

40t1 phasing report

*January 13 to February 21
MeteoFrance CNRM/GMAP*

Jalal Jair

This report is divided into three parts. We only process the job AR1T of AROME. The first part consists in minimizing the differences between the cycle 40t1 and 40main changed. The second part will deal with the options of physical /dynamic interface. In the third part we will test the v03 and v04 of the cycle 40t1.

You will find all scripts and outputs as well as the images in the beaufix account:

/home/gmap/mrpm/jairj

Part 1:

In this section we will launch JOB AR1T for cycle CY40T1 and CY40main. also we will use a hybrid cycle where we combined the binary of Yann Seity with new files ECOCLIMAP. Yann executable is a binary of CY40main where are added the new version of SURFEX 7.3.

All the Binaries are in the path : *~jairj/SAVE/executable*

	Exe	what changed ?	Version of mitraille	Numero of mitraille
CY40main	Exe of Yessad	Add extension .V082013 in the end of the name of ecoclimap file inside the Protojobs files.	Mitraille .V082013 (with command line)	0051
CY40T1	Exe of Olda	-	.V012014 (no command line)	0052
CY40mainBinyan Ecoclimap	Exe of Yann	-	.V082013	0053

Because of a problem in my environment, I had to add this line:

TMP_LOC=/scratch/utmp/jair

in *protojobs/beaufix/config*,

I have also remove the line : *#SBATCH -time job_walltime* from the files *monoheader* and *multiheader* locate in *protojobs/beaufix* since the job take much time than the limit fixed in the submitted file,

After execution we first compare the difference of norms between these three cycle.

comp_cy40t1-cy40main_120_AR1T001		comp_cy40t1-cy40mainBinyanEcoclimT1_120_AR1T001	
1	!VORTICITY : 3.106879e-07 0.000000e+00 0.000000e+00	1	!VORTICITY : 3.007239e-07 0.000000e+00 0.000000e+00
2	!DIVERGENCE : 3.304377e-07 0.000000e+00 0.000000e+00	2	!DIVERGENCE : 3.194582e-07 0.000000e+00 0.000000e+00
3	!TEMPERATURE : -6.358985e-03 0.000000e+00 0.000000e+00	3	!TEMPERATURE : -5.680124e-03 0.000000e+00 0.000000e+00
4	!KINETIC : -4.505826e-04 0.000000e+00 0.000000e+00	4	!KINETIC : -4.223573e-03 0.000000e+00 0.000000e+00
5	!GPNORM HUMID.SPECIFI 4.625337e-06 0.000000e+00 0.000000e+00	5	!GPNORM HUMID.SPECIFI 4.680134e-06 0.000000e+00 0.000000e+00
6	!GPNORM CLOUD_WATER 4.536734e-08 1.084202e-19 1.231702e-05	6	!GPNORM CLOUD_WATER 4.082724e-08 0.000000e+00 1.136949e-05
7	!GPNORM ICE_CRYSTAL -2.299224e-07 -1.355253e-20 -5.001418e-04	7	!GPNORM ICE_CRYSTAL -2.310499e-07 -1.355253e-20 -4.988534e-04
8	!GPNORM SNOW -2.222087e-07 -1.355253e-20 2.821551e-04	8	!GPNORM SNOW -2.226322e-07 0.000000e+00 2.847846e-04
9	!GPNORM RAIN 9.848522e-09 0.000000e+00 -3.119867e-05	9	!GPNORM RAIN 9.742585e-09 -5.421011e-20 -3.027163e-05
10	!GPNORM GRAUPEL -1.645713e-07 -2.710505e-20 3.357305e-04	10	!GPNORM GRAUPEL -1.650284e-07 -5.958743e-21 2.850593e-04
11	!GPNORM TKE 1.776691e-03 1.387715e-17 6.432918e+00	11	!GPNORM TKE 1.921563e-03 0.000000e+00 6.449715e+00
12	!GPNORM CLOUD_FRACTI 5.498898e-04 0.000000e+00 0.000000e+00	12	!GPNORM CLOUD_FRACTI 5.271893e-04 0.000000e+00 0.000000e+00
13	!GPNORM SRC -3.695228e-07 0.000000e+00 2.963822e-08	13	!GPNORM SRC -3.665888e-07 0.000000e+00 6.973502e-08
14	!GPNORM RAD_LIQUID_WATER 5.104622e-08 0.000000e+00 1.474537e-05	14	!GPNORM RAD_LIQUID_WATER 2.656222e-08 0.000000e+00 1.641484e-05
15	!GPNORM RAD_SOLID_WATER -2.480954e-07 0.000000e+00 -4.742702e-04	15	!GPNORM RAD_SOLID_WATER -2.419684e-07 0.000000e+00 -4.709213e-04
16	!GPNORM EZDIAG01 -3.111738e-07 0.000000e+00 4.824303e-04	16	!GPNORM EZDIAG01 -3.187710e-07 0.000000e+00 4.521447e-04
17	!GPNORM EZDIAG02 -3.509046e-04 0.000000e+00 2.212336e-01	17	!GPNORM EZDIAG02 -3.502565e-04 0.000000e+00 2.186475e-01
18	!GPNORM EZDIAG03 -1.425042e-07 0.000000e+00 2.704942e-04	18	!GPNORM EZDIAG03 -1.428492e-07 0.000000e+00 2.216784e-04
19	!SURFRESERV.NEIGE : 2.820383e-06 0.000000e+00 -2.032607e-03	19	!SURFRESERV.NEIGE : 2.692553e-06 0.000000e+00 -2.750492e-03
20	!SURFTEMPERATURE : 2.529965e-02 5.150754e-03 0.000000e+00	20	!SURFTEMPERATURE : 8.564661e-03 -1.070487e-02 0.000000e+00

SURFINSPLUIE : -5.856339e-07 0.000000e+00 -7.018945e-04
 SURFINSNEIGE : 8.261216e-10 0.000000e+00 -5.826245e-07
 SURFINSGRAUPEL : 2.975441e-10 0.000000e+00 -7.757908e-07

513 SURFINSPLUIE : -6.752664e-07 0.000000e+00 -7.001360e-04
 514 SURFINSNEIGE : 7.690585e-10 0.000000e+00 -8.446487e-08
 515 SURFINSGRAUPEL : 2.927619e-10 0.000000e+00 -7.860829e-07

CLSTEMPERATURE : 7.621161e-03 0.000000e+00 -4.331966e-04

527 CLSTEMPERATURE : 7.604524e-03 0.000000e+00 -1.988232e-04

In the left, differences of norms between cy40t1 and cy40main, in the right differences of norms between cy40t1 and cy40mainBinyanEcoclimap.

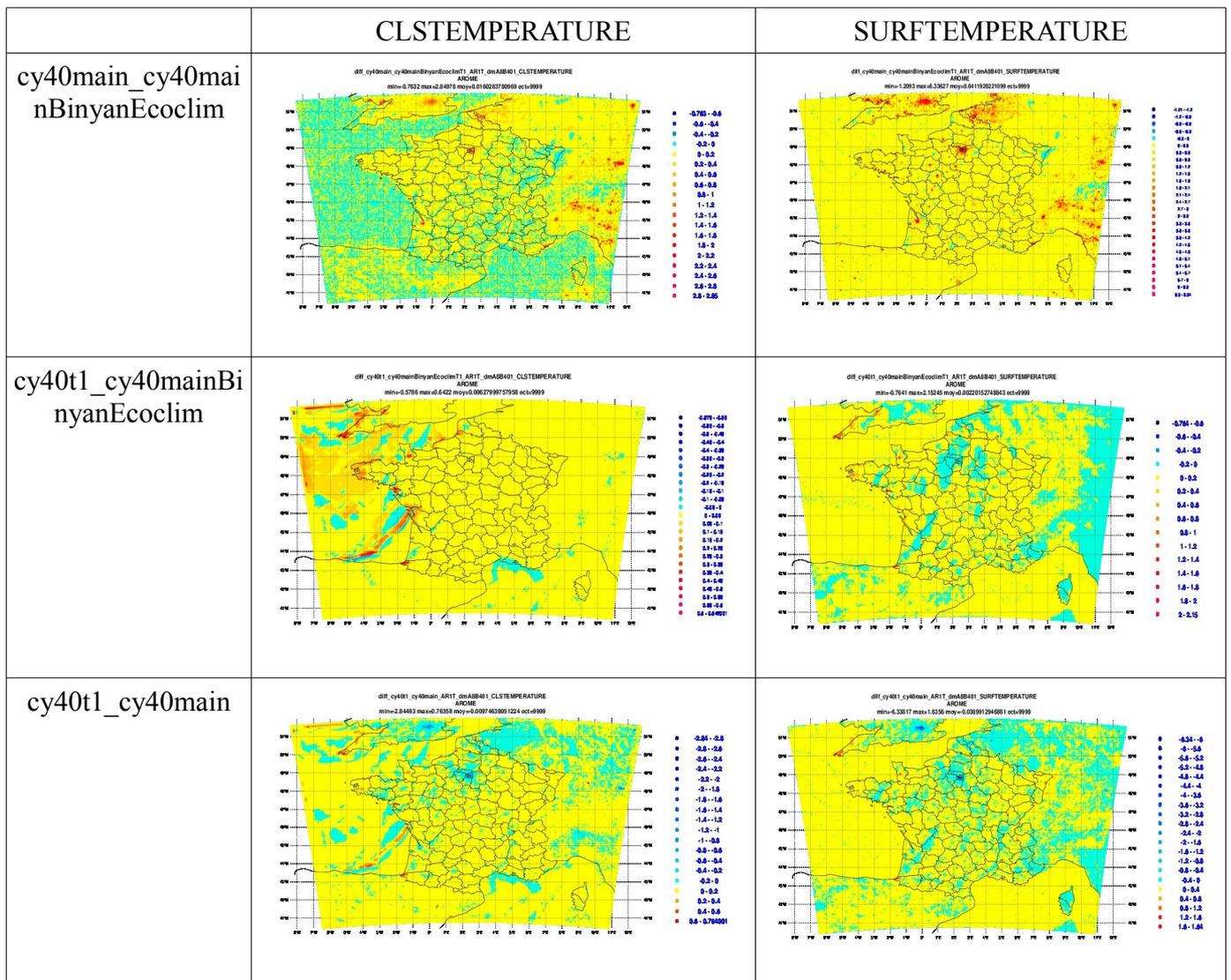
This comparison is done after calculating the differences between cy40t1-cy40main and cy40t1-cy40mainBinyanEcoclimap for tree time steps : 0, 60 and 120.

the script who made this is located in : `~jairj/mitraille/comparaison_listing/digitcomp.sh`

and the output file are in : `~jairj/mitraille/comparaison_listing/COMP/`

we found that the differences between cy40t1 and cy40mainBinyanEcoclimap are less than the differences between cy40t1 and cy40main,

we plot the difference between cy40t1-cy40mainBinyanEcoclimap and cy40t1-cy40main for the : *CLSTEMPERATURE* and *SURFTEMPERATURE*. Here is an example at time 1h. The date of model is : 2009/11/22 at 00.



The differences between cy40mainBinyanEcoclim and cy40t1 are due to some modifications in the shallow convection scheme introduced by Sébastien Riette..

The differences between cy40main and cy40mainBinyanEcoclim are due to the new version of

TEB town scheme in the new version of SURFEX.

So we will disable the shallow convection, by disabling the option LMFSHAL in namelist of AROME for two cycles cy40mainBinyanEcoclim and cy40t1.

	Exe	what changed ?	Version of mitraillette	Numero of mitraille
CY40T1_LMFSHAL_FALSE	Exe of olda	Change LMFSHAL to False in namelist	.V012014	0054
CY40mainBinyanEcoclimap_LMFSHAL_FALSE	Exe of yann	Change LMFSHAL to False in namelist	.V082013	0055

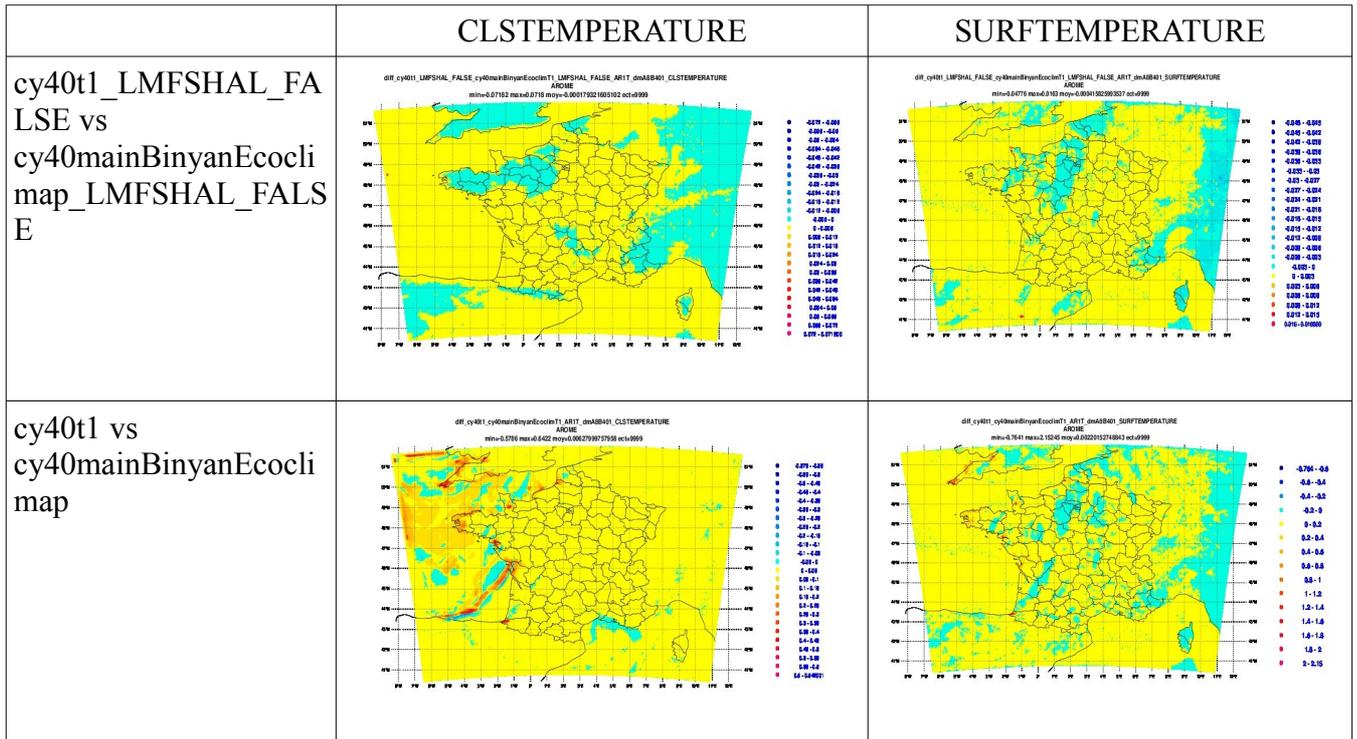
After comparing the norms, we find that CY40T1_LMFSHAL_FALSE and CY40mainBinyanEcoclimap_LMFSHAL_FALSE are closer than CY40T1 and CY40mainBinyanEcoclimap.

This is an example of comparing norms in the time 120 :

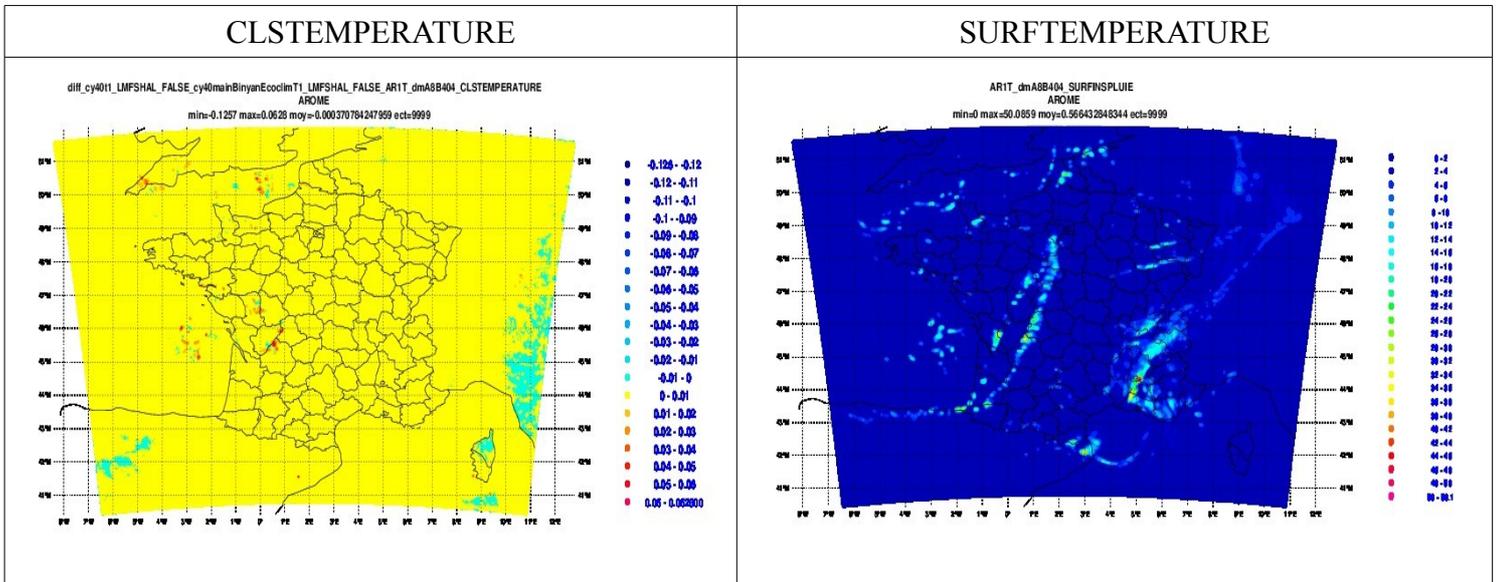
in the left differences of norms between cy40t1 and cy40mainbinyanecoclimap, in the right differences of norms between cy40t1_LMFSHAL_FALSE and cy40mainbinyanecoclimap_LMFSHAL_FALSE.

comp_cy40t1-cy40mainBinyanEcoclimT1_120_AR1T001	comp_cy40t1_LMFSHAL_FALSE-cy40mainBinyanEcoclimT1_LMFSHAL_FALSE_120_AR1T001
VORTICITY : 3.007239e-07 0.000000e+00 0.000000e+00	! VORTICITY : 1.698235e-09 0.000000e+00 0.000000e+00
DIVERGENCE : 3.194582e-07 0.000000e+00 0.000000e+00	! DIVERGENCE : 3.494656e-09 0.000000e+00 0.000000e+00
TEMPERATURE : -5.680124e-03 0.000000e+00 0.000000e+00	! TEMPERATURE : -8.808830e-05 0.000000e+00 0.000000e+00
KINETIC : -4.223573e-03 0.000000e+00 0.000000e+00	! KINETIC : 1.894961e-03 0.000000e+00 0.000000e+00
! GPNNORM HUMI.SPECIFI 4.680134e-06 0.000000e+00 0.000000e+00	! GPNNORM HUMI.SPECIFI -2.027034e-09 0.000000e+00 0.000000e+00
! GPNNORM CLOUD_WATER 4.082724e-08 0.000000e+00 1.136849e-05	! GPNNORM CLOUD_WATER -2.077448e-10 0.000000e+00 3.490232e-08
! GPNNORM ICE_CRYSTAL -2.510499e-07 -1.355253e-20 -4.988534e-04	! GPNNORM ICE_CRYSTAL -5.057487e-09 6.776264e-21 -7.461177e-07
! GPNNORM SNOW -2.226322e-07 0.000000e+00 2.847846e-04	! GPNNORM SNOW -2.259755e-09 0.000000e+00 -2.079892e-07
! GPNNORM RAIN 9.742585e-09 -5.421011e-20 3.827163e-05	! GPNNORM RAIN 4.476324e-10 -2.718505e-20 -2.227613e-08
! GPNNORM GRAUPEL -1.850294e-07 -5.958743e-21 2.850593e-04	! GPNNORM GRAUPEL 4.897122e-10 -1.084202e-19 3.229360e-07
! GPNNORM TKE 1.921563e-03 0.000000e+00 8.449715e-08	! GPNNORM TKE -1.374485e-07 0.000000e+00 2.966157e-01
! GPNNORM CLOUD_FRACTI 5.271893e-04 0.000000e+00 0.000000e+00	! GPNNORM CLOUD_FRACTI 5.239110e-05 0.000000e+00 0.000000e+00
! GPNNORM SRC -3.665528e-07 0.000000e+00 6.97502e-08	! GPNNORM SRC -6.283190e-07 0.000000e+00 7.552027e-08
! GPNNORM RAD_LIQUID_WATER 2.658222e-08 0.000000e+00 1.641484e-05	! GPNNORM RAD_LIQUID_WATER -1.946570e-10 0.000000e+00 4.320976e-08
! GPNNORM RAD_SOLID_WATER -2.419684e-07 0.000000e+00 -4.709213e-04	! GPNNORM RAD_SOLID_WATER -5.527986e-09 0.000000e+00 -1.293164e-08
! GPNNORM EZDIAG01 -3.107710e-07 0.000000e+00 4.521447e-04	! GPNNORM EZDIAG01 0.000000e+00 0.000000e+00 0.000000e+00
! GPNNORM EZDIAG02 -3.502565e-04 0.000000e+00 2.186475e-01	! GPNNORM EZDIAG02 0.000000e+00 0.000000e+00 0.000000e+00
! GPNNORM EZDIAG03 -1.428492e-07 0.000000e+00 2.216784e-04	! GPNNORM EZDIAG03 0.000000e+00 0.000000e+00 0.000000e+00
! SURFRESERV.NEIGE : 2.692533e-06 0.000000e+00 -2.758492e-03	! SURFRESERV.NEIGE : 0.521886e-07 0.000000e+00 1.745507e-04
! SURFTEMPERATURE : 8.564661e-03 -1.078487e-02 0.000000e+00	! SURFTEMPERATURE : 5.288447e-04 -1.077157e-02 0.000000e+00
! SURFINSPLUIE : -6.752664e-07 0.000000e+00 -7.001360e-04	! SURFINSPLUIE : 8.702419e-09 0.000000e+00 3.631908e-07
! SURFINSNEIGE : 7.690585e-10 0.000000e+00 -8.446407e-08	! SURFINSNEIGE : 6.534450e-11 0.000000e+00 2.887456e-08
! SURFINSGRAUPEL : 2.927619e-10 0.000000e+00 -7.860829e-07	! SURFINSGRAUPEL : 3.074359e-10 0.000000e+00 3.618463e-07
! CLSTEMPERATURE : 7.604524e-03 0.000000e+00 -1.988232e-04	! CLSTEMPERATURE : -2.797579e-04 0.000000e+00 5.649908e-06

we plot the difference between cy40t1_LMFSHAL_FALSE and cy40mainBinyanEcoclimap_LMFSHAL_FALSE. Here is an example at time 1h.



comparing cy40t1_LMFHAL_FALSE and cy40mainBinyanEcoclimap_LMFHAL_FALSE we found that they are closest with very small differences. but still some small differences that may be due to SURFINSPLUIE. since differences areas coincide with areas of rain as we see in the picture below in time 4h.



So for reducing this differences we comment a line in the Cy40t1 that don't exist in the main :

! PINPRR=PINPRR+ZINPRC which is locate in */src/local/mpa/micro/externals/aro_rain_ice.F90*

Part 2 :

In this section we will test the options provided by Daan in the new physics / dynamic interface in AROME.

We will execute two run of mitraillette :

the first we will add the LINTFLEX=.TRUE. In the &NAMINTFLEX to activate the interface in the namelist files, which are :

- nam_ar1t_e001_hyd
- nam_ar1t_e001_oper
- nam_ar1t_e001_oper_avecmeteosat

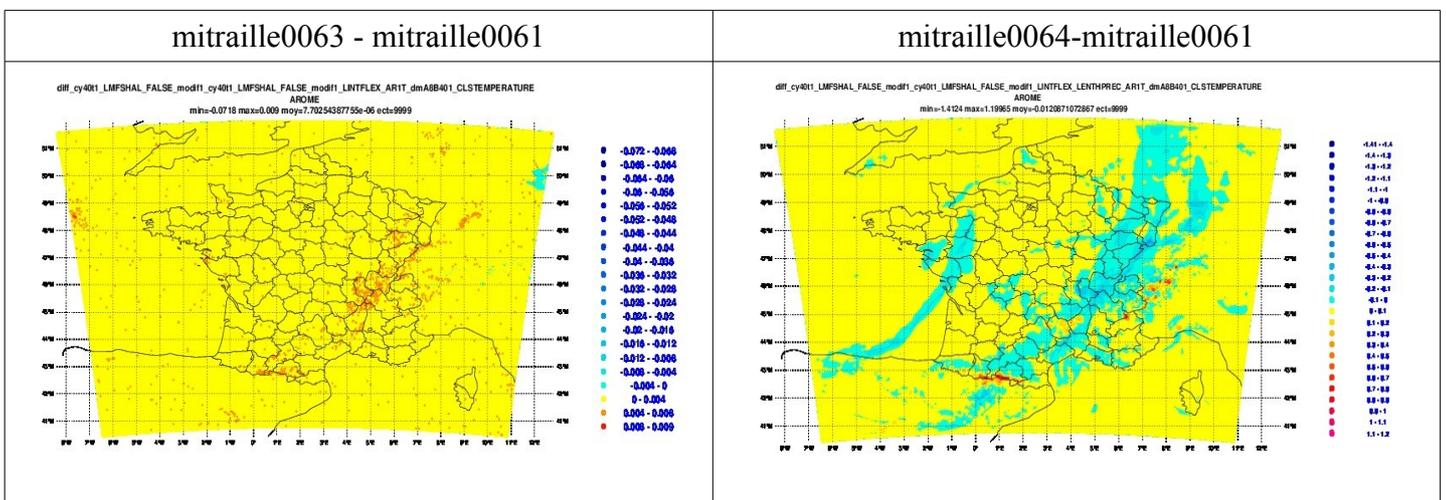
the second run will add the enthalpy transport by precipitations, LENTHPREC =. TRUE in the same namelist.

	Exe	what changed ?	Version of mitraillette	Numero of mitraille
cy40t1_v02_LMF SHAL_FALSE_m odif1_LINTFLEX _TRUE	Exe of local pack + files changed by olda pack	Commenting PINPRR + LMFSHAL=FALSE + LINTFLEX=TRUE	V012014	0063
cy40t1_v02_LMF SHAL_FALSE_m odif1_LINTFLEX _TRUE_LENTHP REC	same	Same + LENTHPREC=TRUE	V012014	0064

after comparison, we find that activating the interface does not change much the results, but by activating the second option much differences appears.

This is an example of comparison between the differences between mitraille0063 - mitraille0061 and mitraille0064-mitraille0061

comp_cy40t1_LMFSHAL_FALSE_modif1_LINTFLEX-cy40t1_LMFSHAL_FALSE_modif1_120_AR1T001	comp_cy40t1_LMFSHAL_FALSE_modif1_LINTFLEX_LENTHPREC-cy40t1_LMFSHAL_FALSE_modif1_120_AR1T001
1 !VORTICITY : 5.041411e-10 0.000000e+00 0.000000e+00	1 !VORTICITY : 4.083853e-06 0.000000e+00 0.000000e+00
2 !DIVERGENCE : 1.939673e-10 0.000000e+00 0.000000e+00	2 !DIVERGENCE : 4.131375e-06 0.000000e+00 0.000000e+00
3 !TEMPERATURE : 3.921140e-07 0.000000e+00 0.000000e+00	3 !TEMPERATURE : -2.426417e-02 0.000000e+00 0.000000e+00
4 !KINETIC : 5.730730e-06 0.000000e+00 0.000000e+00	4 !KINETIC : 4.829908e-02 0.000000e+00 0.000000e+00
5 !GPNORM HUMI.SPECIFI -1.226488e-10 0.000000e+00 0.000000e+00	5 !GPNORM HUMI.SPECIFI -1.334453e-06 0.000000e+00 0.000000e+00
6 !GPNORM CLOUD WATER 3.106205e-11 0.000000e+00 1.090798e-06	6 !GPNORM CLOUD WATER 6.920305e-07 0.000000e+00 5.210372e-05
7 !GPNORM ICE_CRYSTAL 1.298927e-11 6.776264e-21 -3.269440e-06	7 !GPNORM ICE_CRYSTAL -9.334283e-08 6.776264e-21 -2.658399e-04
8 !GPNORM SNOW -5.258983e-11 0.000000e+00 -2.831349e-07	8 !GPNORM SNOW 3.318085e-07 0.000000e+00 -3.637662e-04
9 !GPNORM RAIN 8.526727e-12 2.710505e-20 2.916009e-07	9 !GPNORM RAIN 1.779969e-07 2.710505e-20 3.018090e-04
10 !GPNORM GRAUPEL 1.297483e-10 0.000000e+00 1.519153e-06	10 !GPNORM GRAUPEL -6.955250e-07 2.710505e-20 1.033964e-04
11 !GPNORM TKE 8.283425e-07 8.782885e-18 3.991719e-01	11 !GPNORM TKE 5.256323e-03 8.782885e-18 -5.112044e+00
12 !GPNORM CLOUD_FRACTI -7.542062e-08 0.000000e+00 0.000000e+00	12 !GPNORM CLOUD_FRACTI 2.698150e-03 0.000000e+00 0.000000e+00
13 !GPNORM SRC -3.012801e-11 0.000000e+00 1.067207e-08	13 !GPNORM SRC 1.818056e-07 0.000000e+00 5.646481e-06
14 !GPNORM RAD_LIQUID_WATER 8.317223e-13 0.000000e+00 5.477278e-07	14 !GPNORM RAD_LIQUID_WATER 7.123490e-07 0.000000e+00 -1.058282e-05
15 !GPNORM RAD_SOLID_WATER 1.261000e-11 0.000000e+00 -1.438903e-06	15 !GPNORM RAD_SOLID_WATER -1.139764e-07 0.000000e+00 -1.970673e-04

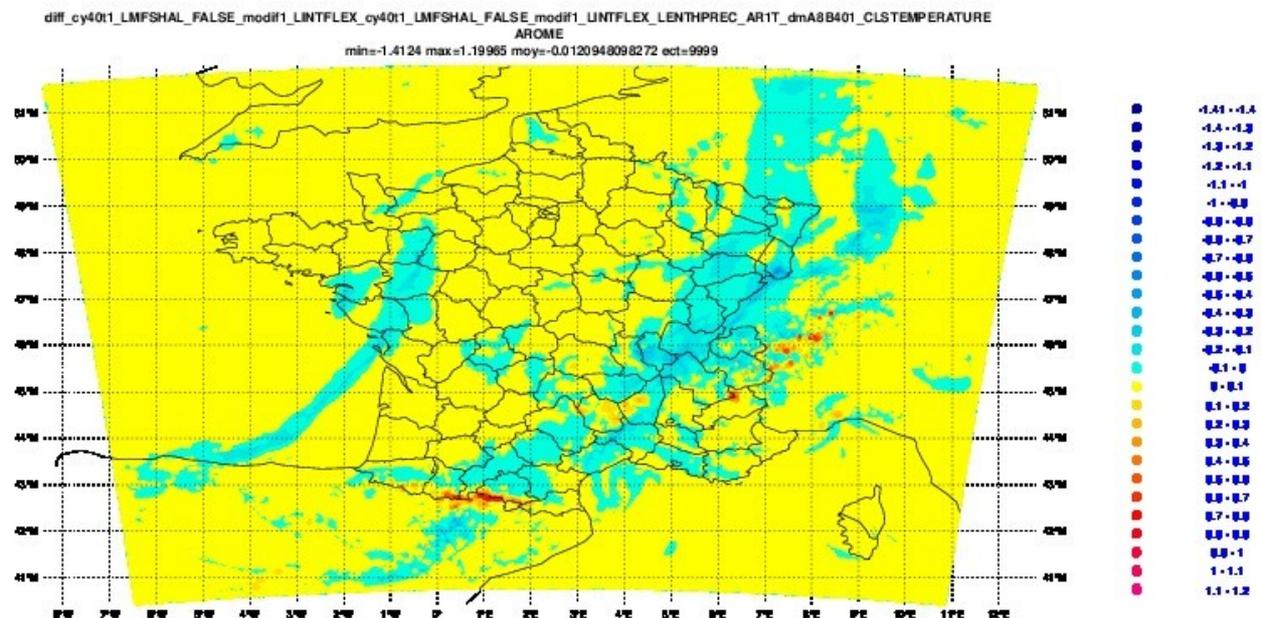


The figures represented the differences of CLSTEMPERATURE at 1h.

This is a comparison between the differences between mitraille0063 - mitraille0055 and mitraille0064-mitraille0055

comp_cy40t1_LMFESHAL_FALSE_modif1_LINTFLEX-cy40mainBinyanEcoclimT1_LMFESHAL_FALSE_120_AR1T001				np_cy40t1_LMFESHAL_FALSE_modif1_LINTFLEX_LENTHPREC-cy40mainBinyanEcoclimT1_LMFESHAL_FALSE_120_AR1T001					
1	!VORTICITY :	1.793275e-09	0.000000e+00	0.000000e+00	1	!VORTICITY :	4.082364e-06	0.000000e+00	0.000000e+00
2	!DIVERGENCE :	3.300707e-09	0.000000e+00	0.000000e+00	2	!DIVERGENCE :	4.128268e-06	0.000000e+00	0.000000e+00
3	!TEMPERATURE :	-8.746756e-05	0.000000e+00	0.000000e+00	3	!TEMPERATURE :	-2.435125e-02	0.000000e+00	0.000000e+00
4	!KINETIC :	1.084380e-03	0.000000e+00	0.000000e+00	4	!KINETIC :	4.820143e-02	0.000000e+00	0.000000e+00
5	!GPNORM HUMI.SPECIFI	3.65535e-09	0.000000e+00	0.000000e+00	5	!GPNORM HUMI.SPECIFI	-1.337986e-06	0.000000e+00	0.000000e+00
6	!GPNORM CLOUD_WATER	6.131318e-10	0.000000e+00	8.041981e-09	6	!GPNORM CLOUD_WATER	6.913862e-07	0.000000e+00	5.209886e-05
7	!GPNORM ICE_CRYSTAL	-5.053492e-09	6.776264e-21	-7.768282e-07	7	!GPNORM ICE_CRYSTAL	-9.840931e-08	6.776264e-21	-2.033473e-04
8	!GPNORM SNOW	2.247179e-09	0.000000e+00	-4.950055e-08	8	!GPNORM SNOW	3.333802e-07	0.000000e+00	-3.635325e-04
9	!GPNORM RAIN	3.930488e-10	2.710505e-20	3.204744e-07	9	!GPNORM RAIN	1.783814e-07	2.710505e-20	3.014801e-04
10	!GPNORM GRAUPEL	5.137170e-10	-5.421011e-20	1.413457e-06	10	!GPNORM GRAUPEL	-6.951411e-07	-2.710505e-20	1.032907e-04
11	!GPNORM TKE	1.097975e-06	0.000000e+00	2.887130e-01	11	!GPNORM TKE	3.256592e-03	0.000000e+00	-5.222503e+00
12	!GPNORM CLOUD_FRACTI	5.116298e-05	0.000000e+00	0.000000e+00	12	!GPNORM CLOUD_FRACTI	2.749389e-03	0.000000e+00	0.000000e+00
13	!GPNORM SRC	6.283688e-07	0.000000e+00	5.190798e-08	13	!GPNORM SRC	-4.465331e-07	0.000000e+00	-5.605245e-06
14	!GPNORM RAD_LIQUID_WATER	-6.188816e-10	0.000000e+00	5.472269e-07	14	!GPNORM RAD_LIQUID_WATER	7.117344e-07	0.000000e+00	-1.058332e-05
15	!GPNORM RAD_SOLID_WATER	-5.524188e-09	0.000000e+00	1.155623e-07	15	!GPNORM RAD_SOLID_WATER	-1.195132e-07	0.000000e+00	-1.955128e-04

and this is the differences between mitraille0063 – mitraille0064 for the CLSTEMPERATURE at 1h.

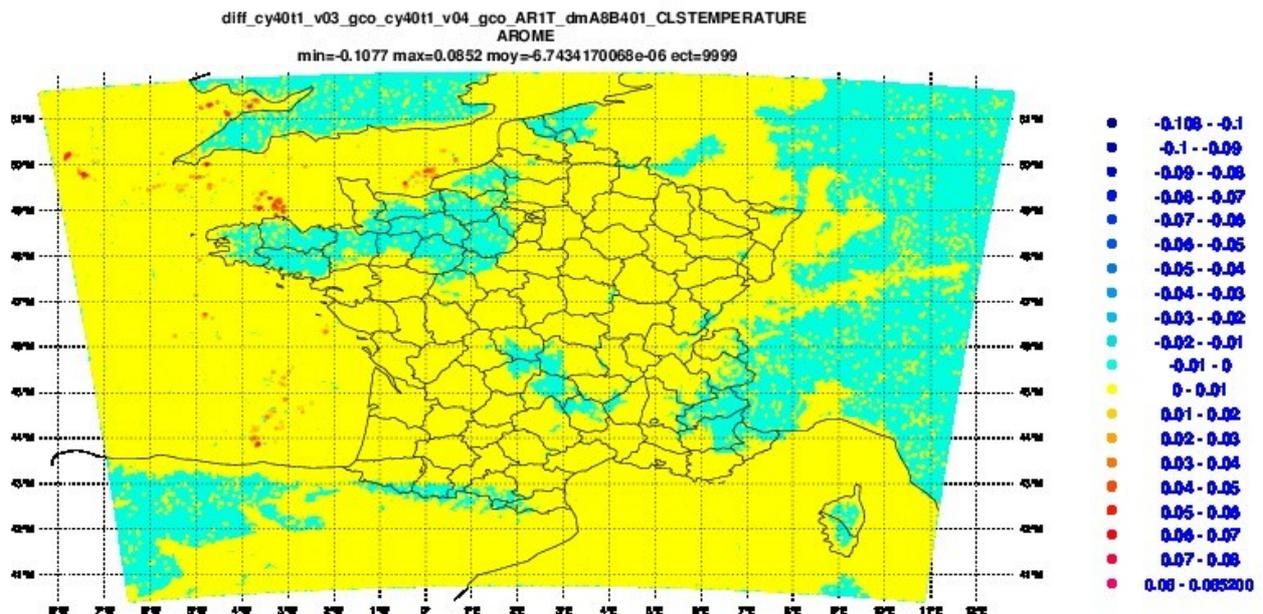


Part 3 :

First we run mitraillette test for the v03 of Seity and GCO to compare them. And we will compare v03 and v04 .

	Exe	what changed ?	Version of mitraillette	Numero of mitraille
cy40t1_v03_seity	Exe of yan	Some modification for micro physics	V012014	0065
cy40t1_v03_gco	Exe of GCO	-	V012014	0066
cy40t1_v04_gco	Exe of GCO	-	V012014	0067

For the v03 of GCO and Seity, the results are the same. Between the v03 and the v04 there are same results in hydrostatique (hyd) but in no-hydrostatique (pc,pcc) we found some differences. This is an exemple :



it is due to some modifications provided by Yann in the spectral computation in *inter.2/arpifs/control/stepo.F90* we commented the ligne `!.AND.NCURRENT==NSITER` in *stepo.F90* and rebuild the binary to do another run mitraillette.

	Exe	what changed ?	Version of mitraillette	Numero of mitraille
cy40t1_v04_modif1	Exe of my pack	Modification in Step0.F90	V012014	0068

Finally we found same results between this cycle and the v03 of GCO.