

Tutorial 2b: 1D-3D physics  
LMDZ training course  
December 17,2014

Tjis file can be downloaded as a pdf file here :

[http://www.lmd.jussieu.fr/~lmdz/DistribG95/TD2\\_1D\\_en.pdf](http://www.lmd.jussieu.fr/~lmdz/DistribG95/TD2_1D_en.pdf)

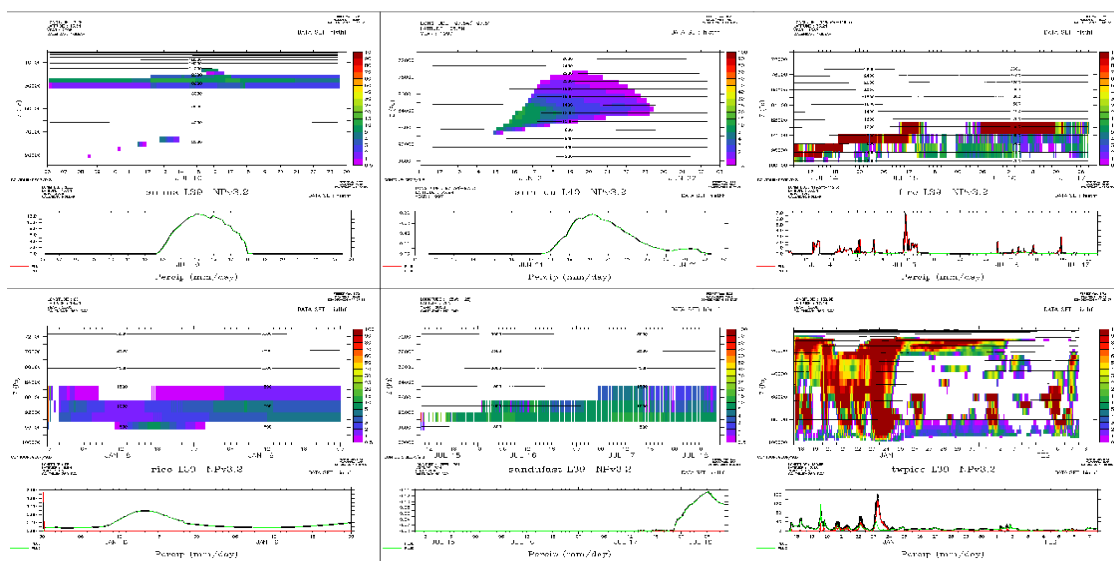
The primary aim of this tutorial is the installation and use of the 1D model that is associated with LMDz and its concurrent use with the 3D model. There are two main differences between the 1D and 3D models: firstly, the 1D model is more « homemade » than the 3D one (it has been designed just for that and it's an ideal tool to fiddle with). Switching from 1D to 3D can then be done with few changes so that the 1D install script can run with several 3D versions. Installing the model itself is done in a similar way than for the 3D model except that *you have to install the 3D model before installing the 1D one.*

### How to execute the 1D install script ?

First step is to get the script and to run it *blindly* (don't forget to change rights and allow execution) in the same directory you ran install.sh.

```
wget http://www.lmd.jussieu.fr/~lmdz/DistribG95/instal1d.sh  
chmod +x instal1d.sh  
./instal1d.sh
```

The script should run smoothly without errors. If not, don't hesitate to ask for assistance. While running the script, which may take a few minutes, you'll see messages corresponding to the download of various elements via wget or informational messages from the compiler. The script ends with the execution of 6 test simulations: arm\_cu, rico, sandufast, fire, twipce, amma, with 2 different options of the physics : NPv3.2 and NPv5.0. At the end and if everything goes well, a pdf file appears with the results (meb & precip) of all cases.



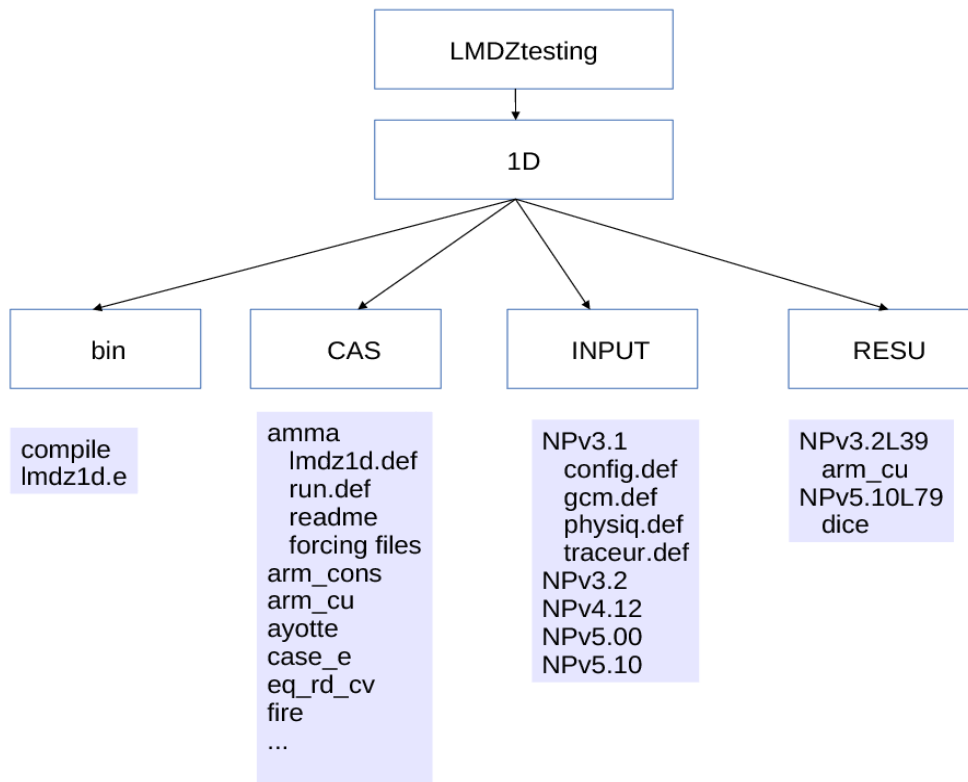
During the install procedure, you are invited to explore the directories in another window. The 1D model is installed in the 3D structure.

1/ In directory **LMDZtesting**, you'll find at the same level than modipsl, a directory **1D/CAS** in which are different directories with 1D test cases:

- amma (diurnal cycle of convection over land in semi-arid conditions)
- arm\_cons
- arm\_cu (1 day continental cumulus)
- ayotte (dry convection)
- case\_e (7 days squall line during Toga\_Coare)
- cindynamo (Dynamics of Madden Julian Oscillation, derived from field experiment)
- dice (Diurnal land/atmosphere coupling case)
- eq\_rd\_cv (radiative-convective equilibrium)
- fire (diurnal cycle of stratocumulus)
- gabls4 (boundary layer with strong stability with a snow surface)
- hapex92\_init (10 days squall line over ouest Africa)
- ihop (distribution of water vapor and improving the prediction of convection)
- rico (2 days oceanic cumulus)
- sandufast (transition case from stratocumulus to cumulus, fast option)
- sanduref (reference option)
- sanduslow (slow option)
- toga (4 monthes of Toga\_Coare campaign)
- twpice (3 weeks during TWP-Ice campaign)

2/ In directory **LMDZtesting/modipsl/modeles/LMDZ5/libf/phylmd** : it's the same directory than for 3D. It contains files necessary to run the 1D model (main program lmdz1d.F90, various routines concerning forcings for each case and some modifications allowing to « force » some part of the model).

In the following diagram, you can visualize where are stored the files characteristic of each case (latitude, longitude, type of surface, albedo ...), the control files of different physics (\*def files) and the results.



To run a case ; you have to execute **LMDZtesting/1D/run.sh** changing  
**listecas** : you choose the list of cases you are interested in  
**listedef** : you choose one or several physics

### Test runs and analysis

Check that physiq.def files are the same in 3D simulations (you ran yesterday) and 1D version.  
 Then run the 1D cases rico and arm\_cu. When results are available, you can for instance:

- compare low cloud covers over ocean and continent in both types of simulations
- analyse diurnal cycle of convection over continent and ocean
- compare convective intensities of convection over ocean
- test sensitivity of new physics package to parameter wb (in physiq.def)
- test sensitivity to cld\_lc\_lsc and cld\_lc\_con: change these values from 6e-4 to 1e-4 and analyse differences. You can also compare to 3D runs with 2 different values.