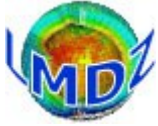


How to run LMDZ

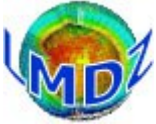
LMDZ Training course December 5-6-7 2016

The LMDZ Team



How to install the LMDZ gcm

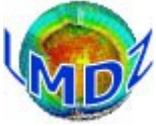
Get the sources and compile



What you need to run the gcm

- Executable (LMDZ) file :
gcm.e
- Parameters files :
run.def, gcm.def, physiq.def, config.def, traceur.def
- Start files ❖ :
 - start.nc, startphy.ncThese 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
- 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



Installing the model by hand

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

1) Installing LMDZ by hand

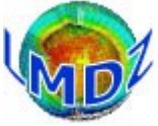
- get source code for each component you need (IOIPSL, ORCHIDEE, LMDZ) and link them with the netcdf library installed on your machine.

2) Installing LMDZ using MODIPSL and libIGCM

- you will need to install one of the configuration defined by modipsl (for example LMDZOR_v5)
⇒ follow the IPSL Training course.
- this is recommended for IDRIS, TGCC, CINES and for long simulations, as it provides tested reference versions and scripts for launching and monitor long simulations.

3) Installing LMDZ using the install.sh script

- this is what you're about to do.
- the script will download the source codes needed and will compile them
- recommended method for Linux PC ; used for developments and tests.



Using MODIPSL to install the model

1) Installing LMDZ by hand

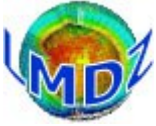
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- this is what you're about to do.
- the script will download the source codes needed and will compile them
- recommended method for Linux PC ; used for developments and tests.



Using MODIPSL to install the model

- Recommended for IDRIS, TGCC and CINES for long runs. See :
https://forge.ipsl.jussieu.fr/igcmg_doc/wiki/Doc

Main configurations defined in modipsl :

- **LMDZOR_v5.2** : LMDZ coupled with ORCHIDEE (**MPI-OMP**)
- **LMDZOR_v5** : LMDZ coupled with ORCHIDEE
- **LMDZINCA** : LMDZ coupled with INCA
- CMIP5 ocean-atmosphere : **IPSLCM5A, IPSLCM5B, IPSLCM5_v5**

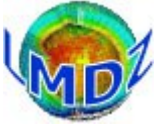
Main points :

- 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 Plateforme group.

► Next courses : **To Be Determined**

https://forge.ipsl.jussieu.fr/igcmg_doc/wiki/Train



Using MODIPSL to install the model

More information on the LMDZ site (in French) :

<http://lmdz.lmd.jussieu.fr/utilisateurs/guides/lmdz-pas-a-pas>

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
```

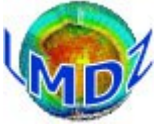
Get LMDZ

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

Compile LMDZ

Fill in the paths for netcdf, IOIPSL et ORCHIDEE libraries in the arch-XXX.path used by `makelmdz_fcm` or `makelmdz` scripts.

```
./makelmdz_fcm -d <grid_resolution> -arch <XXX> gcm
./makelmdz -d <grid_resolution> -arch <XXX> gcm
```



Getting the source codes and compiling

1) Installing LMDZ by hand

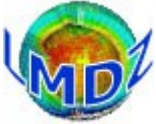
- get source code for each component you need (IOIPSL, ORCHIDEE, LMDZ) and link them with the netcdf library installed on your machine.

2) Installing LMDZ using MODIPSL and libIGCM

- you will need to install one of the configuration defined by modipsl (for example LMDZOR_v5)
⇒ follow the IPSL Training course.
- this is recommended for IDRIS, TGCC, CINES and for long simulations, as it provides tested reference versions and scripts for launching and monitor long simulations.

3) Installing LMDZ using the install_lmdz.sh script

- this is what you're about to do.
- the script will download the source codes needed and will compile them
- recommended method for Linux PC ; used for developments and tests.



Using `install_lmdz.sh` – Contents

Further details (in French), in particular the main modifications between versions:

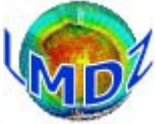
<http://www.lmd.jussieu.fr/~lmdz/Distrib/LISM0I.trunk>

It will do most of the work for you, using standard shell tools and commands (gcc, wget, gunzip, tar, ...):

- Download the required codes archives
- **Install** ancillary **libraries** (netcdf, modipsl, ioipsl)
- Install land surface model ORCHIDEE if needed
- Choose adequate compiler options and build a Makefile
- **Install LMDZ** using any of `makelmdz_fcm` and `makelmdz` scripts
- **Run a test bench**

Some parameters can be modified using command line options (short manual if you launch the script with `-h` option):

- **-v version:** choose a version/branch [YYMMDD.]**trunk/testing**
- **-r release_nb:** choose a particular svn release
- **-parallel mode:** sequential/mixed parallelism **mpi_omp** or **none**
- **-d grid_resolution:** choose model grid resolution **nlonxnlatxnlev**
- **-bench:** launch or not a test bench **1/0**
- **-name MODEL:** choose model folder name **LMDZversion.release**
- ...



Using `install_lmdz.sh` – Options

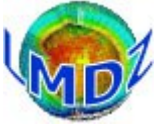
Some other parameters are defined in the script itself only ; you have to edit them:

- `compilo` choose compiler **gfortran / mpif90 / pgf90 / ifort**
- `getlmdzor` get a LMDZ archive **0/1**
- `netcdf` install NetCDF library **0/1**
- `check_linux` check basic tools availability **0/1**
- `ioipsl` install IOIPSL I/O library **0/1**
- `veget` install ORCHIDEE land surface model **0/1**
- `compile_with_fcm` use `makelmdz_fcm` or `makelmdz` **0/1**
- ...

•If you need to recompile later, use `makelmdz[_fcm]`.

This script is in constant evolution. Currently: OK for ADA (IDRIS) and a linux PC.

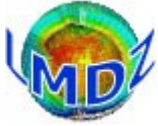
•Later: more machines, with XIOS.



Using *install.sh* – Download and launch it

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

➡ TP1



Choosing which LMDZ version to work with

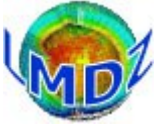
Choose between the different available versions on the LMDZ web site:

<http://lmdz.lmd.jussieu.fr/utilisateurs/distribution-du-modele> (in French)

NB: use the  flag to switch from a French to an English page, for existing translated pages.

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/LMDZ5/branches/LMDZ5_AR5`

- **new physics** version used for CMIP5

2 – *testing version* :

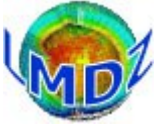
`svn co http://svn.lmd.jussieu.fr/LMDZ/LMDZ5/branches/testing LMDZ5`

- 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.



Running the model

```
ls
```

```
start.nc startphy.nc limit.nc config.def gcm.def orchidee.def  
physiq.def run.def traceur.def gcm.e L??.def
```

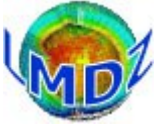
```
./gcm.e
```

or

```
./gcm.e > lmdz.out 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 ?

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

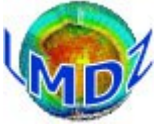
`restart.nc` and `restartphy.nc`

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 ?

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.**

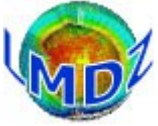
Instability in the physics are likely to be detected by **hgardfou**, which checks the model temperature has realistic values.

Instability in the dynamics most often end up the run 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



Some basic svn commands (1)

To get last revision of a directory with its sub-directories :

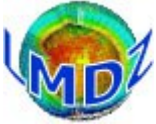
```
svn co http://svn.lmd.jussieu.fr/LMDZ/LMDZ5/trunk LMDZ5
```

Or for the last “robust” version :

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

To get a particular revision, for example :

```
svn co -r 2692 http://svn.lmd.jussieu.fr/LMDZ/LMDZ5/trunk LMDZ5
```

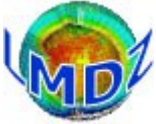


Some basic svn commands (2)

To know what revision and branches you've downloaded:

```
svn info
```

```
Path: .  
URL: http://svn.lmd.jussieu.fr/LMD4/LMDZ5/trunk/libf  
Repository Root: http://svn.lmd.jussieu.fr/LMDZ  
Repository UUID: e51f81be-29bc-408f-98e3-ee85b5628ff9  
Revision: 2699  
Node Kind: directory  
Schedule: normal  
Last Changed Author: oboucher  
Last Changed Rev: 2699  
Last Changed Date: 2016-11-07 22:23:46 +0100 (Mon, 07 Nov 2016)
```



Some basic svn commands (3)

To know which files have been modified with respect to the extracted version:

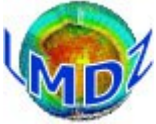
```
svn stat
```

```
[rdzt079@ada337: misc]$ svn stat
?      regr_lint_m.F90
!      regr1_lint_m.F90
!      regr3_lint_m.F90
?      regr_conserv_m.F90
!      regr1_conserv_m.F90
M      slopes_m.F90
```

To see modifications with respect to last version on svn server:

```
svn -u stat
```

```
[rdzt079@ada337: misc]$ svn -u stat
?              regr_lint_m.F90
!              2699  regr1_lint_m.F90
!              2699  regr3_lint_m.F90
?              regr_conserv_m.F90
!              2699  regr1_conserv_m.F90
M              2699  slopes_m.F90
Status against revision: 2723
```



Some basic svn commands

(4)

To check the differences between different versions:

```
svn diff
```

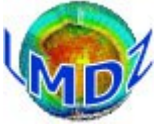
```
Index: regr_pr_int_m.F90
```

```
=====
--- regr_pr_int_m.F90 (revision 2699)
+++ regr_pr_int_m.F90 (working copy)
@@ -27,7 +27,7 @@
     use netcdf95, only: nf95_inq_varid, handle_err
     use netcdf, only: nf90_get_var
     use assert_m, only: assert
-    use regr1_lint_m, only: regr1_lint
+    use regr_lint_m, only: regr_lint
     use mod_phys_lmdz_mpi_data, only: is_mpi_root
     use mod_grid_phy_lmdz, only: nbp_lon, nbp_lat, nbp_lev
     use mod_phys_lmdz_transfert_para, only: scatter2d
@@ -96,7 +96,8 @@

! Regrid in pressure at each horizontal position:
do i = 1, klon
-    v3(i, nbp_lev:1:-1) = regr1_lint(v2(i, :), (/0., plev/), pplay(i, nbp_lev:1:-1))
+    call regr_lint(1,v2(i,:), (/0.,plev/), pplay(i,nbp_lev:1:-1), &
+                v3(i,nbp_lev:1:-1))
! (invert order of indices because "pplay" is in descending order)
end do
```

To check the differences between revision x1 and the working version:

```
svn diff -r x1
```



Some basic svn commands (5)

To check the differences between x1 and x2 revisions:

```
svn diff -r x1:x2
```

Use **HEAD** to point to the last revision

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

```
svn update
```

To update your version with respect to revision x1 of the branch you initially downloaded from:

```
svn update -r x1
```

*Note that this **update** can be towards an older revision.*