Phasing report

Mohamed Anis Satouri, Mai 2016
National Institute of Meteorology, Tunisia
anissatouri@gmail.com

Contents

This short report summarizes items tackled during the phasing of cy43_t1 (pre-cycle).

I. Diagnostics in Horizontal Domains

The main goal of this report is to validate the integration of the new diagnostics on horizontal domains tool «flexible DDH» in the cycle 43_main.01, the integration work was done by Fabrice VOITUS.

The DDH tool provides, on user defined domains, the budget of prognostic variables, it's used mainly to understand the model's dynamical and physical interactions, the full documentation could be found under this link : http://www.cnrm-game-meteo.fr/gmapdoc//IMG/pdf/ddh.pdf

The methodology followed was to compare the computing time of the 4 experiences described in the table bellow, these 4 experiences are derived from 2 ARPEGE experiences built by Jean-Marcel PIRIOU (Many thanks Jean-Marcel for your help and support) :

the first one : ARPEGE T1200 + physique oper

/home/mrpm/mrpm606/experiments/arpege/pcmt_previ/7F2C/

the second one : ARPEGE T1200 + Physique PCMT

/home/mrpm/mrpm606/experiments/arpege/pcmt_previ/7F2B/

From each experience we create 2 experiences by using either the old DDH, or by activating the flexible DDH, to do so we made use of 2 namelists :

The first one : physique oper + executable type 43_main.01

/home/gmap/mrpm/piriou/nam/nam_j788

The second one : Physique PCMT + executable type 43_main.01

prolix:/home/gmap/mrpm/piriou/nam/nam_j795

To activate the flexible DDH we have to add the next gnam :

```
&NAMDDH
   LDDH_OMP=.TRUE.,
   LFLEXDIA=.TRUE.,
/
```

```
The pack used was compiled by Fabrice VOITUS and could be found on BEAUFIX under
this path : /home/gmap/mrpm/voitus/pack/DDH_cy43_main_debug
```

or on PROLIX under this path : /home/gmap/mrpm/voitus/pack/DDH_cy43_t1_prolix*

* don't pay attention to the t1 in the name of the pack on PROLIX, it's just a handling error, it's indeed the branch 43_main.01.

To activate the DR_HOOK profiling wich allow to check the time consumption of the code in routine/line, we add the next variables in the header of each experience :

DR_HOOK=1
DR_HOOK_IGNORE_SIGNALS=-1
DR_HOOK_SILENT=1
DR_HOOK_OPT=prof
SWAPP_PROF=1
SWAPP_PROF_PATH=prof (défaut: $HOME/prof)

Olive swapp environment was used for all the experiences which could be found under this path:

http://sxcoope1.cnrm.meteo.fr:8181/swapp_entry/chico/Olive/Browse/home/coope/anis/experiments/

7F3P : OPER + Old DDH		**7F3O : PCMT + Old DDH**	
Namelist : /home/gmap/mrpm/piriou/nam/nam_j788		Namelist : /home/gmap/mrpm/piriou/nam/nam_j795	
Avg,time(secs)	910.662	Avg,time(secs)	1st run : 917.527 2nd run : 924.400 3rd run : 917.102
86RZ : OPER + Flexible DDH		**86RY : PCMT + Flexible DDH**	
Namelist : /home/gmap/mrpm/piriou/nam/nam_j788		Namelist : /home/gmap/mrpm/piriou/nam/nam_j795	
gnam : &NAMDDH LDDH_OMP=.TRUE., LFLEXDIA=.TRUE., /		gnam : &NAMDDH LDDH_OMP=.TRUE., LFLEXDIA=.TRUE., /	
Avg,time(secs)	926.202	Avg,time(secs)	1st run : 936.613 2nd run : 941.529 3rd run : 938.765

Table.1: The different experiences : Physique OPER or PCMT, with or without Flexible DDH

All the tests run fine, and the difference in the computing time is acceptable, it's about 2 % between « 7F3O : PCMT + Old DDH » and « 86RY : PCMT + Flexible DDH » nevertheless, to understand the cause of this difference we proceeded as follows : The idea is to compare the subroutines that appear or disappear, to see the net balance on computational time: When the flexible DDH are activated, some new routines are activated. Others are inactivated.

86RY : Flexible DDH					**7F3O : Old DDH**				
Avg-%	**Avg,time**	**Min,time**	**Max,time**	**Routine**	**Avg-%**	**Avg,time**	**Min,time**	**Max,time**	**Routine**
1,62%	15,174	12,69	17,003	CPDYDDH	1,84%	16,909	14,833	19,512	CPDYDDH
0,25%	2,305	0,666	3,476	DDH_MIX:CLEANDDH	1,40%	12,817	10,062	15,433	CPPHDDH
0,04%	0,404	0,366	0,448	DDH_MIX:NEW_ADD_FIELD_2D					
2,40%	22,439	20,435	26,326	DDH_MIX:NEW_ADD_FIELD_3D					
0,00%	0,011	0	0,021	DDH_MIX:RESET_DDHFLEX					
0,03%	0,268	0,216	0,331	DDH_MIX:SETDDH					
0,00%	0,033	0,024	0,044	DDH_MIX:STOREDDH					
0,00%	0,019	0,007	0,028	DISTDDH	0,00%	0,032	0,008	0,036	DISTDDH
0,36%	3,405	1,402	8,307	DRESDDH	0,28%	2,584	0,627	7,182	DRESDDH
0,35%	3,292	2,988	4,698	GPINIDDH	0,09%	0,79	0,56	1,003	GPINIDDH
0,01%	0,069	0,054	0,11	POSDDH	0,00%	0,012	0,009	0,028	POSDDH
0,01%	0,054	0,052	0,058	SUMDDH	0,01%	0,054	0,052	0,058	SUMDDH

0,00%	0,015	0,005	0,017	SUNDDH	0,00%	0,014	0,002	0,058	ZERODDH
0,00%	0,021	0,005	0,05	ZERODDH					
0,0152	14,215	12,475	15,361	CPTEND_NEW	0,90%	8,258	6,933	9,712	CPTEND_NEW
6,59%	61,72				4,52%	41,47			

Table.2: Comparison of the computing time between the new and old DDH routines

As expected the new DDH routines are the source of these 2% of computing time, which remains acceptable given that the Flexible DDH is more efficient than the old one.

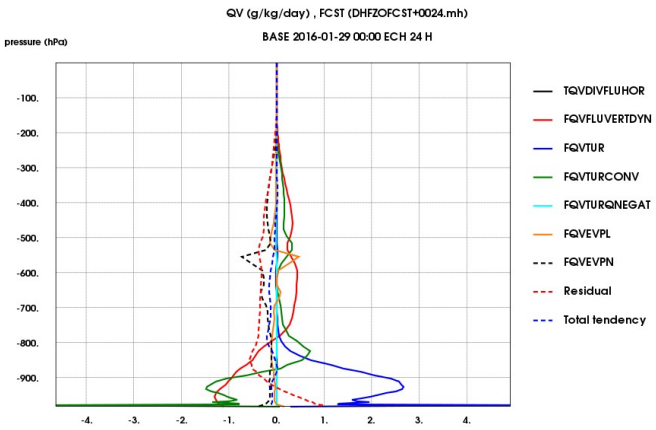


Fig.1: 7F3O: Profiling water vapour budget

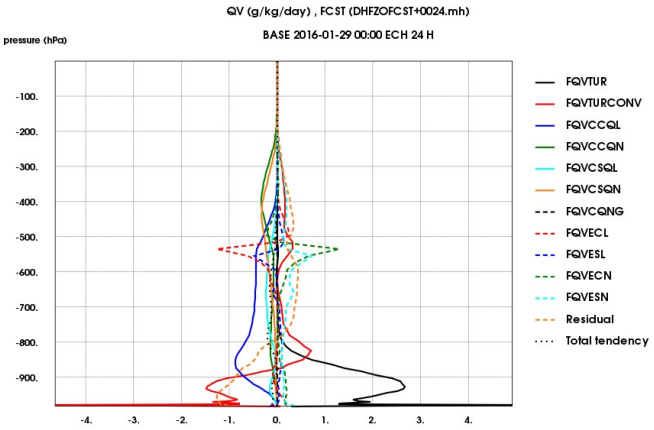


Fig.2 : 86RY : Profiling water vapour budget

The water vapour budget of the 2 experiences 7F3O and 86RY shows that the Flexible DDH is able to reproduce faithfully the results of the old version, I also calculated the difference between the 2 DDH files of the 2 experiences at ECH 24 H, then I plotted the final values of each variable: the temperature and the water vapour, and the result was nil, which confirm that the new DDH is fine.

NB : To recognize the meaning of the different variables, fluxes and tendencies you have to refer back to the documentation, otherwise if not found there, you can search for it in the routine cptend_new.F90 for the new DDH version and in the routine cpphddh.F90 for the old DDH.

II. Configuration 903 : First test to replace the 901 configuration by a Fullpos configuration :

The 901 configuration is a particular configuration that transforms GRIB files (format used at ECMWF) to ARPEGE file FA (format used at METEO-FRANCE). Followed by an execution of the Fullpos it provides, for example, coupling files for ALADIN/AROME from ECMWF data.

For reasons of maintenance costs, it was agreed to replace this couple (conf 901, Fullpos), by a Fupllpos configuration able to read ECMWF GRIB files, and transforms them directly to FA files in a geometry of your choice (global or limited area).

A quick test of the configuration 901 under mitraillette has shown that there is a bug with the mini values; all the mini values were equal to 0, according to the routine cprep1.F90 the variable ZZMIN was not initialised. This initialisation concerns a print of listing. Indeed, we had only to comeback the following line code deleted by accident at ECMW in CY42 in the routine cprep1.F90 to fix this issue.

```
ZZMIN=MINVAL(P_ZZFAGG(1:NGPTOTG))
```

the script used to test the configuration 903 could be found under this path :

/home/gmap/mrpe/satouria/conf_903/ec903

In comparison with the script of the job conf901 only the namelist is modified.

The first run produces this error :

```
ABOR1 CALLED
SU_MCICA:ERROR OPENING FILE MCICA
```

MCICA refers to the radiation scheme for short wavelengths; but we did not need the radiation scheme in this configuration; to disable it, we have to add in the namelist NAERAD:

LSRTM=.FALSE.,

LRRTM=.FALSE.,

Then I got :

```
NHTYP  OVERWRITTEN BY FILE FRAME
 ABORT!    1 SUECRAD: UNABLE TO OPEN RADIATION GRID RTABLE FILE
```

which refers also to the radiation scheme, so the next key should be turned off in the namelist :

LERADI=.FALSE.,

After that, the run goes further, but the troubles are not over there :

```
 ABORT!    1 IOSTREAM_MIX:SPEC_IN - MISSING FIELD
```

This error is due to the specific kind of extraction of the input files for the conf901 from the ECMWF data base MARS. The first approach is to modify the existing input files, otherwise a new extraction from “mars data base” will be needed, a work that requires later a hard work of validation, and more time working than the duration of my stay, so I stopped at this level, Ryad EL KHATIB continues working thereupon.

III. Phasing work

Mitraillette tests were done to perform comparison between cy43t1.02 and cy43_main.01 (the reference). The full status of validation (the crashing part) as reported by Oldřich Španiel will be included in the appendix, in this part I present only the crashes on which I worked.

*** OAHFE049** - Conf 001HYD FPOS OPE2; LELAM=T; CFPFMT=LALON; OFF-LINE; dm32; 16 nd; 12 td;

- **AHFE "ope2"** :
  - Domain and resolution: dep=ALADIN-FRANCE L60, arr=FRANX01 L60.
  - Date of the initial situation: 15 Jan 2010 03TU.
  - Initial file: FRAN_20100115r0_ope_analyse+0003.
  - Departure climatology: clim_france.09km51.14.m01.
  - Arrival climatology: clim_dap.franx01.10.m01.

*** OAHFE050** - Conf 001HYD FPOS OPEX; LELAM=T; CFPFMT=LELAM; C+I; OFF-LINE; dm32; 16 nd; 12 td;

- **AHFE "opex"** :
  - Domain and resolution: dep=ALADIN-FRANCE L60, arr=ALADIN-FRANCE L60.
  - Date of the initial situation: 15 Jan 2010 03TU.
  - Initial file: FRAN_20100115r0_ope_analyse+0003.
  - Climatology: none.

cy43_main - ok
cy43t1.01 - ABORT! 15 RDFA2GP: FIELD IS MISSING :CLPVEIND.MOD.XFU
cy43t1.02 - ABORT! 15 RDFA2GP: FIELD IS MISSING :CLPVEIND.MOD.XFU

The abort occurred in the following program chain :

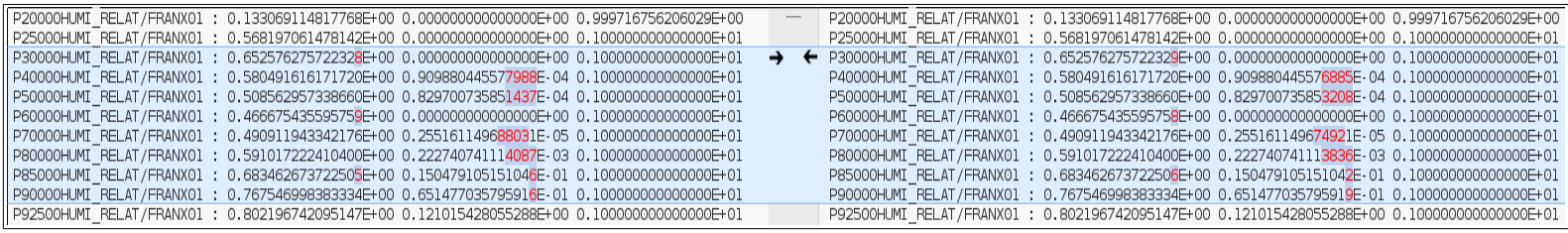
rdfa2gp() at rdfa2gp.F90:228
sugrxfu() at sugrxfu.F90:89
sueinif() at sueinif.F90:170
elsac_IP_elsac_slow_() at elsac.F90:179
elsac() at elsac.F90:103
cnt3_lam() at cnt3_lam.F90:59
cnt3() at cnt3.F90:144
cnt2() at cnt2.F90:113
cnt1() at cnt1.F90:126
cnt0() at cnt0.F90:166
master() at master.F90:146

The above crash was resolved (thanks to Ryad El KHATIB), the fix consists on adding new namelist key LXVEIN which activates ventilation index, the modified source files are :

arpifs/module/yomxfu.F90
arpifs/fullpos/sufpxfu.F90
arpifs/namelist/namxfu.nam.h
arpifs/setup/suxfu.F90

After including this fix the tests run well, there is no numerical impact detected on the spectral norms, and the differences in the gridpoint norms are in the order of numerical noise, like shown in the next 2 figures.

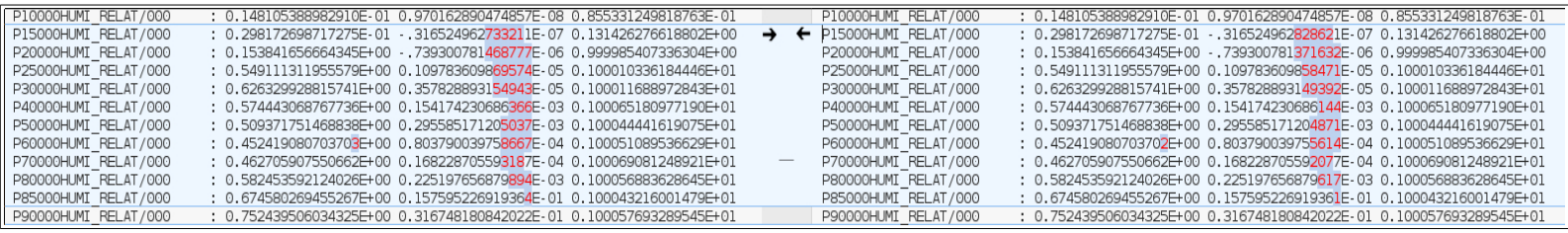
AHFE "ope2" :



P20000HUMI_RELAT/FRANX01 : 0.133069114817768E+00 0.000000000000000E+00 0.999716756206029E+00	P20000HUMI_RELAT/FRANX01 : 0.133069114817768E+00 0.000000000000000E+00 0.999716756206029E+00
P25000HUMI_RELAT/FRANX01 : 0.568197061478142E+00 0.000000000000000E+00 0.100000000000000E+01	P25000HUMI_RELAT/FRANX01 : 0.568197061478142E+00 0.000000000000000E+00 0.100000000000000E+01
P30000HUMI_RELAT/FRANX01 : 0.652576275722328E+00 0.000000000000000E+00 0.100000000000000E+01	P30000HUMI_RELAT/FRANX01 : 0.652576275722329E+00 0.000000000000000E+00 0.100000000000000E+01
P40000HUMI_RELAT/FRANX01 : 0.580491616171720E+00 0.909880445577988E-04 0.100000000000000E+01	P40000HUMI_RELAT/FRANX01 : 0.580491616171720E+00 0.909880445576885E-04 0.100000000000000E+01
P50000HUMI_RELAT/FRANX01 : 0.508562957338660E+00 0.829700735851437E-04 0.100000000000000E+01	P50000HUMI_RELAT/FRANX01 : 0.508562957338660E+00 0.829700735853208E-04 0.100000000000000E+01
P60000HUMI_RELAT/FRANX01 : 0.466675435595759E+00 0.000000000000000E+00 0.100000000000000E+01	P60000HUMI_RELAT/FRANX01 : 0.466675435595758E+00 0.000000000000000E+00 0.100000000000000E+01
P70000HUMI_RELAT/FRANX01 : 0.490911943342176E+00 0.255161149688031E-05 0.100000000000000E+01	P70000HUMI_RELAT/FRANX01 : 0.490911943342176E+00 0.255161149674921E-05 0.100000000000000E+01
P80000HUMI_RELAT/FRANX01 : 0.591017222410400E+00 0.222740741114087E-03 0.100000000000000E+01	P80000HUMI_RELAT/FRANX01 : 0.591017222410400E+00 0.222740741113836E-03 0.100000000000000E+01
P85000HUMI_RELAT/FRANX01 : 0.683462673722505E+00 0.150479105151046E-01 0.100000000000000E+01	P85000HUMI_RELAT/FRANX01 : 0.683462673722506E+00 0.150479105151042E-01 0.100000000000000E+01
P90000HUMI_RELAT/FRANX01 : 0.767546998383334E+00 0.651477035795916E-01 0.100000000000000E+01	P90000HUMI_RELAT/FRANX01 : 0.767546998383334E+00 0.651477035795919E-01 0.100000000000000E+01
P92500HUMI_RELAT/FRANX01 : 0.802196742095147E+00 0.121015428055288E+00 0.100000000000000E+01	P92500HUMI_RELAT/FRANX01 : 0.802196742095147E+00 0.121015428055288E+00 0.100000000000000E+01

Fig.3: Gridpoint norms comparison for the test AHFE "ope2" : between the cy43_main.01(left) and cy43t1.02 (right)

AHFE "opex" :



P10000HUMI_RELAT/000 : 0.148105388982910E-01 0.970162890474857E-08 0.855331249818763E-01	P10000HUMI_RELAT/000 : 0.148105388982910E-01 0.970162890474857E-08 0.855331249818763E-01
P15000HUMI_RELAT/000 : 0.298172698717275E-01 -.316524962733211E-07 0.131426276618802E+00	P15000HUMI_RELAT/000 : 0.298172698717275E-01 -.316524962826821E-07 0.131426276618802E+00
P20000HUMI_RELAT/000 : 0.153841656664345E+00 -.739300781468777E-06 0.999985407336304E+00	P20000HUMI_RELAT/000 : 0.153841656664345E+00 -.739300781371632E-06 0.999985407336304E+00
P25000HUMI_RELAT/000 : 0.549111311955579E+00 0.109783609869574E-05 0.100010336184446E+01	P25000HUMI_RELAT/000 : 0.549111311955579E+00 0.109783609858471E-05 0.100010336184446E+01
P30000HUMI_RELAT/000 : 0.626329928815741E+00 0.357828893154943E-05 0.100011688972843E+01	P30000HUMI_RELAT/000 : 0.626329928815741E+00 0.357828893149392E-05 0.100011688972843E+01
P40000HUMI_RELAT/000 : 0.574443068767736E+00 0.154174230686366E-03 0.100065180977190E+01	P40000HUMI_RELAT/000 : 0.574443068767736E+00 0.154174230686144E-03 0.100065180977190E+01
P50000HUMI_RELAT/000 : 0.509371751468838E+00 0.295585171205037E-03 0.100044441619075E+01	P50000HUMI_RELAT/000 : 0.509371751468838E+00 0.295585171204871E-03 0.100044441619075E+01
P60000HUMI_RELAT/000 : 0.452419080703703E+00 0.803790039758667E-04 0.100051089536629E+01	P60000HUMI_RELAT/000 : 0.452419080703702E+00 0.803790039755614E-04 0.100051089536629E+01
P70000HUMI_RELAT/000 : 0.462705907550662E+00 0.168228705593187E-04 0.100069081248921E+01	P70000HUMI_RELAT/000 : 0.462705907550662E+00 0.168228705592077E-04 0.100069081248921E+01
P80000HUMI_RELAT/000 : 0.582453592124026E+00 0.225197656879894E-03 0.100056883628645E+01	P80000HUMI_RELAT/000 : 0.582453592124026E+00 0.225197656879617E-03 0.100056883628645E+01
P85000HUMI_RELAT/000 : 0.674580269455267E+00 0.157595226919364E-01 0.100043216001479E+01	P85000HUMI_RELAT/000 : 0.674580269455267E+00 0.157595226919361E-01 0.100043216001479E+01
P90000HUMI_RELAT/000 : 0.752439506034325E+00 0.316748180842022E-01 0.100057693289545E+01	P90000HUMI_RELAT/000 : 0.752439506034325E+00 0.316748180842022E-01 0.100057693289545E+01

Fig.4: Gridpoint norms comparison for the test AHFE "opex" : between the cy43_main.01(left) and cy43t1.02 (right)

*** OAHUT000** - Hydrostatic 1D model with SL2TL advection scheme, ALADIN physics.

- Range 3h, Δt=240. s.
- Domain and resolution: 1D column, L79.
- Initial file: FILE1D_ARMCU_L79_ALD.

*** OARUT001** - Hydrostatic 1D model with SL2TL advection scheme, AROME physics.

- Range 3h, Δt=240. s.
- Domain and resolution: 1D column, L79.
- Initial file: FILE1D_ARMCU_L79_ARO.
- Additional file for SURFEX: FILE1D_PREPSURF_IDEALFLUX_1997.fa.

The first test returned the next error, and was resolved by removing NFRISP et N1ISP from the namelist and more generally any other variable "*ISP*" should be deleted, as well as LMOVPH.

forrtl: severe (19): invalid reference to variable in NAMELIST input

fort.4, line 95, position 10

The next 2 bugs were :

ABORT! 1 SUSPECA_FIXUP: THIS IS APPARENTLY Ps, NOT LN(Ps) !

The abort occurred in the following program chain :
suspeca_fixup() at suspeca_fixup.F90:84
suspeca() at suspeca.F90:208
suspec() at suspec.F90:167
sueinif() at sueinif.F90:149
elsac_IP_elsac_slow_() at elsac.F90:179
elsac() at elsac.F90:103
cnt3_lam() at cnt3_lam.F90:59
cnt3() at cnt3.F90:144
cnt2() at cnt2.F90:113

cnt1() at cnt1.F90:126
cnt0() at cnt0.F90:166
master() at master.F90:146

ABORT! 1 RDFA2GP: FIELD IS MISSING :S001FORC0001

The first because the new cycle no longer supports files that contain Ps instead of Ln (Ps), the second due to the numbers included in the fields names passed to 4 digits instead of 3, so we had to change the startup files for these experiences. (work done by Yves BOUTELOUP).

The comparison of the spectral norms shown highest differences after the 8th digit, differences being seen from time step 17 for the GPNORM TKE, and from time step 16 for the GPNORM SRC.

GPNORM RAIN	AVERAGE	MINIMUM	MAXIMUM		GPNORM RAIN	AVERAGE	MINIMUM	MAXIMUM
AVE	-.441994144892376-252	-.872938436162443-251	0.000000000000000E+00		AVE	-.441994144892376-252	-.872938436162443-251	0.000000000000000E+00
GPNORM TKE	AVERAGE	MINIMUM	MAXIMUM		GPNORM TKE	AVERAGE	MINIMUM	MAXIMUM
AVE	0.881887990813902E-01	0.999999999999989E-06	0.369425110482999E+00	→ ←	AVE	0.881887990814005E-01	0.999999999999989E-06	0.369425110483032E+00
GPNORM CLOUD_FRACTI	AVERAGE	MINIMUM	MAXIMUM		GPNORM CLOUD_FRACTI	AVERAGE	MINIMUM	MAXIMUM
AVE	0.235427119330142E-01	0.240000000000000E-10	0.257874307689776E+00		AVE	0.235427119330142E-01	0.240000000000000E-10	0.257874307689776E+00
GPNORM CV_PREC_FLUX	AVERAGE	MINIMUM	MAXIMUM		GPNORM CV_PREC_FLUX	AVERAGE	MINIMUM	MAXIMUM
AVE	0.000000000000000E+00	0.000000000000000E+00	0.000000000000000E+00		AVE	0.000000000000000E+00	0.000000000000000E+00	0.000000000000000E+00
GPNORM CVGQ	AVERAGE	MINIMUM	MAXIMUM		GPNORM CVGQ	AVERAGE	MINIMUM	MAXIMUM
AVE	0.119685766868414E-04	-.481802573028961E-07	0.707870592051695E-04	→ ←	AVE	0.119685766868396E-04	-.481802573028961E-07	0.707870592051574E-04
GPNORM RAD_LIQUID_WATER	AVERAGE	MINIMUM	MAXIMUM		GPNORM RAD_LIQUID_WATER	AVERAGE	MINIMUM	MAXIMUM
AVE	0.670287416871716E-06	0.000000000000000E+00	0.878765258820255E-05		AVE	0.670287416871716E-06	0.000000000000000E+00	0.878765258820255E-05

Fig.5: Spectral norms comparison for the test AHUT : between the cy43_main.01(left) and cy43t1.02 (right)

GPNORM GRAUPEL	AVERAGE	MINIMUM	MAXIMUM		GPNORM GRAUPEL	AVERAGE	MINIMUM	MAXIMUM
AVE	0.000000000000000E+00	0.000000000000000E+00	0.000000000000000E+00		AVE	0.000000000000000E+00	0.000000000000000E+00	0.000000000000000E+00
GPNORM TKE	AVERAGE	MINIMUM	MAXIMUM		GPNORM TKE	AVERAGE	MINIMUM	MAXIMUM
AVE	0.642112745024588E-01	0.100000000000000E-05	0.443913195317661E+00	→ ←	AVE	0.642112732530903E-01	0.100000000000000E-05	0.443913192492604E+00
GPNORM CLOUD_FRACTI	AVERAGE	MINIMUM	MAXIMUM		GPNORM CLOUD_FRACTI	AVERAGE	MINIMUM	MAXIMUM
AVE	0.000000000000000E+00	0.000000000000000E+00	0.000000000000000E+00		AVE	0.000000000000000E+00	0.000000000000000E+00	0.000000000000000E+00
GPNORM SRC	AVERAGE	MINIMUM	MAXIMUM		GPNORM SRC	AVERAGE	MINIMUM	MAXIMUM
AVE	0.346786706442978E-05	0.985699542980651E-10	0.228969610794276E-04	→ ←	AVE	0.346786697112765E-05	0.985699542980651E-10	0.228969591754974E-04
GPNORM RAD_LIQUID_WATER	AVERAGE	MINIMUM	MAXIMUM		GPNORM RAD_LIQUID_WATER	AVERAGE	MINIMUM	MAXIMUM
AVE	0.000000000000000E+00	0.000000000000000E+00	0.000000000000000E+00		AVE	0.000000000000000E+00	0.000000000000000E+00	0.000000000000000E+00

Fig.6: Spectral norms comparison for the test ARUT : between the cy43_main.01(left) and cy43t1.02 (right)

AVE TKE (test ARUT) at the end is : (which seems to be ok)
cy43_main.01 : 0.7172342805973 78E-01
cy43t1.02 : 0.7172342805555 48E-01

For the AHUT test we have almost a Bit-for-bit reproducibility of the spectral norms, for ARUT test the differences between cy43_main.01 and cy43t1.02 are in the order of numerical noise, which is confirmed by the 2 next figures.

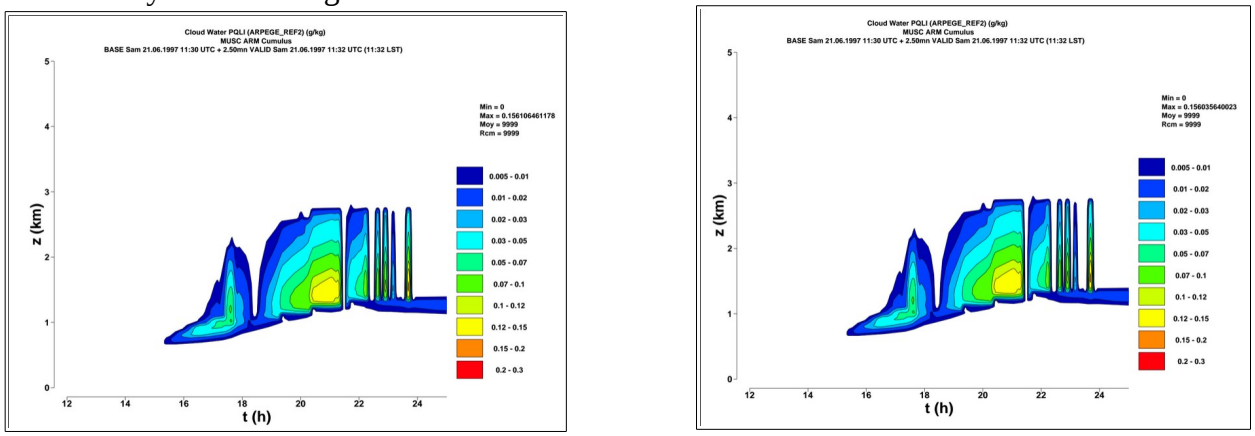


Fig.7: Cloud water PQLI (g/kg) for the test AHUT cy43_main.01(left) and cy43t1.02 (right)

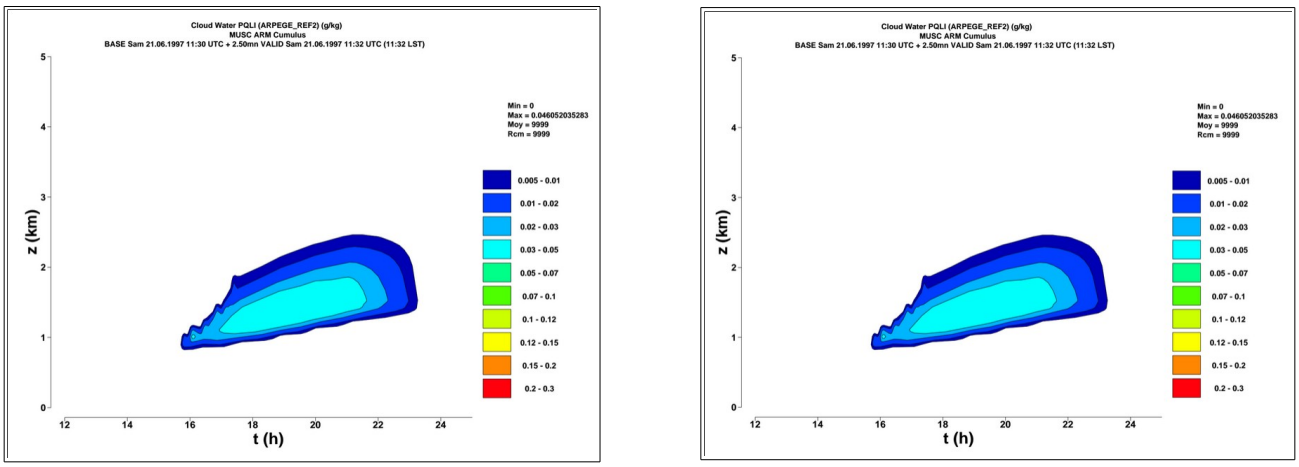


Fig.8: Cloud water PQLI (g/kg) for the test ARUT cy43_main.01(left) and cy43t1.02 (right)

N.B

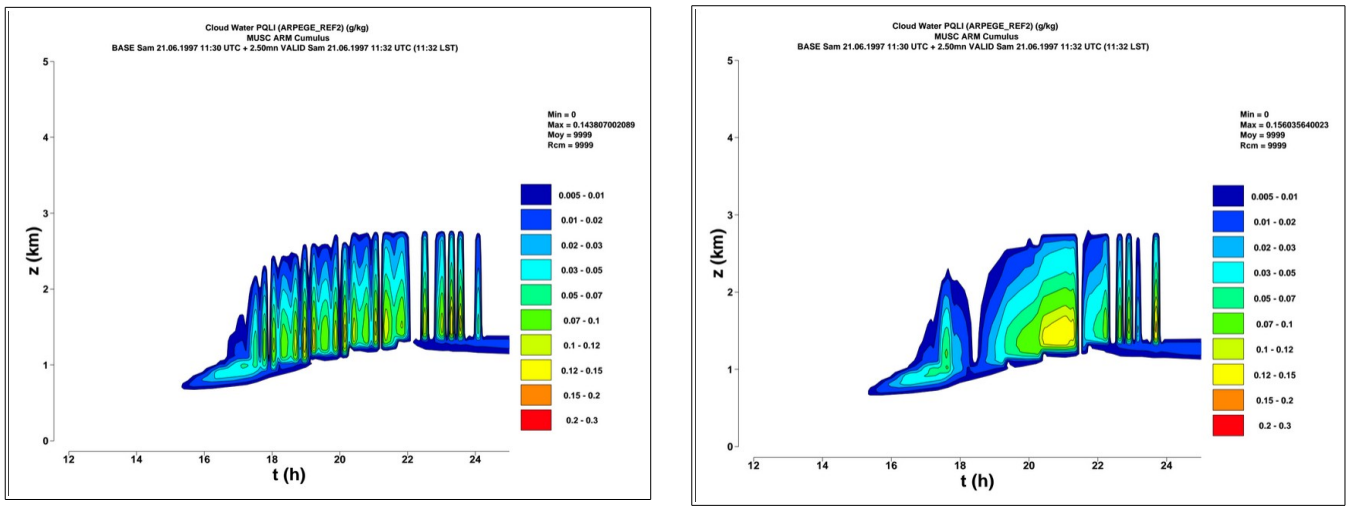


Fig.9: Cloud water PQLI (g/kg) for the test ARUT cy41t1_op1(left) and cy43t1.02 (right)

Like shown in the above figure, we notice some differences between cy41t1 and cy43t1 for the 1D model, and according to Yves BOUTELOUP, this is without doubt due to physics settings, and for him the obtained results validate the cy43_t1 in regards to the 1D model.

*** OAHME008** - Hydrostatic FULLPOS test "lamars"

I noticed the next warning in the listing of this job

WARNING : Const.Clim.sfx SHOULD BE RENAMED const.clim.sfx.FRANGP

If we did this rename the run abort, keeping the same name makes the run go forward.

The first error is :

forrtl: severe (174): SIGSEGV, segmentation fault occurred

The abort occurred in the following program chain :

```
ALDEXE        000000000A14CD2D  read_covers_param       116  read_covers_param.F90
ALDEXE        000000000A0C9336  ini_data_cover_         963  ini_data_cover.F90
ALDEXE        000000000950EE88  init_surf_atm_n_        395  init_surf_atmn.F90
ALDEXE        00000000036D06E7  init_pgd_surf_atm        75  init_pgd_surf_atm.F90
ALDEXE        00000000036BBE75  ini_prep_surfex_a        88  ini_prep_surfex_aroc.F90
ALDEXE        00000000094C171D  fp2sx1_                 223  fp2sx1.F90
ALDEXE        000000000071FB38  gridfpos_               364  gridfpos.F90
```

```
ALDEXE          00000000093B7B8C  cnt4_              924  cnt4.F90
ALDEXE          0000000000668AE6  cnt3_              152  cnt3.F90
ALDEXE          0000000000668867  cnt2_              109  cnt2.F90
ALDEXE          0000000000668590  cnt1_              125  cnt1.F90
ALDEXE          00000000005C65C3  cnt0_              166  cnt0.F90
ALDEXE          00000000005C5BEC  MAIN__                139  master.F90
```

In the default mitraillete AHME test we have :

MPI_TASKS=1 , OMP_NUM_THREADS=40.

OMP_STACKSIZE=1G, KMP_STACKSIZE=1G, KMP_MONITOR_STACKSIZE=1G.

With these values of stacksize the job abort even with MPI_TASKS=2 , OMP_NUM_THREADS=20 or MPI_TASKS=4 , OMP_NUM_THREADS=10.

Fixed by making :

OMP_STACKSIZE=2G, KMP_STACKSIZE=2G, KMP_MONITOR_STACKSIZE=2G.We have 2 version of surfex 7.3 : the one used for the moment (mai 2016) in default mitraillete tests , and the 2nd one is in the next path :

/home/gmap/mrpm/seity/ECOCLIMAP/7.3/ecoclimap7.3.tgz
for this test OAHME008, the spectral norms for cy43_main with the 2 above surfex versions are the same except :
SFX.TS_WATER /FRANGP :

OAHME008 cy43_main	AVERAGE	MINIMUM	MAXIMUM
surfex7.3_v1	0.279103315681220E+03	0.264938187133302E+03	0.294710756941250E+03
surfex7.3_v2	0.279659899752015E+03	0.264938187133302E+03	0.295824958206380E+03

The next AHME tests for cy43_main+surfex_7.3 are performed with surfex7.3_v2.

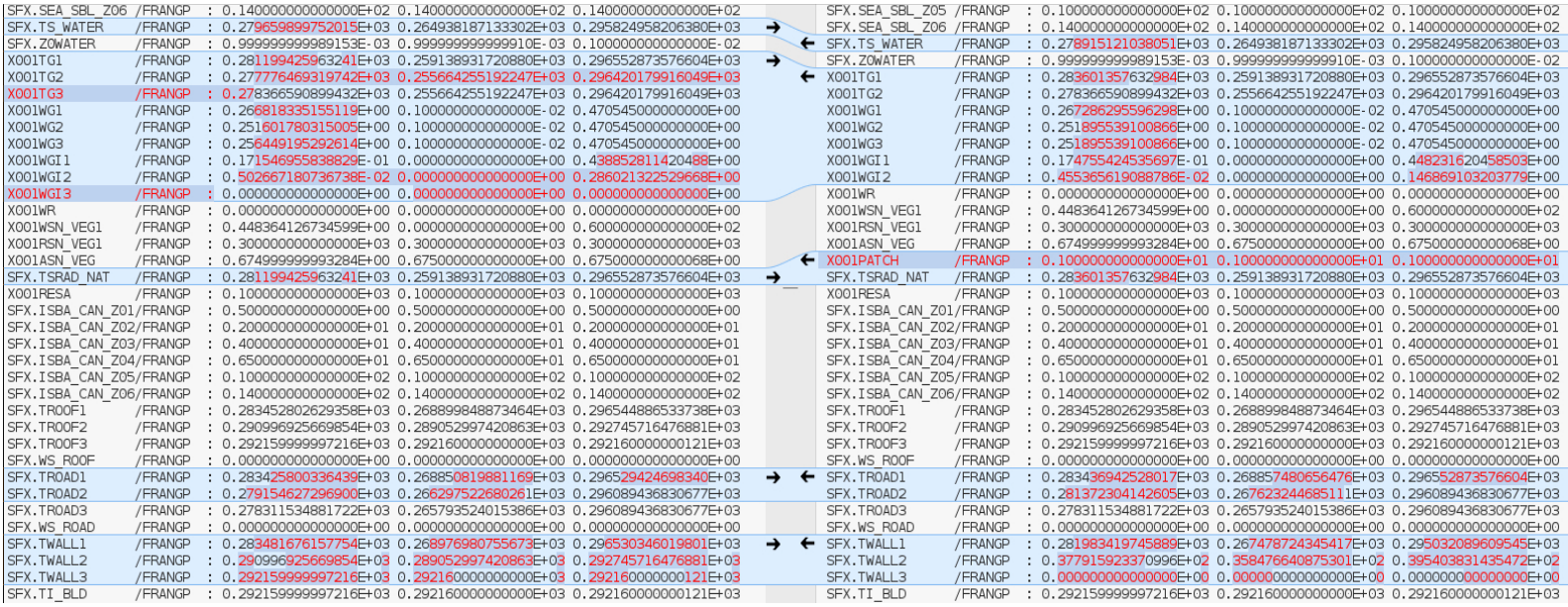


Fig.10: Spectral norms comparison for the test AHME008 : between the cy43_main.01+surfex_7.3 and cy43_main.01+surfex_8 (right)

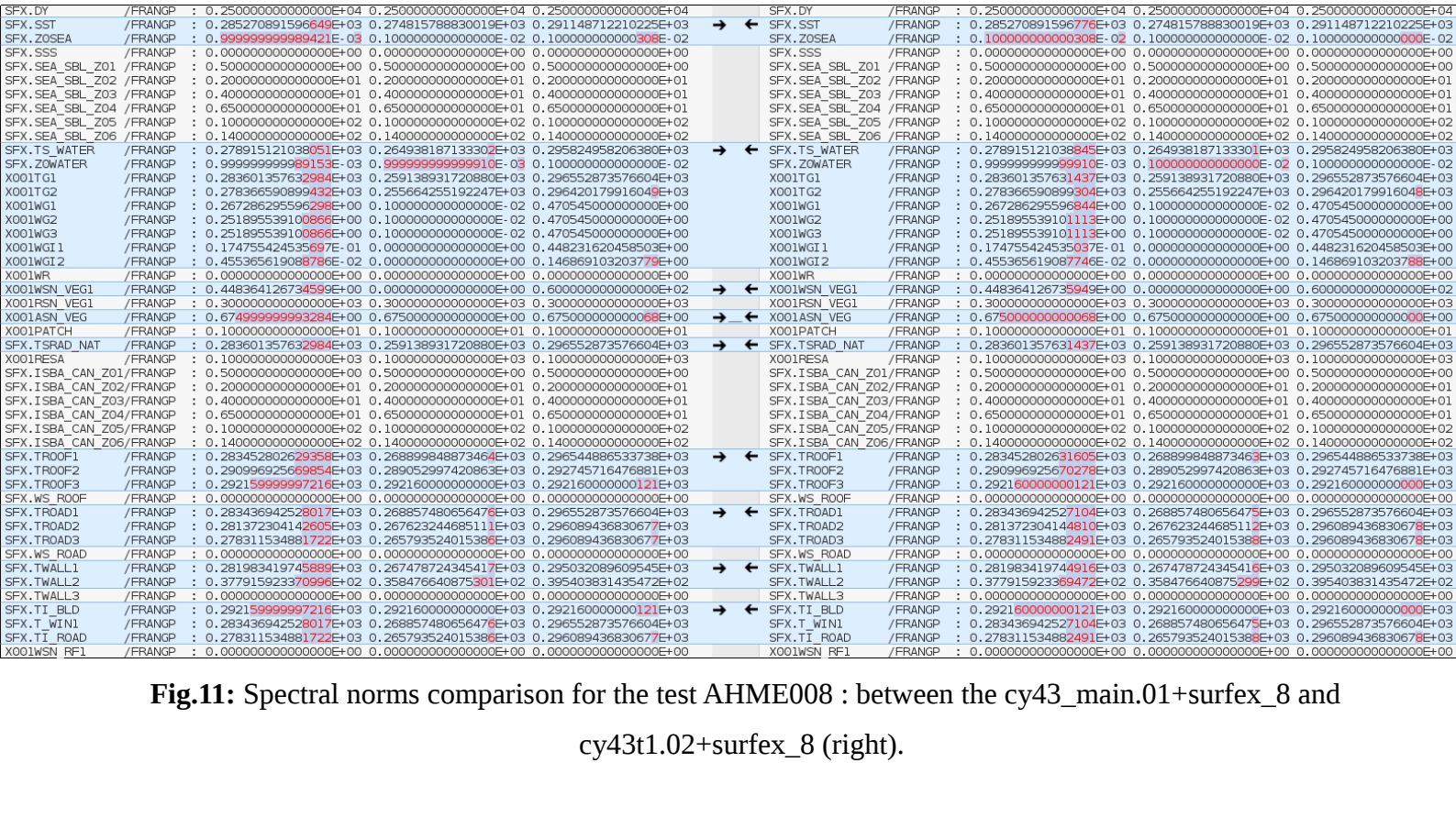


Fig.11: Spectral norms comparison for the test AHME008 : between the cy43_main.01+surfex_8 and cy43t1.02+surfex_8 (right).

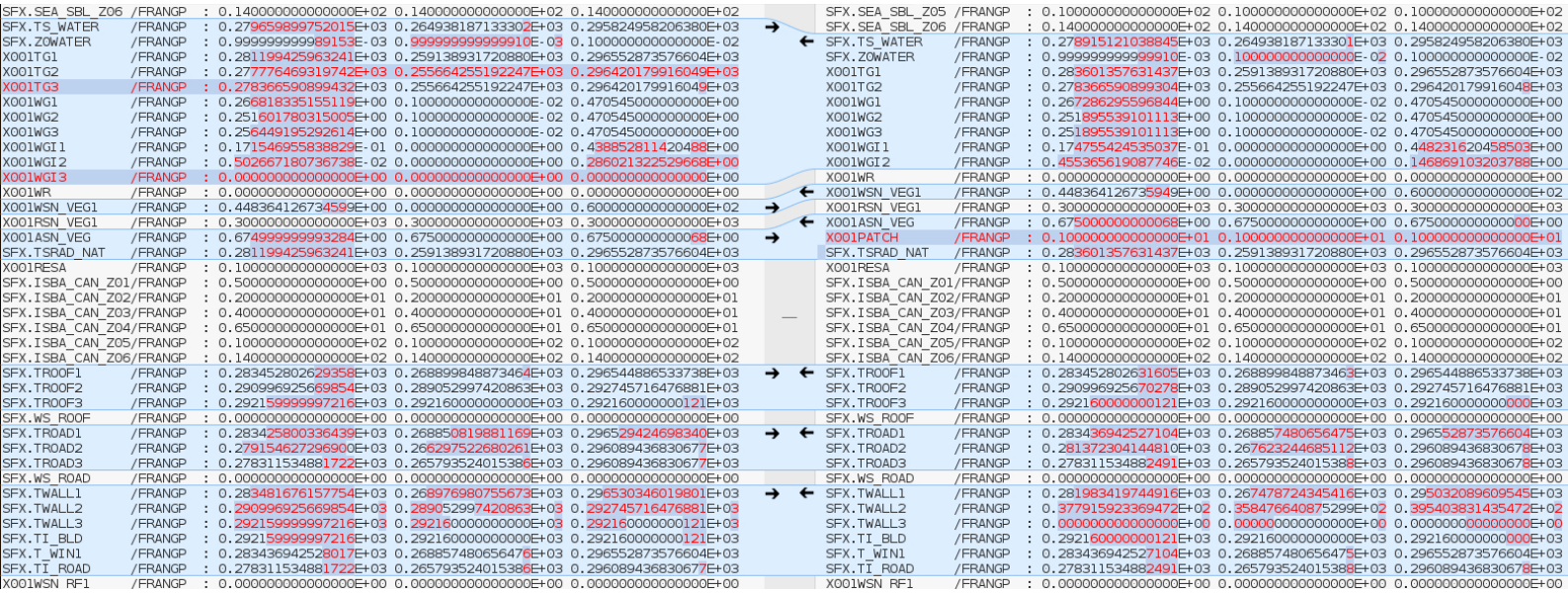


Fig.12: Spectral norms comparison for the test AHME008 : between the cy43_main.01+surfex_7.3 and cy43t1.02+surfex_8 (right).

The differences in spectral norms seems to be related to a bug in surfex 8, for example :

SFX.TWALL3 /FRANGP

cy43main+surfex_v7.3:	0.292159999997216E+03	0.292160000000000E+03	0.292160000000121E+03
cy43main+surfex_v8:	0.000000000000000E+00	0.000000000000000E+00	0.000000000000000E+00
cy43t1.v02 + surfex v8 :	0.000000000000000E+00	0.000000000000000E+00	0.000000000000000E+00

According to Yann Seity, this could be related to the PGD file used with surfex 8.

IV. dd2met : tool to plot the fields of the 1D model

In this paragraph I explain how to install the dd2met tool and how to plot the fields of the 1Dmodel.

– The run of the 1D model produces files of the form : Out.xxx.xxxx.lfa

– If you are running AHUT or ARUT mitraillete tests and these files are not produced, then you have just to put LMUSCLFA = .TRUE. in NAMLSFORC.

&NAMLSFORC	**&NAMLSFORC**
LMUSCLFA=.FALSE.,	**LMUSCLFA=.TRUE.,**

– Verify that you have the executable mevol « type mevol », if not then you have to install the ddhtoolbox.

– Get the dd2met from /public/proc/boutelou/dd2met.tar.gz

or via firefox http://webdav.cnrm.meteo.fr/public/proc/boutelou/

If you have a metview 4 or more recent version then download dd2met_20141015.tar.gz, because the routine curveview is no more supported, it's replaced by cview.

– Unzip this archive in a directory (eg "dd2met"!)

– In the .bash_profile add the path to dd2met in your PATH :

"export PATH=$PATH:/home/path_to_dd2met", then the variable DD2MET_ HOME :

"export DD2MET_HOME=/home/path_to_dd2met".

The next paragraph explain how to plot the field PQLI

– If it's good, then do "mevol -c1000 PQLI Out.* This will generate 2 files "PQLI.tmp.evol" and PQLI.tmp.doc, the .doc file should look like :

```
#FORMAT=XYV
#0PF
#INTERPOLE=200 150
#METHODE_EXTRAPOLATION=Y_PUIS_X
#LEGENDE_Y=z (km)
#Y_MAX_LIMIT=15.
#LEGENDE_X=t (h)
#TITRE=PQLI
#FICHIER=PQLI.tmp.evol
#UNITE=
#DATE=BASE Sam 21.06.1997 11:00 UTC + 2mn VALID Sam 21.06.1997 11:02 UTC (11:02 LST)
#ORIGINE=AHUT
```

– Replace it with this, for the figure to be more readable

```
#FORMAT=XYV
#LEGENDE_Y=z (km)
#Y_MAX_LIMIT=5.
#LEGENDE_X=t (h)
#TITRE=Cloud Water PQLI (ARPEGE_REF2)
#FICHIER=PQLI.tmp.evol
#UNITE=g/kg
#DATE=BASE Sam 21.06.1997 11:30 UTC + 2.50mn VALID Sam 21.06.1997 11:32 UTC (11:32 LST)
#ORIGINE=MUSC ARM Cumulus
#ISO=0.005=0.000=0.000=0.706
#ISO=0.01=0.000=0.239=1.000
#ISO=0.02=0.000=0.714=1.000
#ISO=0.03=0.000=1.000=0.984
#ISO=0.05=0.000=1.000=0.537
#ISO=0.07=0.306=1.000=0.000
#ISO=0.1=0.796=1.000=0.000
#ISO=0.12=0.988=1.000=0.000
#ISO=0.15=1.000=0.525=0.000
#ISO=0.2=1.000=0.000=0.047
#ISO=0.3000000=1.000=0.000=0.510
```

– Type dd2met fic.doc or dd2met -noplot fic.doc <== In the latter case a .ps file is generated but it is not drawn.

– For the mitraillete test if the obtained figure is blank(you don't see cloud), then probably you have a simulation only of 2 hours instead of 15h, you have to modify the namelist NAMARG like this :

```
&NAMARG                          &NAMARG
  CUSTOP='t45',                    CUSTOP='h15',
```

V. APPENDIX

This is the status of validation cy43t1.02. (the crashing part) as reported by Oldřich Španiel.

EXECUTION

mono

* **OAHUT000** - Hydrostatic 1D model with SL2TL advection scheme, ALADIN physics.

* **OARUT001** - Hydrostatic 1D model with SL2TL advection scheme, AROME physics.

cy43_main - ok

cy43t1.01 - RDFA2GP: FIELD IS MISSING :S001FORC0001

cy43t1.02 - SUSPECA_FIXUP: THIS IS APPARENTLY Ps, NOT LN(Ps) ! **FIXED**

* **OAHME008** - Hydrostatic FULLPOS test "lamars"

run only if OMP_STACKSIZE=2G, KMP_STACKSIZE=2G, KMP_MONITOR_STACKSIZE=2G (SIGSEGV !)

and SURFEX v8.0 (ecoclimapI_covers_param.bin, ecoclimapII_af_covers_param.bin, ecoclimapII_eu_covers_param.bin)

* **OAXCX009** - Conf 923; domain=lelam_lace

run only if OMP_STACKSIZE=4G, KMP_STACKSIZE=4G, KMP_MONITOR_STACKSIZE=4G (SIGSEGV !)

multi

all ecoclimfiles have to be change to SURFEX v8.0

* **OAHFE049** - Conf 001HYD FPOS OPE2; LELAM=T; CFPFMT=LALON; OFF-LINE; dm32; 16 nd; 12 td;

cy43_main - ok

cy43t1.01 - ABORT! 15 RDFA2GP: FIELD IS MISSING :CLPVEIND.MOD.XFU

cy43t1.02 - ABORT! 15 RDFA2GP: FIELD IS MISSING :CLPVEIND.MOD.XFU **FIXED**

* **OAHFE050** - Conf 001HYD FPOS OPEX; LELAM=T; CFPFMT=LELAM; C+I; OFF-LINE; dm32; 16 nd; 12 td;

cy43_main - ok

cy43t1.01 - ABORT! 15 RDFA2GP: FIELD IS MISSING :CLPVEIND.MOD.XFU

cy43t1.02 - ABORT! 15 RDFA2GP: FIELD IS MISSING :CLPVEIND.MOD.XFU **FIXED**

* **OAA1T054** - Conf 001HYD sl2tl (cf. ALARO); DFI; dm32; 16 nd; 12 td;

cy43t1.01 - crashed

cy43t1.02 - ok (Luc fix)

* **OAR1T058, OAR1T059, OAR1T060, OAR1T061**

Conf 001 sl2tl (cf. AROME); no DFI; CheapPCiter; NH d4; Nesc; GWadv; nd4sys=2; dm32; 16 nd; 12 td;

Conf 001 sl2tl (cf. AROME); no DFI; FullPCiter; NH d4; Nesc; GWadv; nd4sys=2; dm32; 16 nd; 12 td;
Conf 001 sl2tl (cf. AROME); no DFI; NoPCiter; hydrostatic; Settls; COMAD; dm32; 16 nd; 12 td;
Conf 001 sl2tl (cf. AROME); no DFI; NoPCiter; hydrostatic; Settls; dm32; 16 nd; 12 td;
cy43t1.01 - crashed
cy43t1.02 - ok

* **OAR1T062** - Conf 001 sl2tl (cf. AROME); no DFI; CheapPCiter; NH d4; Nesc; GWadv; nd4sys=2; COMAD; io_server; dm32; 16 nd; 12 td;
cy43t1.01 - crashed, even if NFPOS=0
cy43t1.02 - segmentation fault occurred - 122 extfpselect_mod.F90
- ok only if NFPOS=0

VALIDATION

Due to different versions of the SURFEX (cy43_main - v7.3, cy43t1 - v8.0) validation should be done in following steps.

1) cy43_main+SURFEX v7.3 / cy43_main+SURFEX v8.0

beaufix:/home/gmap/mrpe/spaniel/pack/cy43_main.01/bin/MASTERODB

beaufix:/home/gmap/mrpm/seity/pack/v8rev3681@cy43_main.01/bin/MASTERODB

difference between SURFEX v7.3 and v8.0

2) cy43_main+SURFEX v8.0 / cy43t1+SURFEX v8.0

beaufix:/home/gmap/mrpm/seity/pack/v8rev3681@cy43_main.01/bin/MASTERODB

beaufix:/home/gmap/mrpe/spaniel/pack/cy43t1.02/bin/MASTERODB
difference between cy43_main and cy43t1.02, with SURFEX v8.0

3) cy43_main+SURFEX v7.3 / cy43t1+SURFEX v8.0

beaufix:/home/gmap/mrpe/spaniel/pack/cy43_main.01/bin/MASTERODB

beaufix:/home/gmap/mrpe/spaniel/pack/cy43t1.02/bin/MASTERODB
finall difference between cy43_main and cy43t1.02

1)		2)		3)	
OAH4T014	4decim	OAH4T014	2decim	OAH4T014	2decim
OAH4T015	3decim	OAH4T015	3decim	OAH4T015	3decim
OAH6T017	3decim	OAH6T017	3decim	OAH6T017	3decim
OAH6T018	3decim	OAH6T018	3decim	OAH6T018	3decim
OAHFE049	abort				

```
OAHFE050  abort     |                     |
OAHFE051 16decim    |  OAHFE051  4decim   | OAHFE051
4decim
OAGIT052 16decim    |  OAGIT052  2decim   | OAGIT052  2decim
OAG1T053  0decim    |  OAG1T053  0decim   | OAG1T053  0decim
OAC1T055 16decim    |  OAC1T055  2decim   | OAC1T055
2decim
OAC1U056 16decim    |  OAC1U056  0decim   | OAC1U056
0decim
OAR1T057  0decim    |  OAR1T057  0decim   | OAR1T057  0decim
OAR1T058  0decim    |  OAR1T058  0decim   | OAR1T058  0decim
OAR1T059  0decim    |  OAR1T059  1decim   | OAR1T059  0decim
OAR1T060  2decim    |  OAR1T060  2decim   | OAR1T060
2decim
OAR1T061  2decim    |  OAR1T061  2decim   | OAR1T061  2decim
OAR1T062  0decim    |  OAR1T062  0decim   | OAR1T062  0decim
```

Remark: If configuration is not presented on the list above, the NORMS are same to 16 decim.

PATH to results:
beaufix:/home/gmap/mrpe/spaniel/mitraille/cy43
mitraille_0085 - cy43_main + surfex 7.3 - mono
mitraille_0086 - cy43_main + surfex 7.3 - multi
mitraille_0087 - /home/gmap/mrpm/seity/pack/v8rev3681@cy43_main.01/bin/MASTERODB + surfex 8 - mono
mitraille_0088 - /home/gmap/mrpm/seity/pack/v8rev3681@cy43_main.01/bin/MASTERODB + surfex 8 - multi
beaufix:/home/gmap/mrpe/spaniel/mitraille/cy43t1
mitraille_0091 - cy43t1.02 - surfex 8 - mono
mitraille_0093 - cy43t1.02 - surfex 8 - multi

very preliminary **CONCLUSION**

1) All configuration related fix SURFEX are significantly affected with the version change here. The huge differences has to be check in sense of meteorological field also. ALADIN/SURFEX and AROME/SURFEX produces too much different result. Some validation between SURFEX v7.3/v8.0 itself would be welcome.

2) The abort at OAHUT000, OARUT001 (mono task), OAHFE049, OAHFE050 (multi task) should be fixed.

3) AA1T (ALARO) gives identical NORMS for cy43_main/cy43t1.02

4) OAR1T062 (multi task) goes well just if FullPos inline is switched off.

5) No clear why OAH4T014/15 (Hydrostatic adiabatic E401 with SL2TL) and OAH6T017/18 are effected by SURFEX change.

6) Conf OAHME008 and OAXCX009 - if OMP_STACKSIZE=1G -> SIGSEGV. There should be helpful to check run with bound checking compilation.