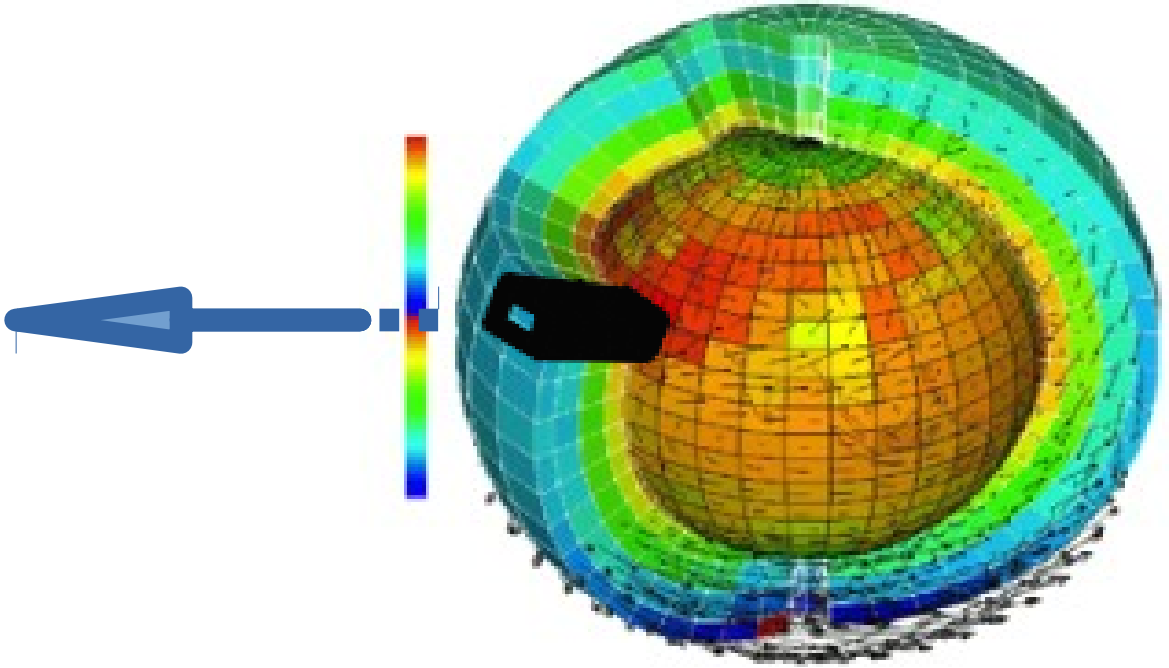
LMDZ Single Column Model



M-P Lefebvre and LMDZ team

How to install 1D model ?

cd LMDZ20191106

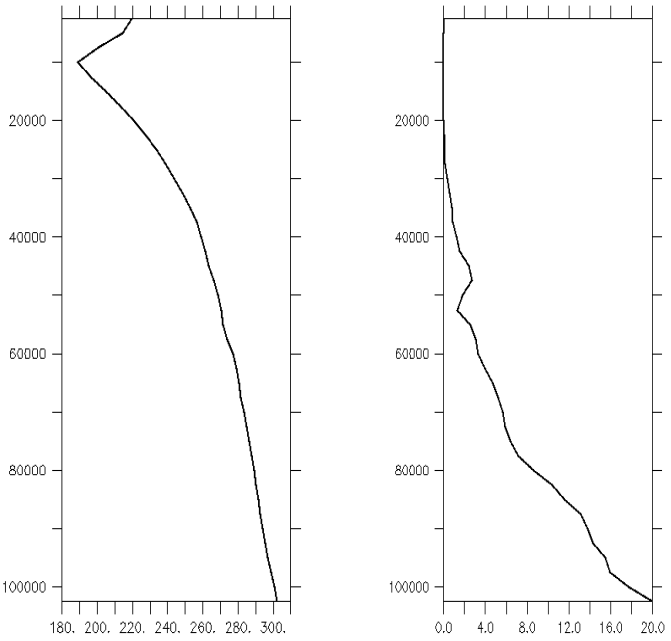
wget http://www.lmd.jussieu.fr/~lmdz/pub/1D/1D.tar.gz

tar xvf 1D.tar.gz

Now you have 1D directory avalaible

./run.sh

LMDZ in 1D mode



z~20km

Δz =
30m - 1km

Large scale forcings
(constant or not):
Temperature, humidity,
Wind advection

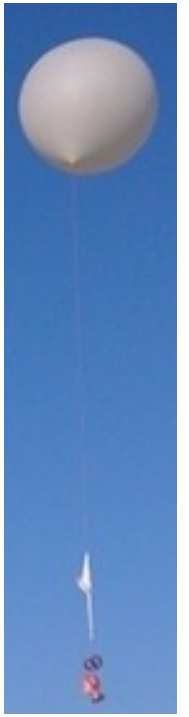
Surface conditions:
Surface fluxes or
Surface temperature

Δx =
50-300 km

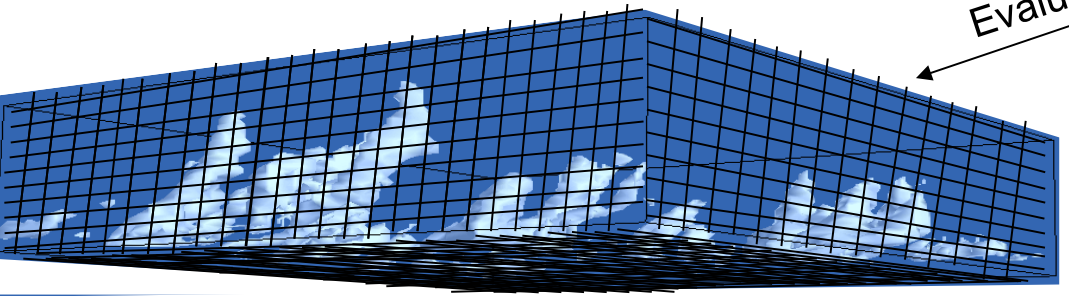
How 1D cases are built ?

Test case, field campaign experiment

Observation



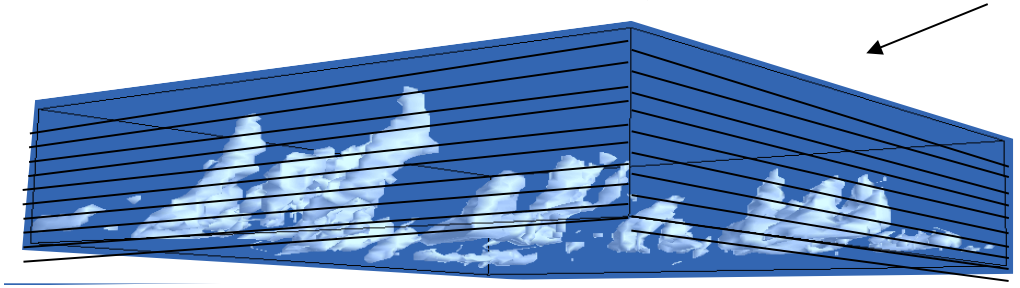
Evaluation



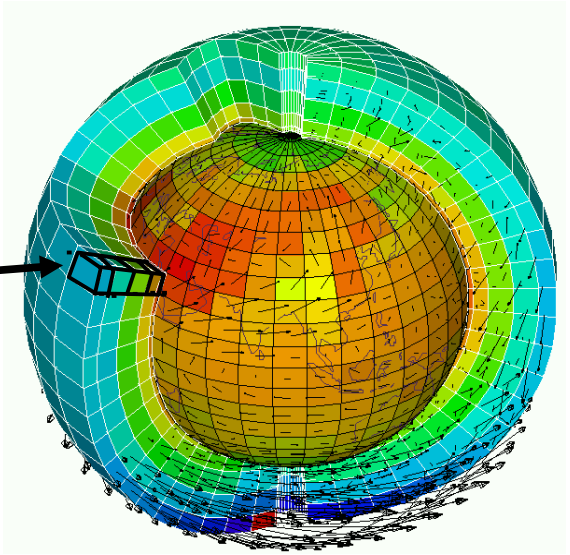
Explicit simulations, Grid cell, 20-100 m

Evaluation

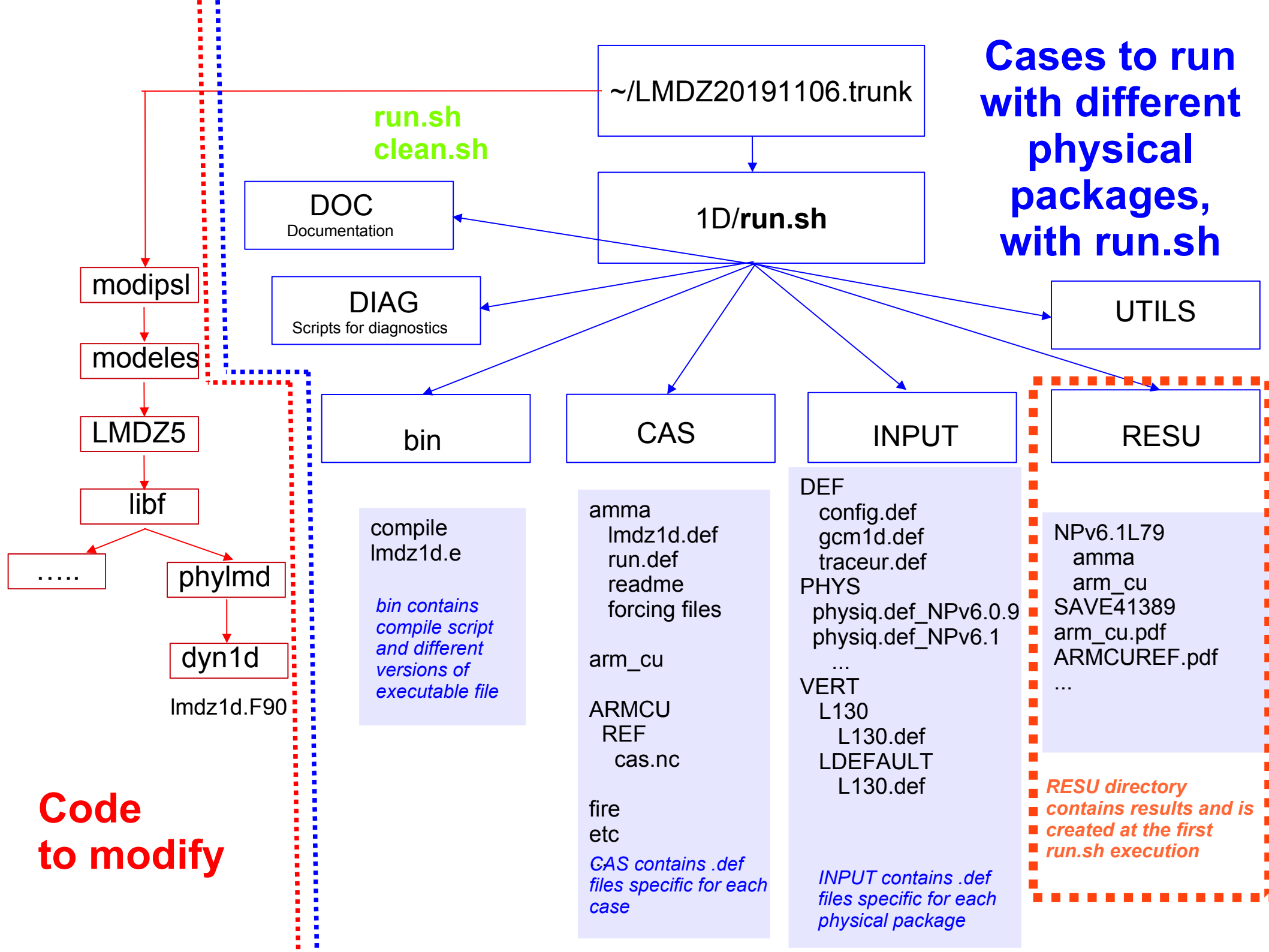
« Large scale » conditions imposed



Climate model, parameterizations, « single-column » mode



Courtesy F.Hourdin


~/LMDZ20191106.trunk
run.sh
clean.sh
DOC
Documentation
1D/run.sh
DIAG
Scripts for diagnostics
UTILS
modipsl
modeles
LMDZ5
libf
.....
phylmd
dyn1d
lmdz1d.F90
bin
CAS
INPUT
RESU
compile
lmdz1d.e
bin contains compile script and different versions of executable file
amma
lmdz1d.def
run.def
readme
forcing files
arm_cu
ARMCU
REF
cas.nc
fire
etc
CAS contains .def files specific for each case
DEF
config.def
gcm1d.def
traceur.def
PHYS
physiq.def_NPv6.0.9
physiq.def_NPv6.1
...
VERT
L130
L130.def
LDEFAULT
L130.def
INPUT contains .def files specific for each physical package
NPv6.1L79
amma
arm_cu
SAVE41389
arm_cu.pdf
ARMCUREF.pdf
...
RESU directory contains results and is created at the first run.sh execution
Cases to run with different physical packages, with run.sh
Code to modify

Common input and output format

In the frame of project DEPHY, we've defined with Météo-France a common format for forcings and output files.

For cases which are up to date : ARMCU, RICO, SANDU

+ forcings file is cas.nc
+ output file is hourly_std.nc
+ there is also histhf.nc or hourly.nc

For the other cases :

+ forcings file is case_name.nc or prof.inp.001
+ output file is histhf.nc or hourly.nc

Have a look in run.sh

Which case(s) ?

listecas="arm_cu bomex ihop rico ayotte_24SC ayotte_05WC sanduslow sanduref sandufast ARMCU/REF RICO/REF SANDU/REF"
listecas="arm_cu bomex "

Which physics ?

listedef="NPv6.1"

Number of levels ?

LLM="" # imposing the number of **vertical level** (default 79)
default values for various cases are defined bellow
day_step="" # number of physical steps per day
flag_output_commun="1"

Results : in LMDZ20191106/1D/R

arm_cu.pdf

ARMCUREF.pdf

ayotte_05WC.pdf

ayotte_24SC.pdf

bomex.pdf

ihop.pdf

NPv6.1L79/

rico.pdf

RICOREF.pdf

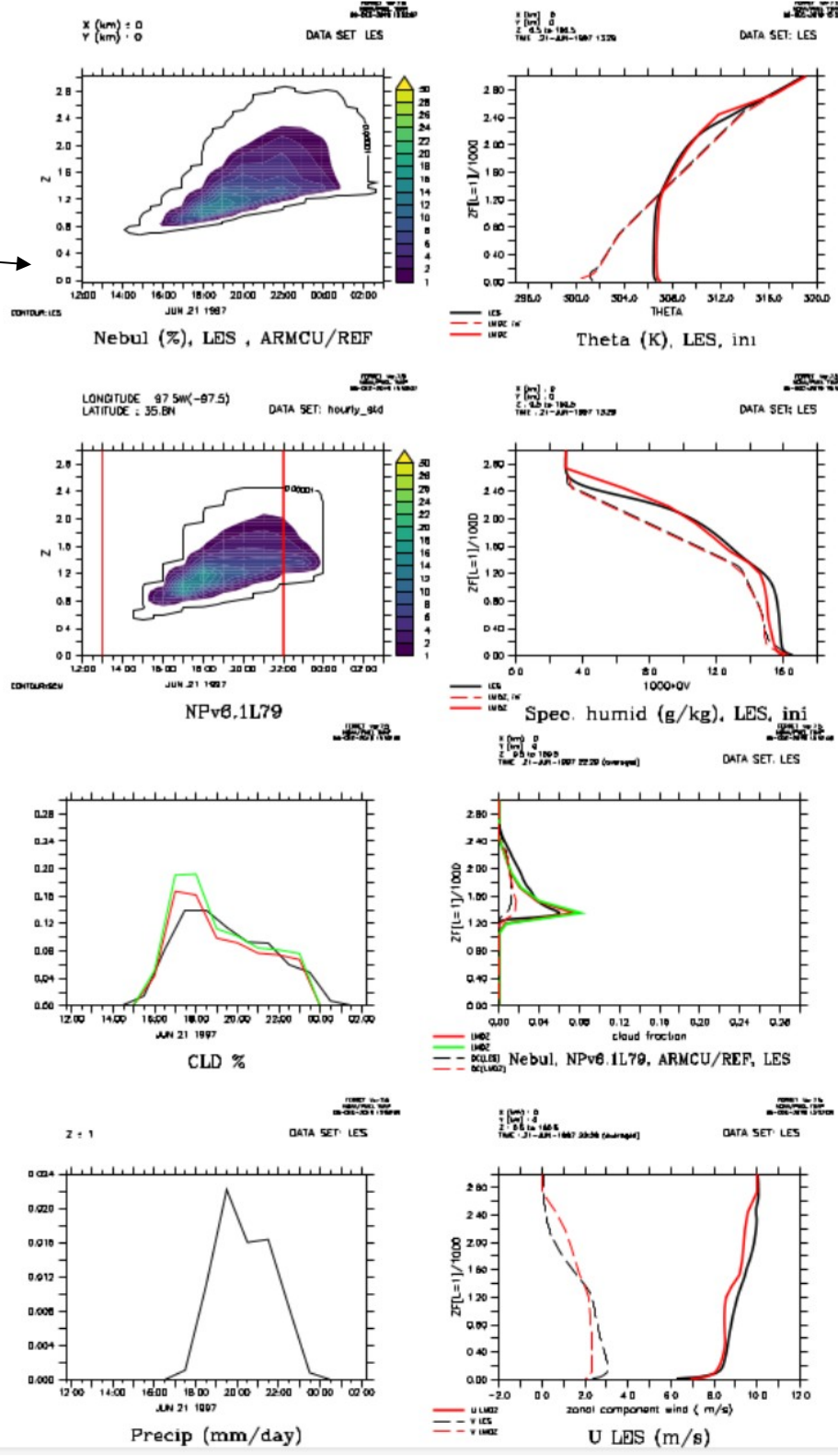
sandufast.pdf

sanduref.pdf

SANDUREF.pdf

sanduslow.pdf

SAVE41389/



Where are the results ?
In LMDZ20191106/1D/RESU/NPv6.1/ARMCU/REF

cas.nc ← **forcings**

Result files

filehf.nc
histhf.nc
hourly.nc
hourly_std.nc

LES.nc

lmdz1d.e

cas.def
config.def
gcm1d.def
L79.def
physiq.def
run.def
traceur.def
vert.def

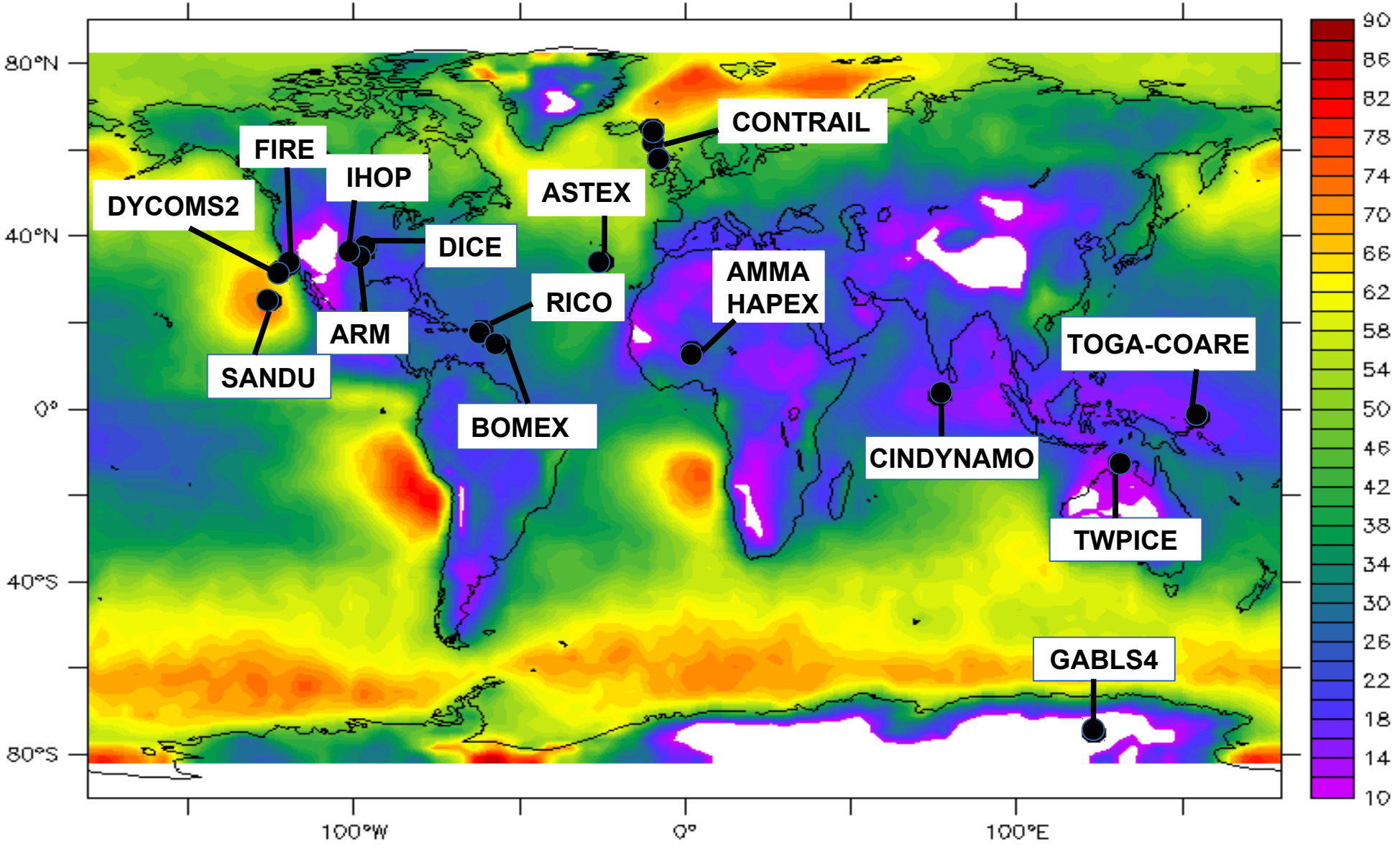
***def files**

Listing

listing.gz

CAUTION !
You can modify *def files in ~LMDZ20191106/1D/RESU/NPv6.1/ARMCU/REF
and quickly rerun the model because lmdz1d.e is in this directory.
BUT BE CAREFULL
The « original » files are either under ~/CAS or ~/INPUT
And will be replaced at each run of run.sh

Where are located all these cases ?



Background : low cloud cover from Calipso (Chepfer et al. 2008)

Avalaible cases correspond to different meteorological situations

Dry and shallow convection

Arm_cu (diurnal cycle of shallow cumulus over land)
Rico (Rain In Cumulus over Ocean,
shallow precipitating cumulus over sea)
Ayotte (convective boundary layer, sky clear)

Stratocumulus and transition to cumulus

Sandu (transition case with 3 options : variation of SST)
Fire (diurnal cycle of stratocumulus)

Deep convection Over ocean:

Toga
case_e (part of Toga)
TWPICE : off the coast of Darwin

Deep convection Over land:

Hapex : african monsoon
AMMA : african monsoon
Idealized case:
eq_rad_conv (RCE) : radiative and convection scheme active

Recent improvements:

DICE case : characterize boundary layer
In the site of SGP during 3 days/nights
May be coupled with soil model

GABLS4 case : interaction of a very stable boundary layer with a snow surface

+ **Cindy Dynamo** case (MJO study)

To conclude: Why use SCMs ?

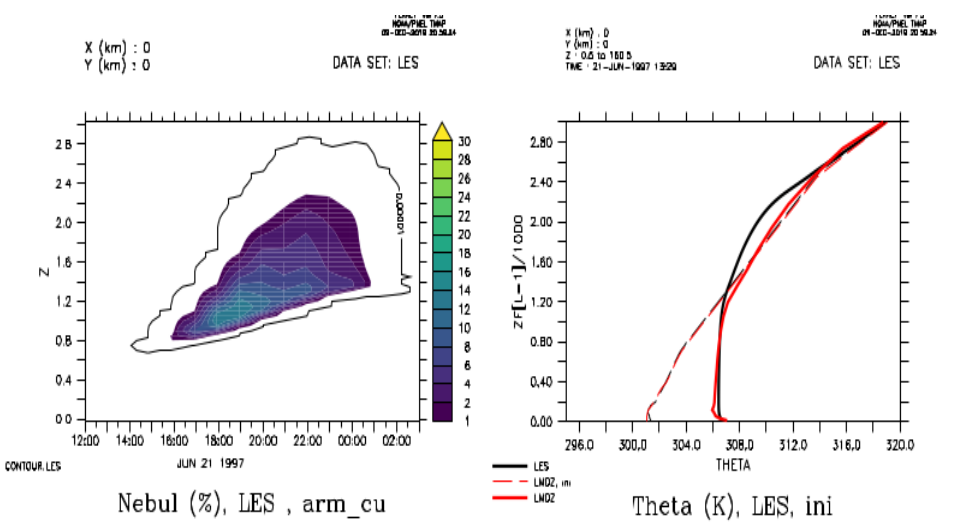
+ **simplicity**: technical and understanding, usable on any labtop

+ it's a useful tool for **parameterization development**: shallow convection, deep convection, transition from stratocumulus to cumulus, stable boundary layer, radiation...

+ we can **compare results to observations or to explicit simulations** (CRM, LES)

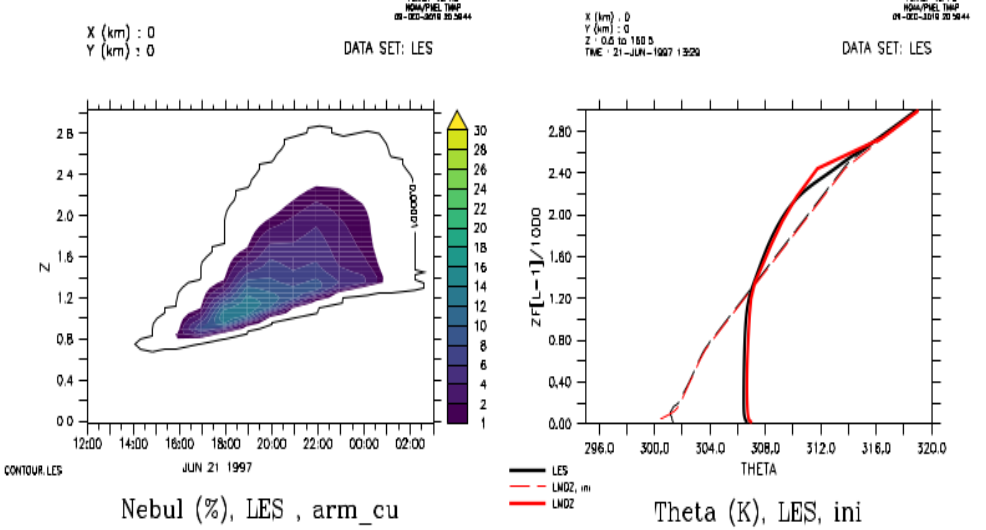
+ then we go back to GCM and test new parameterizations ...

+ hierarchy of models: SCM, LAM, AGCM, GCM ...



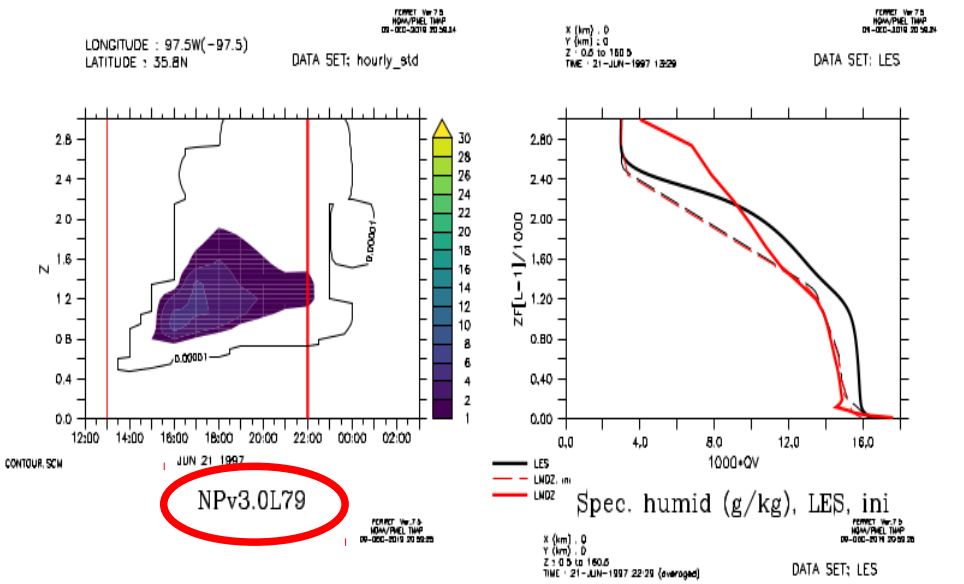
Nebul (%), LES , arm_cu

Theta (K), LES, ini



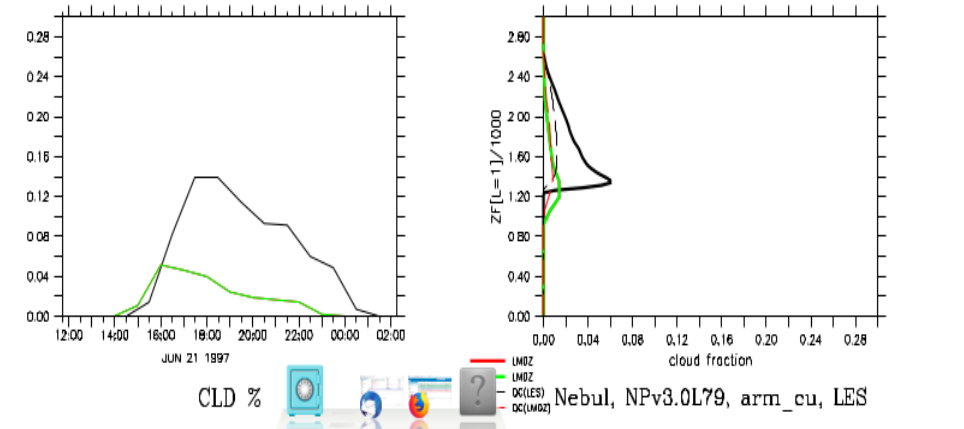
Nebul (%), LES , arm_cu

Theta (K), LES, ini



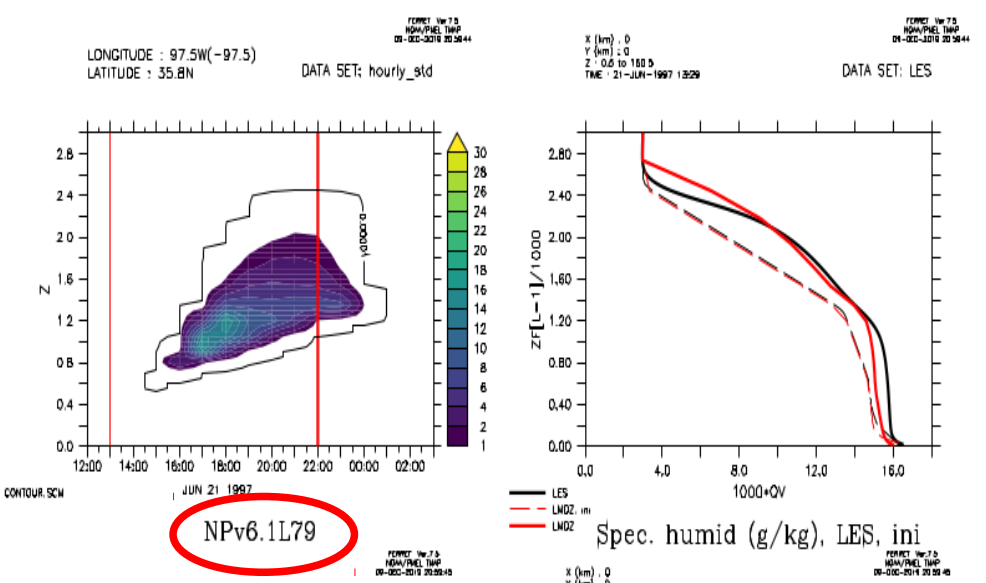
NPv3.0L79

Spec. humid (g/kg), LES, ini



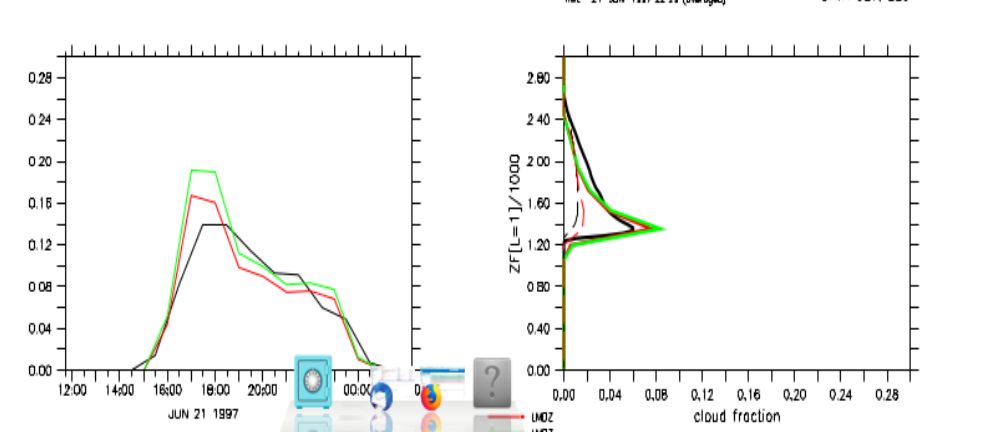
CLD %

Nebul, NPv3.0L79, arm_cu, LES



NPv6.1L79

Spec. humid (g/kg), LES, ini



Thank you for your attention !