

Wikiprint Book

Title: 1. Compiling environment

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Table of Content

Compile	3
1. Compiling environment	3
1.1. FCM	3
2. Creating the main makefile	3
3. The main makefile	4
4. How to compile?	5
5. How to optimize the compilation	5

Compile

The compiling steps are described in this chapter.

1. Compiling environment

First of all, make sure that your working environment contains all the necessary compiling tools. To this end, see the chapter [Computing environments](#)

1.1. FCM

Some IPSL models use the **fc**m tool to create their makefile (LMDZ, INCA). Fcm may not be available on all computing machines yet but the recent versions of the LMDZ5 model provide the **fc**m tool with their installation package (LMDZ/tools/fcm/bin/) except for the INCA model for which you must add the following path:

```
# At TGCC:
PATH=~p86ipsl/fcm/bin:$PATH

# At IDRIS:
PATH=/smphome/rech/psl/rpsl035/FCM/bin:$PATH

# At LSCE(obelix):
PATH=/home/orchideeshare/igcmg/fcm/FCM_V1.2/bin:$PATH
```

For other machines, extract fcm from svn and add the path to your environment variable PATH. Extract as follow:

```
svn co http://forge.ipsl.jussieu.fr/fcm/svn/PATCHED/FCM_V1.2 fcm
```

For each machine supported by the IPSL tools, two kinds of files ***.fcm** and ***.path** are created. They provide all the information needed by fcm to create a makefile. These files are stored in the directory arch/ (LMDZ/arch/, INCA/arch/).

- ***.fcm** : contains the compiler information
 - compiler name
 - compiling options
 - options and settings
- ***.path** : contains the library path names.

These files have the name of the machine as a prefix : arch-X64_CURIE.fcm, arch-X64_CURIE.path

2. Creating the main makefile

Note : The compilation of ORCHIDEE_OL and NEMO requires a few special steps. For example, the main Makefile is located in another directory. Read this chapter and the chapter on special cases for [ORCHIDEE_OL](#) and for [NEMO](#).

Each model configuration has a main makefile which provides information about each model component's makefiles. The main Makefile is stored in the modipsl/config/XXXX directory. The main Makefile is created when a model configuration is downloaded and installed.

Example :

```
cd modipsl/util
./model LMDZOR_v5
(...)
Makefiles setup, scripts and data for ada

Installation in ../config/LMDZOR_v5
Path from Makefile to modipsl/util : ../../util
Installation in ../modeles/IOIPSL/src
Path from Makefile to modipsl/util : ../../../../util
```

```

Installation in ../modeles/ORCHIDEE/src_global
Path from Makefile to modipsl/util : ../../../util
Installation in ../modeles/ORCHIDEE/src_parameters
Path from Makefile to modipsl/util : ../../../util
Installation in ../modeles/ORCHIDEE/src_parallel
Path from Makefile to modipsl/util : ../../../util
Installation in ../modeles/ORCHIDEE/src_stomate
Path from Makefile to modipsl/util : ../../../util
Installation in ../modeles/ORCHIDEE/src_sechiba
Path from Makefile to modipsl/util : ../../../util
Installation in ../modeles/ORCHIDEE
Path from Makefile to modipsl/util : ../../util

```

You can recreate those Makefiles by running the `ins_make` script. You have to do this if, for example, you changed the path of `modipsl`.

```

cd modipsl/util/
./ins_make

```

The main Makefile is created by concatenating the following 3 items: `AA_make.ideal` and `AA_make` located in the directory where the main Makefile will be created, and the lines corresponding explicitly to the target machine of the `util/AA_make.gdef` file. For each predefined machine the `util/AA_make.gdef` file contains the compiler settings. If your machine is not included, you can choose a target among the predefined machines in `AA_make.gdef` or you can add a new one.

```

vi AA_make.gdef

(...)
#-Q- ada
(...)
#-Q- curie
(...)
#-Q- aix6
(...)
#-Q- gfortran
(...)

```

In this case, the script becomes

```
./ins_make -t cible
```

3. The main makefile

The Makefile is available for different resolutions. Example with `LMDZOR_v5` :

```

LMD4443 : libioips1 liborchidee lmdz44x43x19 verif
        echo "noORCAxLMD4443" >.resol
        echo "RESOL_ATM_3D=44x43x19" >>.resol

LMD5655 : libioips1 liborchidee lmdz56x55x19 verif
        echo "noORCAxLMD5655" >.resol
        echo "RESOL_ATM_3D=56x55x19" >>.resol

LMD9671 : libioips1 liborchidee lmdz96x71x19 verif
        echo "noORCAxLMD9671" >.resol
        echo "RESOL_ATM_3D=96x71x19" >>.resol

LMD9695 : libioips1 liborchidee lmdz96x95x19 verif
        echo "noORCAxLMD9695" >.resol
        echo "RESOL_ATM_3D=96x95x19" >>.resol

```

```
LMD9695-L39 : libioipsl liborchidee lmdz96x95x39 verf
             echo "noORCAxLMD9695-L39" >.resol
             echo "RESOL_ATM_3D=96x95x39" >>.resol

LMD144142 : libioipsl liborchidee lmdz144x142x19 verf
            echo "noORCAxLMD144142" >.resol
            echo "RESOL_ATM_3D=144x142x19" >>.resol

LMD144142-L39 : libioipsl liborchidee lmdz144x142x39 verf
               echo "noORCAxLMD144142-L39" >.resol
               echo "RESOL_ATM_3D=144x142x39" >>.resol
```

Available resolutions are :

- LMD4443
- LMD5655
- LMD9671
- LMD9695
- LMD9695-L39
- LMD144142
- LMD144142-L39

Another feature of the Makefile is ability to compile any model with the chosen resolution.

For **_v5** configurations, the default resolution is 96x95x39.

4. How to compile?

Once you chose a resolution you can start compiling:

```
gmake ma_resolution
```

For the default resolution gmake is fine. Example for LMDZOR_v5:

```
cd modipsl/config/LMDZOR_v5
gmake LMD144142-L39
```

The hidden file **.resol** is created when compiling was successful. This file contains information about the resolution you have just compiled. This file will be used later when setting up the simulation, in particular to locate the input files.

Going back to the previous example, the **.resol** file looks as follows :

```
ORCAxLMD144142-L39
RESOL_ATM_3D=144x142x39
```

Once the file **.resol** is created

5. How to optimize the compilation

- You can change your optimization options for the ORCHIDEE and IOIPSL models in the **AA_make.gdef** file. To this end you must find your target machine and change the associated lines. You will have to recreate the Makefile.
- Three levels of optimization for the INCA and LMDZ models are predefined in the **arch/** files. You can select them in the **modipsl/config/.../Makefile** file. The three options are: **-debug**, **-dev**, **-prod**.

Example: to compile LMDZ you can add the keyword **"-debug"** :

```
(cd ../../modeles/LMDZ; ./makelmdz_fcm (...) -debug (...) -arch $(FCM_ARCH) gcm ; cp bin/gcm_$(RESOL_LMDZ)_phylmd_para_orc
```

The default option is `-prod`