Set up the GRAPES-MESO

Step by step

Get the software

- The download server
  - IP：219.239.44.87
  - User：nwpftp
  - Password：qweasd
  - Directory：RFS/GRAPES_MESO/tools/share
  - FTP protocol
- Components
  - GRAPES_MESO3.1.1.2a.tar about 500M
    - Codes about 130M
    - A case output for comparison about 430M
  - STATIC_DATA.tar.gz about 400M
  - Gfsdata about 600M NCEP GFS data

```
-bash-3.2$ ls -l
总计 899660
drwxr-xr-x 2 nwpup ftpusrs      4096 11-26 16:50 gfsdata
-rw-r--r-- 1 nwpup ftpusrs 487792640 11-26 18:17 GRAPES_MESO3.1.1.2a.tar
-rw-r--r-- 1 nwpup ftpusrs 432539454 11-26 16:48 STATIC_DATA.tar.gz
```

```
-bash-3.2$ cd gfsdata
-bash-3.2$ pwd
/data/download/nwp/RFS/GRAPES_MESO/tools/share/gfsdata
-bash-3.2$ ls -l
总计 607336
-rw-r--r-- 1 nwpup ftpusrs 16432472 11-26 16:49 gfs.t00z.pgrbf00.grib2
-rw-r--r-- 1 nwpup ftpusrs 18384769 11-26 16:49 gfs.t00z.pgrbf03.grib2
-rw-r--r-- 1 nwpup ftpusrs 18154109 11-26 16:49 gfs.t00z.pgrbf06.grib2
-rw-r--r-- 1 nwpup ftpusrs 18047409 11-26 16:49 gfs.t00z.pgrbf09.grib2
-rw-r--r-- 1 nwpup ftpusrs 18118360 11-26 16:49 gfs.t00z.pgrbf12.grib2
-rw-r--r-- 1 nwpup ftpusrs 18170199 11-26 16:49 gfs.t00z.pgrbf15.grib2
-rw-r--r-- 1 nwpup ftpusrs 18286354 11-26 16:49 gfs.t00z.pgrbf18.grib2
-rw-r--r-- 1 nwpup ftpusrs 18256479 11-26 16:49 gfs.t00z.pgrbf21.grib2
-rw-r--r-- 1 nwpup ftpusrs 18314136 11-26 16:49 gfs.t00z.pgrbf24.grib2
-rw-r--r-- 1 nwpup ftpusrs 18252665 11-26 16:49 gfs.t00z.pgrbf27.grib2
-rw-r--r-- 1 nwpup ftpusrs 18290206 11-26 16:49 gfs.t00z.pgrbf30.grib2
-rw-r--r-- 1 nwpup ftpusrs 18227502 11-26 16:49 gfs.t00z.pgrbf33.grib2
-rw-r--r-- 1 nwpup ftpusrs 18302926 11-26 16:49 gfs.t00z.pgrbf36.grib2
-rw-r--r-- 1 nwpup ftpusrs 18441983 11-26 16:49 gfs.t00z.pgrbf39.grib2
-rw-r--r-- 1 nwpup ftpusrs 18547420 11-26 16:49 gfs.t00z.pgrbf42.grib2
-rw-r--r-- 1 nwpup ftpusrs 18322970 11-26 16:49 gfs.t00z.pgrbf45.grib2
-rw-r--r-- 1 nwpup ftpusrs 18404748 11-26 16:49 gfs.t00z.pgrbf48.grib2
-rw-r--r-- 1 nwpup ftpusrs 18287512 11-26 16:49 gfs.t00z.pgrbf51.grib2
-rw-r--r-- 1 nwpup ftpusrs 18303546 11-26 16:49 gfs.t00z.pgrbf54.grib2
-rw-r--r-- 1 nwpup ftpusrs 18184068 11-26 16:49 gfs.t00z.pgrbf57.grib2
-rw-r--r-- 1 nwpup ftpusrs 18222652 11-26 16:49 gfs.t00z.pgrbf60.grib2
-rw-r--r-- 1 nwpup ftpusrs 18149233 11-26 16:49 gfs.t00z.pgrbf63.grib2
-rw-r--r-- 1 nwpup ftpusrs 18225240 11-26 16:49 gfs.t00z.pgrbf66.grib2
-rw-r--r-- 1 nwpup ftpusrs 18204972 11-26 16:49 gfs.t00z.pgrbf69.grib2
-rw-r--r-- 1 nwpup ftpusrs 18217455 11-26 16:50 gfs.t00z.pgrbf72.grib2
-rw-r--r-- 1 nwpup ftpusrs 18319130 11-26 16:50 gfs.t00z.pgrbf75.grib2
-rw-r--r-- 1 nwpup ftpusrs 18270806 11-26 16:50 gfs.t00z.pgrbf78.grib2
-rw-r--r-- 1 nwpup ftpusrs 18364451 11-26 16:50 gfs.t00z.pgrbf81.grib2
-rw-r--r-- 1 nwpup ftpusrs 18458319 11-26 16:50 gfs.t00z.pgrbf84.grib2
-rw-r--r-- 1 nwpup ftpusrs 18591254 11-26 16:50 gfs.t00z.pgrbf87.grib2
-rw-r--r-- 1 nwpup ftpusrs 18635626 11-26 16:50 gfs.t00z.pgrbf90.grib2
-rw-r--r-- 1 nwpup ftpusrs 18467618 11-26 16:50 gfs.t00z.pgrbf93.grib2
-rw-r--r-- 1 nwpup ftpusrs 18658136 11-26 16:50 gfs.t00z.pgrbf96.grib2
-rw-r--r-- 1 nwpup ftpusrs 18492023 11-26 16:50 gfs.t00z.pgrbf99.grib2
-bash-3.2$
```

Compile the package

- The version number： 3.1.1.2a
- The target executable
  - Read_for_grapes.exe “convert the format of NCEP GFS data for GRAPES SI ”
  - Si.exe “create the initial & boundary condition, topography, landuse, etc ”
  - Grapes.exe “forecast”

Read_for_grapes.exe

- Instructions
  - Cd GRAPES_MESO3.1.1.2a/data_proc/GFS_proc
  - Cp Makefile-pgi Makefile
  - Make clean
  - Make
- Compiler parameter
  - FC=pgf90
  - FFLAGS= -w -Ktrap=fp -Mfree -byteswapio
    - Fp： Trap on floating point exceptions.
    - Free： free code formatting
    - Byteswapio： Swap bytes from big-endian to little-endian or vice versa on input/output
      - Big-endian ： IBM，HP，SGI UNIX
      - Little-endian： intel linux

Si.exe & grapes.exe

- Instructions
  - Cd GRAPES_MESO3.1.1.2a/fcst/grapes_model
  - ./clean
  - Cp configure.si.pgi configure.si
  - Cp configure.grapes.pgi configure.grapes
  - ./compile grapes
- Check out the executable
  - Cd run
  - Ls –l *.exe

```
grapes@suse:/mnt/data3/grapes/perforce/mytest.tmp/GRAPES_MESO3.1.1.2a/fcst/grapes_model/run> ls -l *.exe
-rwxr-xr-x 1 grapes users 3264108 Nov 28 01:52 grapes.exe
-rwxr-xr-x 1 grapes users 1525019 Nov 28 01:53 si.exe
```

Si.exe & grapes.exe(continued)

- Compiler parameter
  - Configure.grapes.pgi
    - Real size 8:
      - For physics codes
      - FCFLAGS8 = $(FCOPTIM3) $(FCDEBUG) $(FCBASEOPTS) $(OMP) -r8
    - About the optimize optional
      - Most code is level 3
        - » FCOPTIM2 = -O3
        - » FCOPTIM3 = -O3
        - » FCOPTIM4 = -O3
      - Exception
        - » Module_dm.F
        - » Module_integrate.F
        - » module_io_grapes.F

Should pay attention

```
## compile these without high optimization to speed compile
module_dm.o: module_dm.F
	$(RM) $@
	sed /\!.\*\'/s/\'//g $*.F > $*.b
	$(CPP) -I../inc $(CPPFLAGS) $*.b  > $*.f
	$(RM) $*.b
	$(FC) -c $(FCBASEOPTS) $(MODULE_DIRS)  $*.f

########################################################
```

Running

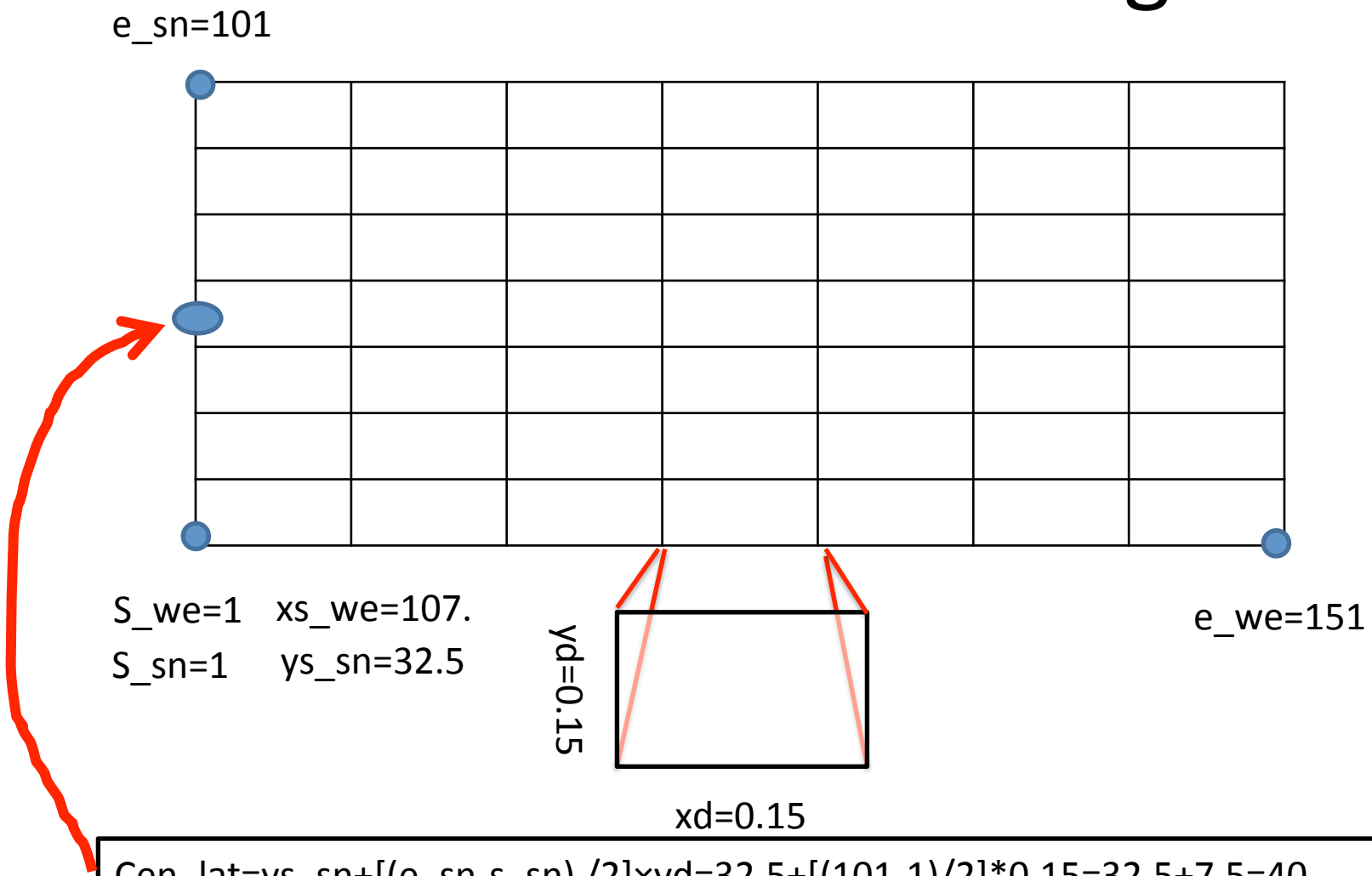
- Step1: process the GFS data
  - Cd GRAPES_MESO3.1.1.2a/data_proc/GFS_proc
  - ./Grib2bin.sh $FILESLOCATION [big|little]_endian
    - $FILESLOCATION : **Dir and part** of the data file name
      - /GFSDATA/gfs.t00z.pgrbf "will find the gfs.t00z.pgrbf* files in directory GFSDATA"
      - big_endian
    - Output
      - Files: bckg_yyyymmddhh : 3hours interval
      - Variables : bckg.ctl (sample)
      - GRADS to open

```
grapes@suse:/mnt/data3/grapes/perforce/mytest.tmp/GRAPES_MESO3.1.1.2a/data_proc/GFS_proc> vi bckg.ctl
dset ^bckg_%y4%m2%d2%h2
options sequential big_endian template
title pp  data
undef 9.999E+20
xdef  360 linear   0.0000    1.0
ydef  181 linear   -90.0000    1.0
zdef 26 levels
1000 975 950 925 900 850 800 750 700 650 600 550 500 450 400 350 300 250 200 150 100 70 50 30 20 10
tdef  21 linear  00z21JUL2012   180mn
vars 14
h 26 0 h
t 26 0 h
u 26 0 u
v 26 0 v
q 26 0 q
ps 0 0 ps
ts 0 0 ts
t2 0 0 ts
u10 0 0 ts
v10 0 0 ts
rh2 0 0 ts
psea 0 0 ts
tslb 4 0 ts
mslb 4 0 ts
endvars
```

Change the start time of the data

- Step 2: prepare initial data and modify namelist.input
  - Cd fcst/grapes_model/run
  - Cp ../../../data_proc/GFS_proc/bckg_* bckg_data/
  - Ln –sf $GEOG/geog /v3 geog_data
    - If you change the forecast regional ,to generate the static data
  - Modify the configure : namelist.input

Grid locations setting



Time and step of model

- dt=90 (the step time is 90 sec)
- Time_step_max=960 (total steps is 960)
  - Forcast hours: 90*960/3600=24 hours
- time_step_count_output = 120 (the output every 120 steps)
  - That means :90*120/3600=3 hours

Bckg data

```
&namelist_05
 init_date = 2012072100,
 start_year = 2012,
 start_month = 07,
 start_day = 21,
 start_hour = 00,
 start_minute = 00,
 start_second = 00,
 end_year = 2012,
 end_month = 07,
 end_day = 22
 end_hour = 00,
 end_minute = 00,
 end_second = 00,
 interval_seconds = 10800,
 real_data_init_type = 2,
 bdyfrq = 10800,
 nested = .false.,
 specified = .true. /
```

```
&namelist_bckg
 nz_bckg    = 26,
 xs_we_bckg = 0.,
 ys_sn_bckg = -90.,
 xe_we_bckg = 360.,
 ye_sn_bckg = 90.,
 xd_bckg    = 1.0,
 yd_bckg    = 1.0,
 p_bckg = 1000,975,950,925, 900,850,800,750,
700,650,
        600, 550,500, 450,400, 350,300,
        250, 200, 150, 100,
         70,  50,  30,  20, 10/
```

Set the si process

```
 &namelist_si
  ideal_flags = 0,       !ideal_flags=1 for idealtest
and ideal_flags=0 for realdata
  do_static_data = .true.,
  do_3dv = .false.,
  do_9210 = .false.,
  do_surface_t = .false., ! .true. not use surface
temperature in T213 data set
  hinterp_method  = 2,
  vinterp_method  = 2,
  op_ver_lev = 2 /     ! op_ver_lev=0 for uniform
level and op_ver_lev=1 for uneven level
```

The first run or change the regional setting ,should be ".true."

- Step 3 :run si.exe
  - Rm static_data if you do not change the domain,keep it!
  - Rm grapesbdy
  - Rm grapesinput
  - ./si.exe

  - Check out the new data:static_data,grapesbdy,grapesinput

- Step 4 :run grapes.exe
  - ./grapes.exe
  - Check the output
    - Postvar files
    - Post.ctl files

```
grapes@suse:/mnt/data3/grapes/perforce/GRAPES_MESO3.1.1.2a/fcst/grapes_model/run> ls post*
post.ctl_20120723000000  post.ctl_20120723001200  postvar20120723000000  postvar20120723001200
post.ctl_20120723000300  post.ctl_20120723001500  postvar20120723000300  postvar20120723001500
post.ctl_20120723000600  post.ctl_20120723001800  postvar20120723000600  postvar20120723001800
post.ctl_20120723000900  post.ctl_20120723002100  postvar20120723000900  postvar20120723002100
grapes@suse:/mnt/data3/grapes/perforce/GRAPES_MESO3.1.1.2a/fcst/grapes_model/run>
```

```
tdef 1 linear 12z23JUL2012   180mn
vars 29
u 26 0 u_wind
v 26 0 v_wind
t 26 0 temperature
h 26 0 geopotential height
Qv 26 0 Q vapor
Qc 26 0 Q cloud
Qr 26 0 Q rain
Qi 26 0 Q ice
Qs 26 0 Q snow
Qg 26 0 Q grapaul
w 26 0 vertical wind
ps 0 0 surface pressure
psl 0 0 sea level pressure
rainc 0 0 precipitation
rainnc 0 0 precipitation
ts 0 0 surface temperature
glw 0 0 surface long wave radiation flux
gsw 0 0 surface short wave radiation flux
hfx 0 0 surface heat flux
qfx 0 0 surface vapour flux
q2m 0 0 vapour at 2m
t2m 0 0 t at 2m
u10m 0 0 u at 10m
v10m 0 0 v at 10m
lu 0 0 land use
zs 0 0 terrain
tmn 0 0 tmn
tslb            4 0 tslb
mslb            4 0 mslb
endvars
```

Variables in the postvar