes:

Entry and model:

make gemclim

or just entry:

make gemclimntr

or just model:

make gemclimdm

Create your own executables

Check again:

ls -all

```
drwxr-xr-x 2 train users      4096 Jan 27 11:15 .
drwxr-xr-x 3 train users      4096 Jan 27 11:08 ..
-rw-r--r-- 1 train users       219 Jan 27 11:08 .exper_cour
-rw-r--r-- 1 train users    269101 Jan 27 11:13 Makefile
-rw-r--r-- 1 train users   134707 Jan 27 11:13 arbre_de_dependance
-rwxr-xr-x 1 train users  8754475 Jan 27 11:15 maingemclimdm_Linux_x86-64_pgi611_3.3.2.Abs
-rwxr-xr-x 1 train users 1239124 Jan 27 11:15 maingemclimntr_Linux_x86-64_pgi611_3.3.2.Abs
-rw-r--r-- 1 train users    96458 Jan 27 11:13 make_cdk
drwxr-xr-x 3 train users      4096 Jan 27 11:15 malibLinux_x86-64_pgi611
```

Create the config files

Build and enter a configuration directory:

```
mkdir -p ~/gemclim/v_3.3.2/Configs/bcmk  
cd ~/gemclim/v_3.3.2/Configs/bcmk
```

Copy the benchmark config files into the current directory:

```
cp ~winger/gemclim/BCMK/v_3.3.2_clim/Configs/LAM_60x60/* .
```

Check

```
ls -l
```

```
configexp.dot.cfg  
gemclim_settings.nml  
outcfg.out
```

In the file configexp.dot.cfg **replace** the example user name '**FOO**' with your own **user name**. Use your favorite editor to do this.

configexp.dot.cfg

Run specifications

```
BACKEND_mach=headnode;  
CLIMAT_localhost=headnode;  
BACKEND_cm=200000;  
BACKEND_time_mod=10800;  
BACKEND_time_ntr=600;  
BACKEND_OMP=1
```

```
UM_EXEC_exp=bcmk_lam01_YYYYMMDD;  
CLIMAT_climat=1;  
UM_EXEC_r_ent=1;  
UM_EXEC_r_mod=1;  
CLIMAT_startdate="1978 01 01 00";  
CLIMAT_enddate="1978 01 03 00";  
CLIMAT_interval=1;  
CLIMAT_step_total=6;  
CLIMAT_deltat=1200;  
CLIMAT_etaname=lh56t10;  
CLIMAT_update_ghg=1;  
CLIMAT_rsti=31;  
CLIMAT_cleanup=31;  
CLIMAT_pp_cpus=4;
```

configexp.dot.cfg

Input

```
UM_EXEC_ovbin=/home/ron/gemclim/v_3.3.2/Abs/bcmk;  
UM_EXEC_geophy=/home/winger/gemclim/Geophys/geophys_global_180x90;  
UM_EXEC_anal=/home/winger/gemclim/Analysis/1978010100_000.332.isba;  
CLIMAT_anclim=/home/winger/gemclim/Climatology/amip2bc_1951-2008;  
UM_EXEC_climato=/home/winger/gemclim/Climatology/clim_gemdm320_1080x540;  
UM_EXEC_ozone=${MODEL_PATH}/dfiles/ozone_clim.fst;  
CLIMAT_nest_rept=/local_disk/winger/ERA40;  
CLIMAT_nest_exp=era40_YYYYMM;  
UM_EXEC_inrep=/local/sata2/ron/gemclim/NestInfo;
```

Output directories

```
CLIMAT_outrep=${HOME}/MODEL_EXEC_RUN/headnode/stage;  
UM_EXEC_xfer=headnode:/local/sata2/ron/gemclim/PostPro;  
CLIMAT_arch_mach=st1;  
CLIMAT_archdir=/st1_fs9/ron/gemclim/bcmk/lam;
```

Output settings

```
UM_EXEC_d2z=1;  
CLIMAT_diagnos=0;  
CLIMAT_makeTS2d=0;  
CLIMAT_fularch=oui;  
CLIMAT_clean=1;
```

gemclim_settings.nml

```
&grid
  Grd_typ_S   = 'LU'      ,
  Grd_ni      = 60      , Grd_nj   = 60  ,
  Grd_dx      = 0.5     , Grd_dy  = 0.5  ,
/

&ptopo
  Ptopo_npex  = 2      , Ptopo_npey = 2  ,
  Ptopo_nblox = 1      , Ptopo_nblox = 2  ,
/

&gement
  Pil_nesdt   = 21600  ,
  Pil_dx      = 1.5    ,
  Pil_maxcfl  = 5      ,
  Pil_hblen   = 10     ,
  E_tr3d_list_S = 'QC' ,
/

&gem_cfgs
  Lam_toptt_L = .true. ,
  Lam_0ptend_L = .true. ,
  Lam_nesdt   = 21600  ,
  Step_maxcfl = 5      ,
  Hblen_x     = 10     , Hblen_y   = 10  ,
  Cstv_dt_8   = 1200.  ,
  Out3_etik_s = 'BCM5_01',
/

&physics_cfgs
  KNTRAD      = 3      ,
  SCHMSOL     = 'ISBA' ,
/
```

Grid type
Total grid size (# of grid points)
Grid box size (in degrees)

Topology
Output blocking → web

Time step of nesting/pilot files (in seconds)
Intermediate resolution of pilot files
Size of halo / pilot area (Pil_maxcfl + 5)
Size of blending area
Pilot liquid water content (only CRCM5 pilots)

Pilot temperature at model top
Zero out physics tendencies
Time step of nesting/pilot files (in seconds)
Size of halo / pilot area (Step_maxcfl + 5)
Size of blending area
Model time step [s] (same as in configexp.dot.cfg)
Etiket

Radiation time step (in model time steps)
Surface scheme ('ISBA' or 'CLASS')

outcfg.out

grid=1,free;

levels=1, eta, -1;

levels=2, pres,[1000.,975.,950.,925.,900.,850.,...,150.,100.,70.,50.,30.,20.,15.,10.];

levels=3, eta, 0;

steps=1, hour, <0,48,3>;

steps=2, hour, <0,48,24>;

sortie([TT,GZ,HU,HR,UU,VV,WW,QQ] , grid, 1, levels, 2, steps, 1)
sortie([TT,UU,VV,HU,HR] , grid, 1, levels, 3, steps, 1)
sortie([P0,PN] , grid, 1, levels, 1, steps, 1)

sortie_p([PR,PC,AE,NF,ICRM,IIRM] , grid, 1, levels, 1, steps, 1)
sortie_p([AS,N4,AI,AD,AB,AU,AR,AH,AV] , grid, 1, levels, 1, steps, 1)
sortie_p([S7,S8,IWVM,UVMX,AL] , grid, 1, levels, 1, steps, 1)
sortie_p([SN,DN,SD,I6,TN,I4] , grid, 1, levels, 1, steps, 1)
sortie_p([I8,GL] , grid, 1, levels, 1, steps, 1)
sortie_p([N0,RFAC,N3,I0,I1,I2] , grid, 1, levels, 1, steps, 1)

sortie_p([T5,T9] , grid, 1, levels, 3, steps, 2)

Output variable names

You will find a list of all fields available for output in your model listing, ..._M_...

Search for “**PERBUS**” and you will find a list of all permanent physics fields available for output.

Search for “**VOLBUS**” and you will find a list of all volatile physics fields available for output.

Search for “**DYNAMIC VARIABLES**” and you will find a list of all dynamic fields available for output.

To find the meaning of the dynamic variables use:

r.dict -n variable_name

Be careful, 'r.dict' also works for the **physics** variables but sometimes gives the **wrong answer!!!** Always verify with the description in the model listing.

Launch and check the model

Launch the model run:

Um_lance

Check the status of your run:

qstat

or use my script:

~winger/ovbin/qs

Check your model output at runtime ($\${CLIMAT_outrep}/\${UM_EXEC_exp}/...$):

ls -l ~/MODEL_EXEC_RUN/headnode/stage/bcmk_lam01_197801/current_last_step/*

Check your listings at runtime:

ls -l ~/listings/headnode/*bcmk_lam01*

Launch and check the model

Check your config-directory:

ls -l

```
GO
bcmk_lam01_197801_E
bcmk_lam01_197801_E.tar
bcmk_lam01_197801_M
bcmk_lam01_197801_M.tar
configexp.dot.cfg
configexp_drive.cfg
gemclim_settings.nml
lajob
outcfg.out
```

Look at your output

Look at your output

Go on archiving machine

```
ssh -X st1
```

Go into the directory with your output

```
cd /st1_fs9/$USER/gemclim/bcmk/lam
```

Check your output

```
voir -iment ...
```

```
xrec -imflds ...
```

```
r.diag ggstat
```

Process your output

[r.diag ...](#)

[editfst ...](#)

[fst-functions](#)

Modify decks

Find you way through the CRCM5 code

Where to find the code:

`cd $gemclim`

RCS_DYN : entry and model dynamic routines

RCS_PHY : physic routines

RCS_CLASS : CLASS routines (version 3.4 and 3.5)

Main entrance routines:

entry : e_gemntr.ftn

dynamic : gemdm.ftn

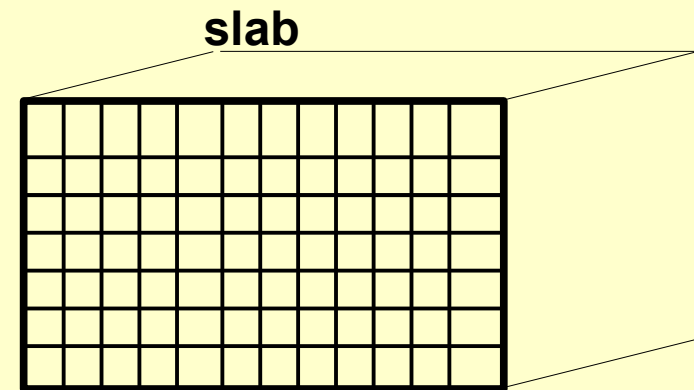
physic : phy_exe.ftn

CLASS : class.ftn (in RCS_PHY)

Note:

Physics work on **slabs**

$k = 1, nk$
levels



$i = 1, ni$
longitudes

Physic variables in the CRCM5 code

Physic variables available for output are declared in:

`#{gemclim}/RCS_PHY/phy_ini.ftn`

Buses:

e: entry bus (only at first time step)
d: dynamic bus
f : permanent bus
v: volatile bus

Example:

```
do k = 1,nk  
do i = 1,ni
```

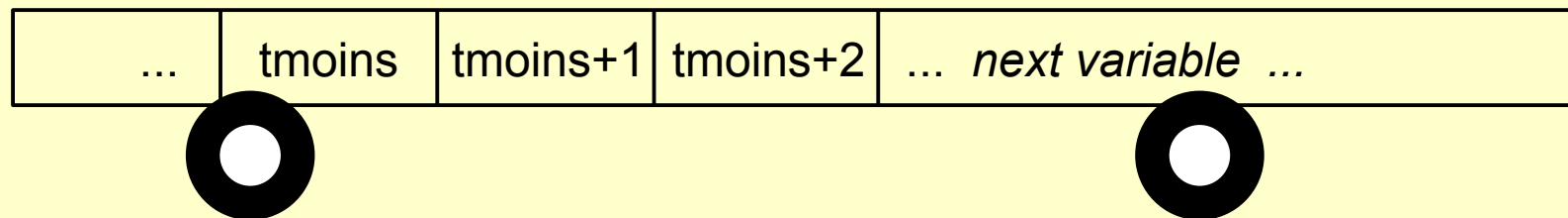
```
end do; end do
```

name of bus index of first point in bus for tmoins: temperature at t-dt

$d(\text{tmoins} + (k-1)*ni + i - 1)$

index of tmoins (i,k) in bus

dynamic bus



Modify decks

Go back into the directory in which you create your absolutes:

```
cd ~/gemclim/v_3.3.2/Abs/bcmk
```

Check out a routine, i.e. 'phy_exe.ftn':

```
omd_exp phy_exe.ftn
```

Open the routine with your favorite editor and add a 'print' statement

Create the object file:

```
make phy_exe.o
```

If you modified a *.cdk or want to create object files for all decks (*.ftn*, *.cdk*, ...) use:

```
make objloc
```

The object file(s) are now in your malib-directory:

```
ls -l malibLinux_x86-64_pgi611
```

Re-Create the model absolute including all object files in your malib-directory:

```
make gemclim
```

Clean up:

```
make clean
```

Note: If ever you want to remove a deck you had modified you have to remove the object file in the malib-directory file as well!!!

Launch the model

Go back into the directory with your config file:

```
cd ~/gemclim/v_3.3.2/Config/bcmk
```

Launch the model:

```
Un_lance
```

LAM grid set up

Grid description in gemclim_settings.nml

&grid

Grd_typ_S	=	'LU'	,			Grid type, L AM U niform		
Grd_ni	=	60	,	Grd_nj	=	60	,	Total number of grid points (including blending and pilot area)
Grd_dx	=	0.5	,	Grd_dy	=	0.5	,	Grid box size in degrees
Grd_iref	=	30	,	Grd_jref	=	30	,	Reference point in LAM grid (best set Grd_iref = Grd_ni / 2 and Grd_jref = Grd_nj / 2)
Grd_latr	=	0.0	,	Grd_lonr	=	180.0	,	Location of reference point in rotated grid (best set to Grd_latr = 0.0, Grd_lonr = 180.0)
Grd_xlat1	=	45.3	,	Grd_xlon1	=	-73.35	,	Center of your domain, i.e. Montreal
Grd_xlat2	=	0.	,	Grd_xlon2	=	16.65	,	First point on grid equator
								Second point on grid equator (best set to Grd_xlat2 = 0. , Grd_xlon2 = Grd_xlon1 + 90.)

/

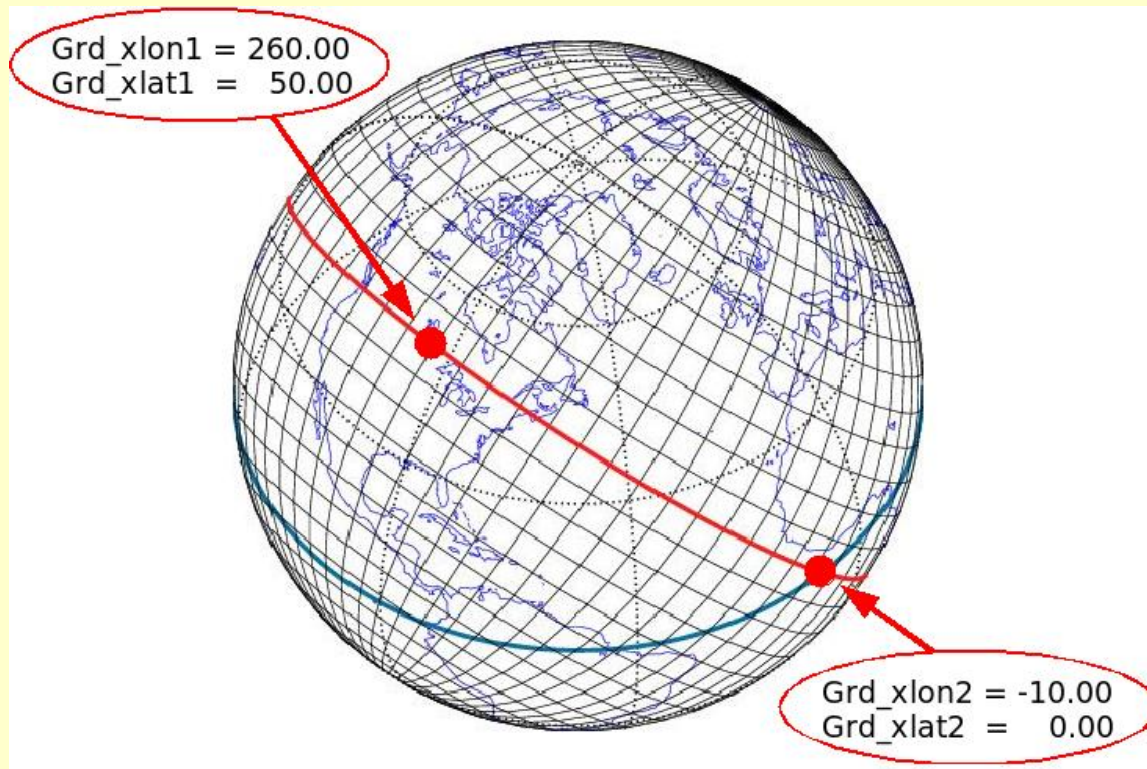
Check your grid:

grille -xrec

LAM grid set up

```
&grid  
  Grd_typ_S = 'LU' ,  
  Grd_ni    = 60   ,   Grd_nj                = 60   ,  
  Grd_dx    = 0.5  ,   Grd_dy                = 0.5  ,  
  Grd_iref  = 30   ,   Grd_jref              = 30   ,  
  Grd_latr  = 0.0  ,   Grd_lonr             = 180.0 ,  
  Grd_xlat1 = 50.  ,   Grd_xlon1            = 260.  ,  
  Grd_xlat2 = 0.   ,   Grd_xlon2            = -10.  ,
```

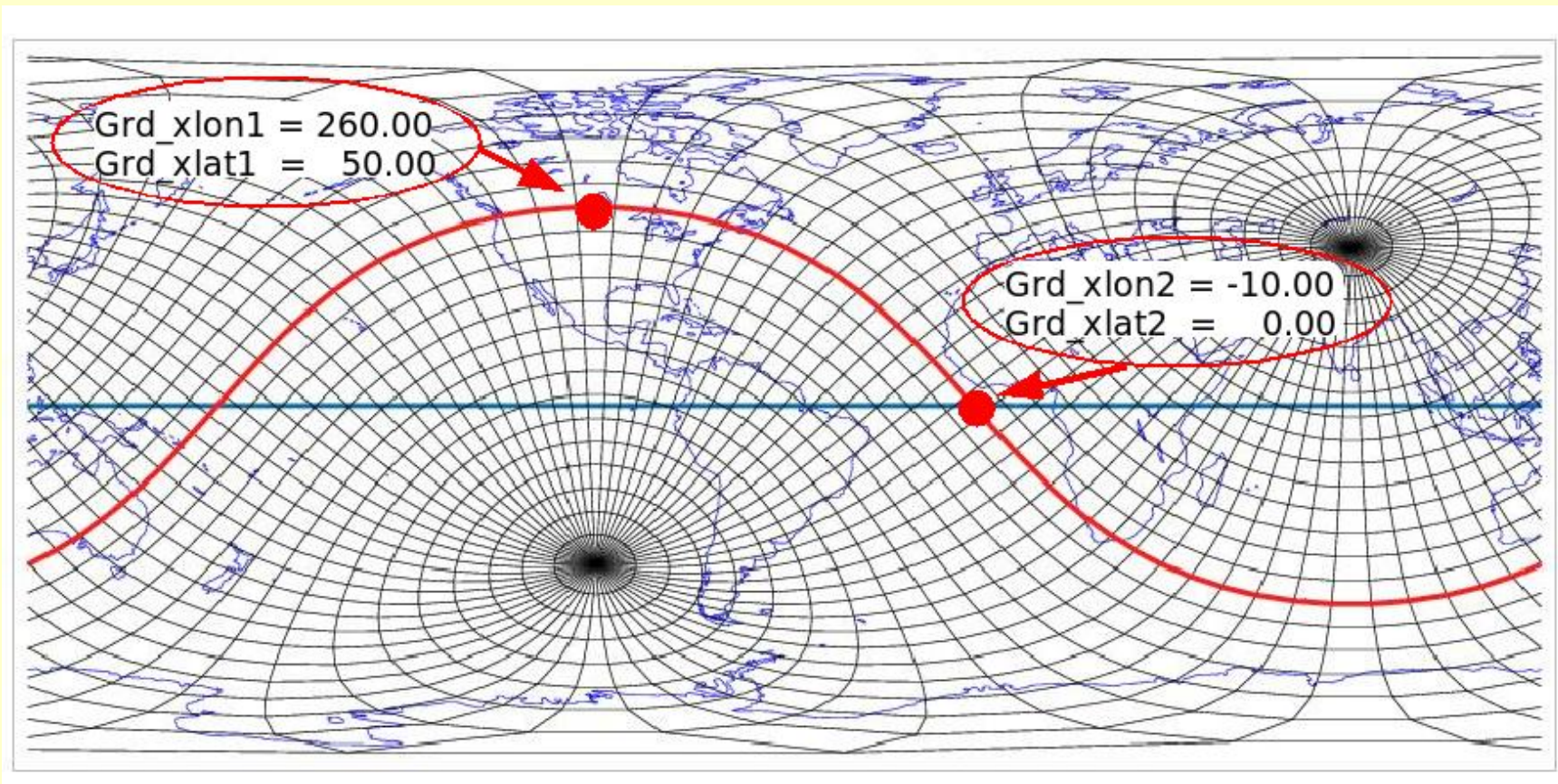
/



LAM grid set up

```
&grid  
  Grd_typ_S   = 'LU'   ,  
  Grd_ni      = 60    ,   Grd_nj      = 60    ,  
  Grd_dx      = 0.5   ,   Grd_dy      = 0.5  ,  
  Grd_iref    = 30    ,   Grd_jref    = 30    ,  
  Grd_latr    = 0.0   ,   Grd_lonr    = 180.0 ,  
  Grd_xlat1   = 50.   ,   Grd_xlon1   = 260.  ,  
  Grd_xlat2   = 0.    ,   Grd_xlon2   = -10.  ,
```

/



LAM grid set up

```
&grid
  Grd_typ_S   = 'LU'   ,
  Grd_ni      = 60     ,   Grd_nj      = 60     ,
  Grd_dx      = 0.5    ,   Grd_dy      = 0.5    ,
  Grd_iref    = 30     ,   Grd_jref    = 30     ,
  Grd_latr    = 0.0    ,   Grd_lonr    = 180.0  ,
  Grd_xlat1   = 50.    ,   Grd_xlon1   = 260.   ,
  Grd_xlat2   = 0.     ,   Grd_xlon2   = -10.   ,
/
```

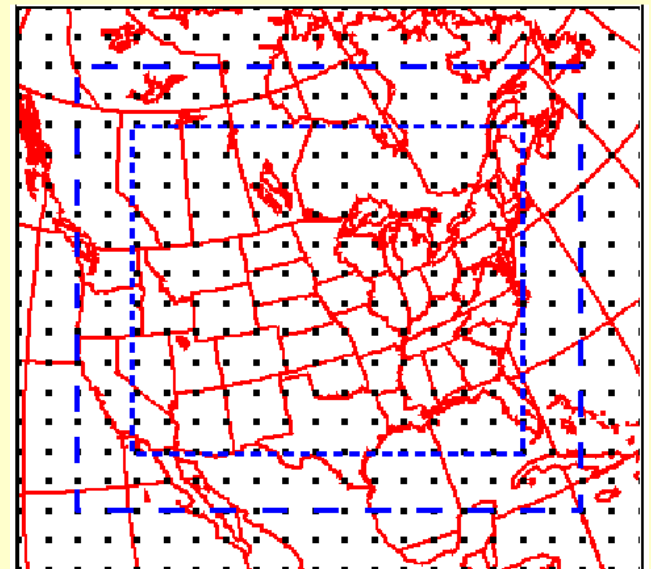
Grd_ni : total number of grid points in x-direction
(including blending and pilot area)

Grd_nj : total number of grid points in y-direction
(including blending and pilot area)

Grd_dx : grid size in x-direction in degrees

Grd_dy : grid size in y-direction in degrees

merging or blending area {
halo or pilot region {



LAM grid set up

```
&grid
  Grd_typ_S   = 'LU'   ,
  Grd_ni      = 60     ,   Grd_nj      = 60     ,
  Grd_dx      = 0.5    ,   Grd_dy      = 0.5    ,
  Grd_iref    = 30     ,   Grd_jref    = 30     ,
  Grd_latr    = 0.0    ,   Grd_lonr    = 180.0  ,
  Grd_xlat1   = 50.    ,   Grd_xlon1   = 260.   ,
  Grd_xlat2   = 0.     ,   Grd_xlon2   = -10.   ,
/
```

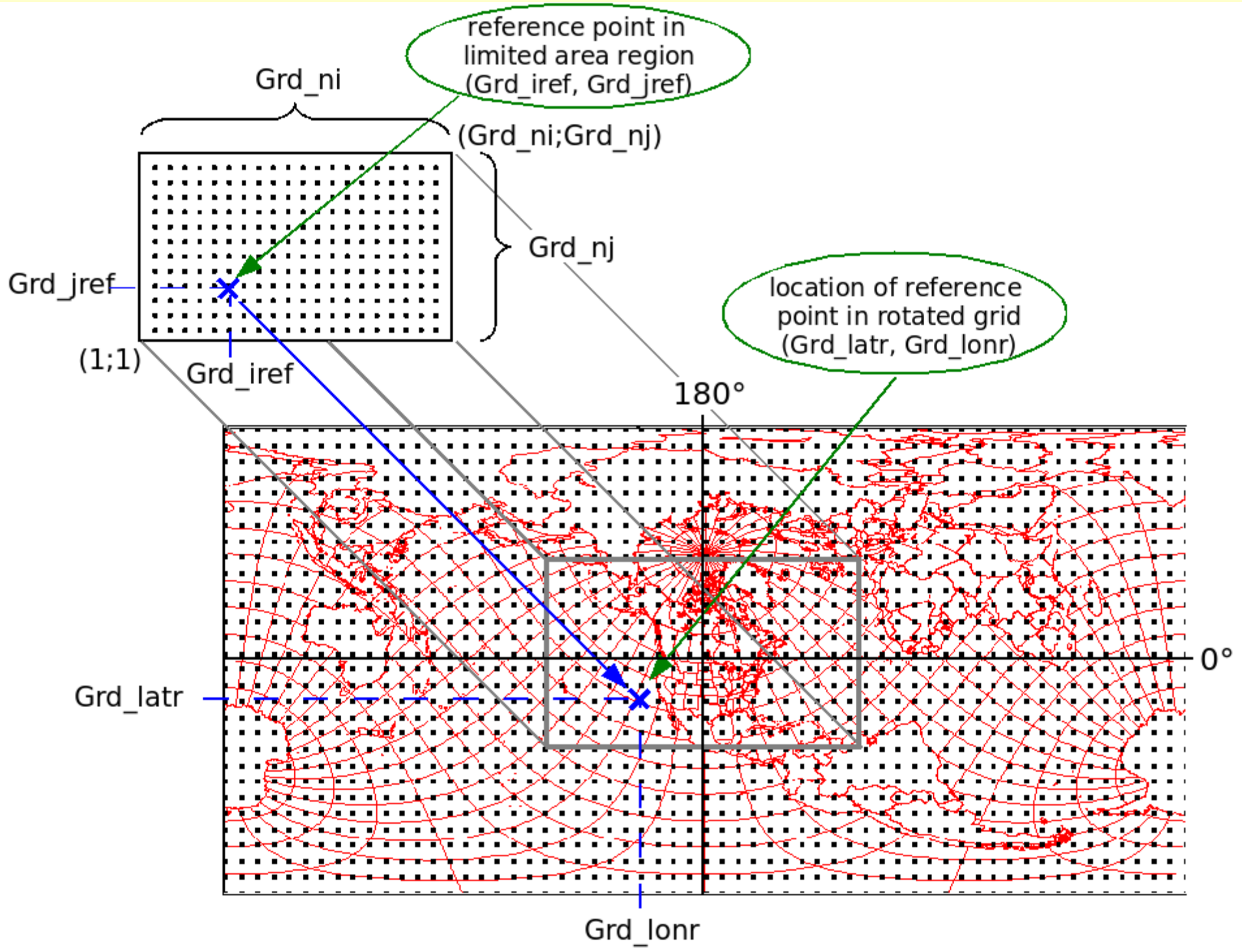
Specify where the limited area is located on the rotated grid.

Grd_iref : reference point in limited area region, x-grid coordinate
Best set "**Grd_iref = Grd_ni / 2**"

Grd_jref : reference point in limited area region, y-grid coordinate
Best set "**Grd_jref = Grd_nj / 2**"

Grd_latr : location of reference point in "grid latitude"
Best set "**Grd_latr = 0**"

Grd_lonr : location of reference point in "grid longitude"
Best set "**Grd_latr = 180**"



Asking for help

- Which machine are you working on?
- What are you trying to do?
- What is the error message?
- What are your latest modifications? (if you have)
- **Where are your config files?**
(if you have problems with the model)
- Where are your absolutes? (only if you modified the code)