Getting started with LMDZ

LMDZ Training course December 9-10-11 2013

The LMDZ Team

How to install the LMDZ GCM : Get the sources and compile

Choosing which version of LMDZ to work with

Choose between the different available versions on the LMDZ web site:

http://lmdz.lmd.jussieu.fr/utilisateurs/distribution-du-modele
(in French)
http://lmdz.lmd.jussieu.fr/utilisateurs/distribution-du-modele-en
(in English)
NB: when on a French page, try clicking on the  flag to get English version

Ask the LMDZ team for more information on which versions are actually used :
lmdz-svp@lmd.jussieu.fr

Choosing which LMDZ version to work with

1 – *« production » or reference versions :*

- LMDZ4_AR5

svn co http://svn.lmd.jussieu.fr/LMDZ/LMDZ4/branches/LMDZ4_AR5

- the most tested/validated version
- production version used for CMIP5
- runs with « old physics » package (« ancienne physique »)

- LMDZ5_AR5

svn co http://svn.lmd.jussieu.fr/LMDZ/LMDZ4/branches/LMDZ5_AR5

- « new physics » version used for CMIP5

2 – *« testing » version :*

svn co http://svn.lmd.jussieu.fr/LMDZ/LMDZ5/branches/testing LMDZ5

- less tested than reference version but more tested than development version
- runs with « old or new physics » packages (« ancienne et nouvelle physique »)

3 - *« development » version :*

svn co http://svn.lmd.jussieu.fr/LMDZ/LMDZ5/trunk

- Beware! This is often updated and may not be thoroughly tested!
- Some revisions are more tested than others; these development versions eventually become « testing » versions.

How to install LMDZ : getting the source codes & compiling

There are different ways to install LMDZ ; your choice depends on the machine you will be using and the type of simulation (long, test or development) you will run.

1) Installing LMDZ « by hand »

- get each source code one by one (IOIPSL, ORCHIDEE, LMDZ) and link them with the netcdf library installed on your machine.

2) Installing LMDZ using the install.sh script

- see afternoon tutorial
- the script will download the source codes needed and will compile them
- this method is recommended for Linux PC and used for developments and tests.

3) Installing LMDZ using modipsl and libIGCM

- you will need to install one of the configuration defined by modipsl (for example LMDZOR_v5)

  $\Rightarrow$ follow the IPSL Training course.
- this is recommended for IDRIS and CCRT/TGCC and for long simulations as it provides tested reference versions and scripts for launching and following long simulations.

1) Installing LMDZ « by hand »

More information on the LMDZ site :
http://lmdz.lmd.jussieu.fr/utilisateurs/guides/lmdz-pas-a-pas (in French)

To do once and for all :

Install netcdf

Install IOIPSL

```
svn co http://forge.ipsl.jussieu.fr/igcmg/svn/modipsl/trunk modipsl
cd modipsl/util
./model IOIPSL
Modify AA_make.gdef
./ins_make   [-t g95 ou -t egi]
cd ../modeles/IOIPSL/src
gmake
```

Get LMDZ

```
svn co  http://svn.lmd.jussieu.fr/LMDZ/LMDZ4/branches/LMDZ4_AR5 LMDZ4
```

Compile LMDZ

Fill in the paths for netcdf, IOIPSL et ORCHIDEE libraries in the makegcm file or in the arch-XXX.path file if you use makelmdz_fcm or makelmdz scripts

```
./makelmdz_fcm -d « grid_resolution » -arch « XXX » gcm
./makelmdz -d « grid_resolution » -arch « XXX » gcm
./makegcm  -d « grid_resolution » gcm
```

2) Installing LMDZ using the install.sh script (preliminary remarks)

Further details here : http://lmdz.lmd.jussieu.fr/utilisateurs/script-install.sh-en (in English)

• The install.sh script compiles the model and the associated libraries using any of the g95, gfortran , ifort or pgf90 compilers and standard shell commands and utilities (gcc, wget, gunzip, tar, ...).

• This script will download the « testing » branch of LMDZ. The main modifications between different versions and the link between the proposed versions and the SVN revision numbers are summarized in the LISMOI (README) file.

• To modify some of the installation options, for example the directory where the model will be put or to inhibit the compilation of IOIPSL and/or NETCDF libraries you will have to modify variables defined in the install.sh script.

• Any of the makegcm, makelmdz_fcm or makelmdz scripts can be used to compile the model and may be used afterwards to recompile the model.

- If compile_with_fcm=1, makelmdz_fcm will be used to compile the model.
- If compile_with_fcm=0, makelmdz will be used.

2) Installing LMDZ using the install.sh script (how to download and launch it)

```
> wget http://www.lmd.jussieu.fr/~lmdz/Distrib/install.sh
> chmod +x install.sh
( eventually modify some variables in the script )
> ./install.sh
```

The variables to modify :

version	see LISMOI file (to eventually know the available versions)
MODEL	PATH to install the model
veget=1	to compile with a « frozen » ORCHIDEE version
netcdf=1	to install netcdf library
bench=1	to launch a test run at the end of compiling stage
compilo	compiler to use : g95 / ifort / pgf90 / gfortran
compile_with_fcm	=1 use of makelmdz_fcm (available since revision 1578) =0 use of makelmdz (makegcm before)
grid_resolution	possible choices for the included bench : 32x24x11, 48x36x19, 96x71x19

3) Installing LMDZ using modipsl and libIGCM

- Recommended for IDRIS and CCRT/TGCC for long runs
See :
https://forge.ipsl.jussieu.fr/igcmg/wiki/platform/documentation (in French)

Main configurations defined in modipsl :
- LMDZOR_v5.2 configuration : LMDZ coupled with ORCHIDEE (MPI-OMP) !
- LMDZOR_v5 configuration : LMDZ coupled with ORCHIDEE
- LMDZINCA configuration : LMDZ coupled with INCA
- CMIP5 ocean-atmosphere configurations : IPSLCM5A, IPSLCM5B, IPSLCM5_v5

Main points :
• Download modipsl
• Choose a given configuration (containing the different models)
• Compile all models using one main Makefile
• Launch the run (simulation and post-treatment) using libIGCM

•modipsl and libIGCM courses - « highly recommended » also for false beginners - are given at “Maison de la simulation” by the IPSL Plate-forme group.

►Next courses : Spring 2014
https://forge.ipsl.jussieu.fr/igcmg/wiki/platform/en/training

What you need to run the LMDZ model

- Parameters files :
  - run.def, gcm.def, physiq.def, config.def, traceur.def

- Start files : ♣
  start.nc, startphy.nc
  These files are created by the ce0l.e program or may be the result of previous runs

- Boundary conditions file : ♣
  limit.nc
  Created by ce0l.e

- Executable (LMDZ) file :
  gcm.e

- Some optional input files (depending on the simulation) : ♣
  aerosols.nc, climoz_LMDZ.nc, nudging input files (u.nc, v.nc,..)

♣ : these files have to be interpolated on the horizontal grid of the model

How to run the model

```
> ls
start.nc startphy.nc limit.nc config.def gcm.def orchidee.def
physiq.def  run.def  traceur.def  gcm.e

> ./gcm.e

or

> ./gcm.e > out_lmdz.x 2>&1
```

To carry on a simulation that has been run, you have to copy the restart files obtained at the end of the previous run as new initial start files:

```
> mv restart.nc start.nc
> mv restartphy.nc startphy.nc

> ./gcm.e
```

Has your run completed successfully ? (1)

YES

► you will then have a message saying « Everything is cool »
on the standard output or in the output text file.

► The code will have created 2 restart files

restart.nc and restartphy.nc

needed to carry on your run

► and some output diagnostic files

histday.nc, histmth.nc, etc. ...

to explore/view using ferret, grads, ...

Has your run completed successfully ? (2)

NO

You must find out what the problem is !!!

Look for an error message in the output text file. Search for one of the following key words/phrase « Houston, we have a problem », « STOP », « hgardfou », «integrd: negative surface pressure » etc.

Different typical errors :

- technical problem : a missing input file, an error in one of the *.def file

- problem with the model's stability.

If it is an instability in the physics, hgardfou will probably detect it as it tests if the model temperature has realistic values.

If it is an instability in the dynamics, you will most often end up with a « negative surface pressure » error message

> In any of these cases you will most probably have to adjust some flags in the .def files. See the talk tomorrow.

- you have some source code modifications that might not have been thoroughly tested or validated.

Some basic svn commands

Basic svn commands (1)

To get last revision of a directory with its sub-directories :
> svn co http://svn.lmd.jussieu.fr/LMDZ/LMDZ5/trunk LMDZ5
or
> svn co http://svn.lmd.jussieu.fr/LMDZ/LMDZ4/branches/LMDZ4_AR5 LMDZ4

To get a particular revision, for example :
> svn co -r 1575 http://svn.lmd.jussieu.fr/LMDZ/LMDZ5/trunk LMDZ5

Basic svn commands (2)

> svn info : to know what revision and branches you've downloaded

```
[jghattas@woodyard trunk]$ svn info
Chemin : .
URL : http://svn.lmd.jussieu.fr/LMDZ/LMDZ5/trunk
Racine du dépôt : http://svn.lmd.jussieu.fr/LMDZ
UUID du dépôt : e51f81be-29bc-408f-98e3-ee85b5628ff9
Révision : 1572
Type de nœud : répertoire
Tâche programmée : normale
Auteur de la dernière modification : lguez
Révision de la dernière modification : 1572
Date de la dernière modification: 2011-09-13 10:58:59 +0200 (mar. 13 sept. 2011
```

Basic svn commands (3)

> svn stat : to know which files have been modified with respect to the extracted version

```
[jghattas@woodyard libf]$ svn stat
?       grid/dimensions.h
?       grid/dimension/dimensions.32.24.11
M       phylmd/concvl.F
M       phylmd/phys_output_mod.F90
```

> svn -u stat : to see modifications with respect to the last version on the svn server.

```
[jghattas@woodyard libf]$ svn -u stat
        *     1572   phylmd/mod_phys_lmdz_omp_data.F90
        *     1572   phylmd/fisrtilp_tr.F
M       *     1572   phylmd/phys_output_mod.F90
        *     1572   phylmd/mod_phys_lmdz_mpi_data.F90
        *     1572   phylmd/soil.F90
M       *     1572   phylmd/concvl.F
        *     1572   phylmd/conf_phys.F90
        *     1572   phylmd/sw_aeroAR4.F90
?                    grid/dimensions.h
?                    grid/dimension/dimensions.32.24.11
État par rapport à la révision   1576
```

Basic svn commands (4)

> svn diff : to check the differences between different versions

```
[jgipsl@dhcp-236 phylmd]$ svn diff phys_output_mod.F90
Index: phys_output_mod.F90
===================================================================
--- phys_output_mod.F90   (révision 1572)
+++ phys_output_mod.F90   (copie de travail)
@@ -1695,10 +1695,11 @@
            IF (nqtot>=3) THEN
               DO iq=3,nqtot
                  iiq=niadv(iq)
+                 print*,'iq = ',iq
                  o_trac(iq-2) = ctrl_out((/ 4, 5, 1, 1, 1, 10 /)

-              ENDDO
+              END
            ENDIF
```

> svn diff -r x1 : differences between the x1 revision and the working version
> svn diff -r x1:x2 : differences between x1 and x2 revisions.
Use HEAD to point to the last revision

Basic svn commands (5)

> svn update : to update your version with respect to the last revision of the branch you initially downloaded from.

> svn update -r x1 : to update your version with respect to revision x1 of the branch you initially downloaded from.
Note that this "update" can be towards an older revision.