

## Summary of the 2nd HIGH-TUNE coding sprint, 2-4 May 2018 :

Is highlighted in cyan all the actions that have to be carried out.

### -Status of LES :

reference LES : ASTEX missing

sensitivity tests : need to run them for : AYOTTE (00SC, 00WC, 03WC, 05SC), WANGARA, AMMAsec, DYCOMS, AMMA

need to convert all of them to the right format and put them on the HIGH-TUNE website to be available

=> a smart way in order to update only the modifications when updating the directory (ask Florence Favot)

### - HIGH-TUNE web site :

=> need to create a repertory with the different presentations of the 2 coding-sprints session + Summary

=> make the website for the comparison of 1D/LES visible from outside of Meteo-France => See with Florence Favot

### -Tuning tool :

codes available under svn

- 'svn checkout --username=htune <http://svn.lmd.jussieu.fr/HighTune/HighTune>' : to get the codes  
password : ask Frédéric Hourdin ([frederic.hourdin@lmd.jussieu.fr](mailto:frederic.hourdin@lmd.jussieu.fr))

- './setup.sh Model\_name [EXPE\_NAME]' : Model\_name can be AROME, ARPEGE, ARPCLIMAT, LMDZ ; EXPE\_NAME is optional and allows to define the name of the directory under WORK

- 'svn diff' : to know the differences between the src directory and the reference one

- 'svn commit' : to submit the modifications to the svn site. Need to include comments.

=> not sure how the comment should be taken into account. To be checked with Fred.

- 'svn update' : to get the new updates from the svn site

### organisation

- ExeterUQ : contains the code developed by Daniel and its team ;

=> how to synchronise this directory with the rstan tools available under git at Exeter ?

- src : contains the codes developed from the statistical tools of Exeter and dedicated to the estimation of free parameters from the comparison 1D/LES. See the readme for the description of the different steps [step 1 : generation of the sampling of the parameter values for the n 1D simulations to be run ; step 2 : run the SCM ; step 3 : compute metrics for LES and SCMs and convert them to R format ; step 4 : create Emulator(s) and use it to define the NROY

- LES : contains the LES outputs

- models : contains the code specific to each 1D model

- WORK : work directory

### updates & development :

=> modified the codes to include modification for multi-metrics=DONE

the tData matrix contains the n parameters + the p metrics and an emulator is created for each p metric ; advantage by considering all the metrics at once we are sure to use the same Xp for each metric otherwise difficult to combine.

=> small modifications to improve the plotting :

- to plot the time series for all the already defined metrics = DONE

- **Need to be done** : add the LES values and the default values in the graphs that show the metrics as a function of the parameter values + convert the parameter values from [-1, 1] to [valmin, valmax]

=> introduction of integral metrics with cdo => Action C Rio & JY Grandpeix

case\_name.metric (where t1, t2, z1, z2 are defined => compute spatio-temporal integral btwn t1 & t2 and z1 & z2 ; the bash\_script has 3 args (case\_name, file\_name, target\_variable)

=> need to add the computation for more complex metrics (vertical profiles, time series) => Action R Roehrig

=> need to add the use of the non-stationarity codes developed by Victoria

=> need to add metrics, maybe add a repertory by cases that deal with the metrics specific for this case as well as the plot\_setup adapted for this case

=> need to add the quite general script in python developed by Florence Favot to draw time series and vertical profiles

### Inputs from Daniel :

=> need to think how to best estimate

- the Disc (=structural error) up to now two possibilities either =0 or = observational error ; this may need to depend on the metric

- the nugget : should be dependant on the metric (maybe ok now with the new codes???)

- nb of elements to sample the domain (up to now fix to 10000) should be increased when a lot of parameters are used or maybe defined this number as a function of the nber of parameters => notably for graphic purposes

- maxdf (max number of degree of freedom = number of fuctions retained in the linear model) should be adapted to the number of simulations available (~10 % of the number of runs).

- FastVersion=False : more accurate but much longer ; probably only very small impact

### graphic interpretation :

as a reminder :

the upper right figures : indicate the % of space behind this 2D visualisation is kept ( $I < 3$ ) => grey indicate the values of the parameters that are ruled out independantly of any values of the other parameters.

the lower left figures : indicate the minimum value of implausibility on the rest of the domain.

Objective= find values in the green.

### How to continue on this ?:

- meeting every two thursday at 14:30 by visio=>

Proposed dates every two thursday starting on Thursday 24 May :

**Thursday 24 May**

**Thursday 7 June**

**Thursday 21 June**

**Thursday 5 July**

**Thursdat 19 July**

- go-on the familiarization of the use of those tuning tools for different cases/parameters/models

- Scientific questions to be adressed :

- use of global metrics versus parameterization-oriented diagnostics ?

- answer of the tuning tools for similar free parameters in two different models (LMDZ & AROME)

- use of the tuning tools for stable boundary layers

- use of the tuning tools for CRE simulations => deep convection

- what do we learn from the combination of metrics on a given case, of several cases, of several waves ?

- A meeting on a list of 1D cases available with inputs at a given format and also the definition of common outputs:

to be organised by Frederic Hourdin in fall 2018

=> need to think of the position of HIGH-TUNE for this meeting as once agreed on a common format for inputs & outputs, the tuning tools can rapidly be adapted to any models.

- Victoria work :

To explore multi-case & multi-metric & non-stationarity with LMDZ

Also explore the link between the tuning in 1D/LES on the representation of the clouds and how this can help in the tuning of the 3D model on radiative metrics.

- Publication :

Development of a framework dedicated to the comparison 1D/LES to provide a first tuning of the model and also better understand the sensitivity of the model behaviour to those parameters

A model = ensemble of parameterizations + free parameters to be tuned

Demonstration on several models

This will serve as a reference publication for this tool

to be submitted to BAMS or JAMES

Probably another paper could be on the use of this tuning tool (1D/LES) for the tuning of 3D models, in relation with Victoria work.

At longer term, other more specific papers on different subjects