Phasing report

STUDIES ON THE LATEST DEVELOPMENTS IN ARPEGE/IFS (CY46)

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Content:

Introduction:

The present report will summarize all the tasks I have done during my phasing stay in Toulouse. I have tackled the next specific issues:

- Not compiled LAM routines in CY45T1_R1.01.
- Some microphysics GPNORMS not printed in output.
- DFI not reproducible, wrong kinetic energy norms in step 2 of the incremental DFI (LINCR) which is a pending issue from CY45T1.
- Suescal.F90 refactoring: Olda addressed a few phasing aspects to suescal.F90 in CY45T1_R1.02, but he mentioned that this routine should be potential candidate for cleaning/refactoring.

This report will contain also my Git branch contributions to pre-CY46 and some mitraillette validations of TL/AD tests in each step while refactoring suescal.F90.

1. Getting started as newcomer:

1. 1. Phasing work background:

Since the beginning of the project, ARPEGE/IFS software is getting fairly complicated scientifically due to successive contributions, but also handier thanks to the code ***"OOPSification"*** efforts. Twice per each year, a common new cycle of ARPEGE/IFS is launched after many technical exchanges and coordination conferences between ECMWF (Reading) and Meteo France (Toulouse). Before the final release of each new cycle, both global and LAM validations should be done.

GCO will merge all LAM contributions (ALADIN/AROME/ALARO) with global part (IFS/ARPEGE), and then the phasing task will take place. Basically, the phaser will be asked to check and understand the changes in new ARPEGE/IFS cycle, adapt subtly the LAM counterpart routines if necessary and then evaluate the numerical impact of the new cycle.

1. 2. What is numerical impact and how to evaluate it?

The numerical impact in Mitraillette, for both LAM and global tests, is mainly the difference between the Spectral norms/Grid point norms (SPNORMS/GPNORMS) of your test and the reference test (the reference is usually from the last released cycle). There's two ways to evaluate the numerical impact:

- "Bit reproducible" => all digits are equal => test OK (see next example).

Your mitraillette test

```
LEV          VORTICITY                    DIVERGENCE              TEMPERATURE                 HUMIDITY                KINETIC ENERGY
AVE   0.373700922951002E-04   0.226332457467153E-04   0.250225249341497E+03  0.189574713270919E-02   0.178577890251846E+03
```

The reference test

```
LEV          VORTICITY                    DIVERGENCE              TEMPERATURE                 HUMIDITY                KINETIC ENERGY
AVE   0.373700922951002E-04   0.226332457467153E-04   0.250225249341497E+03  0.189574713270919E-02   0.178577890251846E+03
```

- "Not reproducible" => It means there is differences in norms (see next example), Usually in this case you have two options:

a) Those norms differences were expected and corresponds to what the developer have already report => So technically the results are acceptable.

b) The differences does not seem to have an explanation => In this case you have to investigate where this numerical impact came from and fix it, especially if there is only few similar digits (less than 3 digits). Several means of investigation could be used: additional tests by changing options or removing modified parts of code between the test and the reference (where possible); put PRINT in the code; compile with debug options; plot some fields etc..

Your mitraillette test

```
LEV          VORTICITY                    DIVERGENCE              TEMPERATURE                 HUMIDITY                KINETIC ENERGY
AVE   0.373700922951002E-04   0.226332457467153E-04   0.250225241981497E+03  0.189574713270919E-02   0.178577890251846E+03
```

The reference test

```
LEV          VORTICITY                    DIVERGENCE              TEMPERATURE                 HUMIDITY                KINETIC ENERGY
AVE    0.373728056180303E-04  0. 226332454026426E-04   0.250225241981854E+03  0.189574713270919E-02   0.178577801389574E+03
```

During my first days of this stay, I was getting familiar with phaser work and have learnt many necessary phasing basics with Olda. In parallel, I have been introduced to a comprehensive knowledge of the IFS/ARP/LAM code structure and model data layout with Claude. I have been also introduced to new MF tools checkpack and ciboulette by Alex.

2. Specific phasing issues tackled in pre-CY46:

2. 1. Remaining compilation issues in CY45T1_R1.01:

After merging 45T1 and 45R1+OOPS by GCO, the first version of pre-CY46 was prepared and compiled (CY45T1_R1.01). Then quite few bugs and fixes have been spotted in some LAM routines (about 30 routines did not compile in v01).

create_pert.F90
deello.F90
ecosjr.F90
ecvargpad.F90
ecvargptl.F90
ediagb_psot.F90
edist_spec.F90
edist_spec_control_mod.F90
egathereigmd.F90
egath_spec.F90
egath_spec_control_mod.F90
einflation_mean.F90
einflation_pert.F90
ejgnrgg.F90
ejgnrggad.F90
ejgnrggi.F90
ejgnrggiad.F90
elascaw.F90
elsac.F90
eslextpol.F90
etransdir_jb.F90
etransdir_jbad.F90
etransinv_jb.F90
etransinv_jbad.F90
ewreini.F90
sueinfce.F90
suejbcor.F90
suejbcosu.F90
suejbstd.F90
suejbwavalloc.F90
suejbwav_read_sigmab.F90
suemp.F90
suescal.F90

This number has decreased from 33 to 13 routines with Ryad+Karim's modset. The remaining issues mostly concerned VAR routines for LAM:

aladin/var/ecosjr.F90
aladin/var/ecvargpad.F90
aladin/var/ecvargptl.F90
aladin/var/einflation_mean.F90
aladin/var/einflation_pert.F90
aladin/var/ejgnrgg.F90
aladin/var/ejgnrggad.F90
aladin/var/ejgnrggi.F90
aladin/var/ejgnrggiad.F90
aladin/var/ewreini.F90
aladin/var/sueinfce.F90
aladin/var/suescal.F90

Olda has modified suescal.F90 (see Olda's report), but he mentioned that this routine should be potential candidate for cleaning/refactoring. I have addressed a few technical phasing aspects to solve the rest of not compiled routines, and hereafter a table summarizing those issues and the changes made to fix them (Tab-1-). For more details about each routine issue please refer to the appendix.

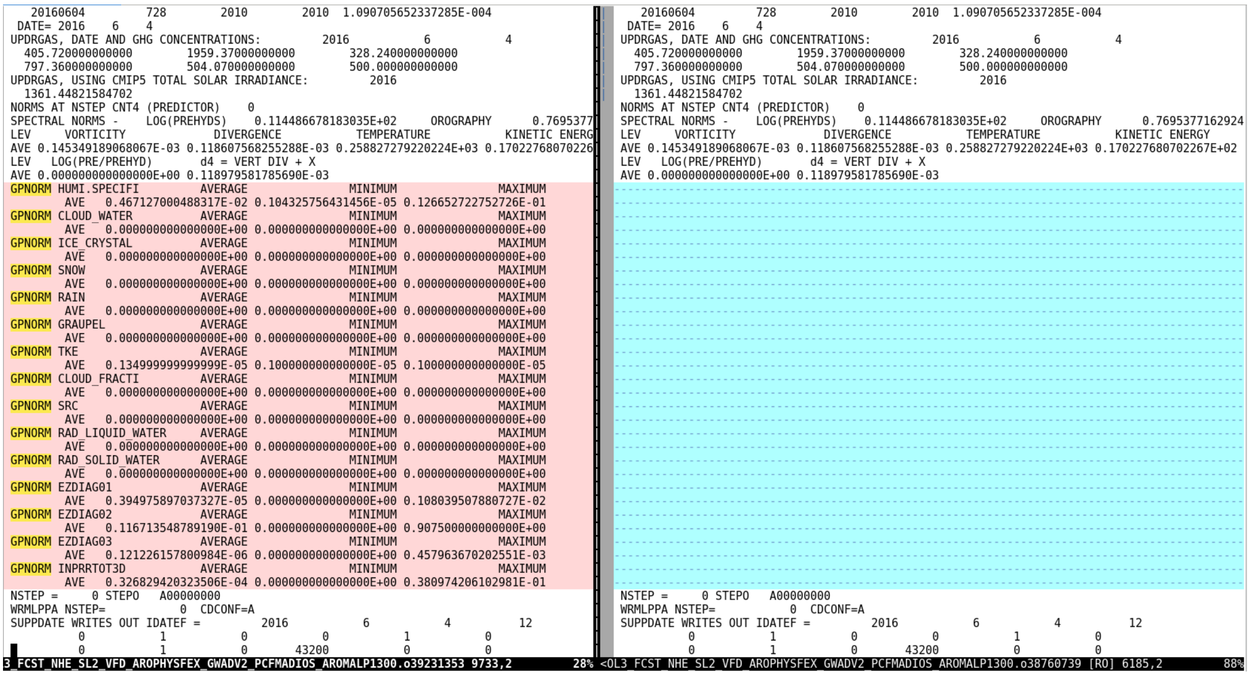
Routine	Error	Modifications
suejbwavalloc.F90	▪ The POINTER attribute is required (VOR, DIV, TMP, HUM, TMP, SP, TMPSP) JB_STRUCT%LAMWAVELET_GRID%WAV_CV_HOR%VOR => JB_STRUCT%LAMWAVELET_GRID%WAV_CV_HOR%DATA_3D(:,:,:,:,1) …..	✓ Change all type declarations from POINTER to ALLOCATBLE.
einflation_pert.F90	▪ Name in only-list does not exist. [NGRBVO……... USE YOMGRIB , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ, NGRBLNSP ▪ einflation_pert.F90(92): #error: can't find include file: ppclose.intfb.h ▪ einflation_pert.F90(93): #error: can't find include file: ppflush.intfb.h	✓ Replace YOMGRIB by USE YOM_GRIB_CODES ✓ Remove PPFLUSH and PPCLOSE.
einflation_mean.F90		
sueinfce.F90	▪ This is not a field name that is defined in the encompassing structure. [FCERENBUF YD_JB_STRUCT%JB_DATA%FCERENBUF(:,:,1+(JKGLO-1)/YDGEOMETRY%YRDIM%NPROMA) = ZFCE	✓ Adapt to modified modules: from FCERENBUF to FCEREN%BUF.
ecvargpad.F90		
ecvargptl.F90		
ecosjr.F90	▪ The type of the actual argument differs from the type of the dummy argument. [YDVARBC CALL STEPO(YDGEOMETRY,YDFIELDS,YDMTRAJ,YDMODEL,'0K0000000',YDVARBC)	✓ Remove YDVARBC from CALL STEPO.
ewreini.F90		
ejgnrggad.F90	▪ Name in only-list does not exist. [NGRBVO……... USE YOMGRIB , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ, NGRBLNSP. ▪ This is not a field name that is defined in the encompassing structure. [FCEBUF ZFCE = YD_JB_STRUCT%JB_DATA%FCEBUF (:, :, 1+(KSTGLO-1)/YDGEOMETRY%YRDIM%NPROMA)	✓ Replace YOMGRIB by USE YOM_GRIB_CODES. ✓ Adapt to modified modules: from FCEBUF to FCE%BUF.
ejgnrgg.F90		
ejgnrggi.F90		
ejgnrggiad.F90		

Tab -1- : Not compiled LAM routines (errors and modefications)

Eventually, all the "aladin" project source code compiles after those modifications.

2. 2. Missing GP norms print-out issue:

After the firsts mitraillette tests (Patrick), although the results were fairly good, but grid-points of several microphysics fields (GPNORMS) were missing from the output files (Fig-1-).



```
   20160604         728        2010        2010  1.090705652337285E-004
 DATE= 2016    6    4
UPDRGAS, DATE AND GHG CONCENTRATIONS:         2016           6           4
  405.720000000000        1959.37000000000        328.240000000000
  797.360000000000        504.070000000000        500.000000000000
UPDRGAS, USING CMIP5 TOTAL SOLAR IRRADIANCE:         2016
  1361.44821584702
NORMS AT NSTEP CNT4 (PREDICTOR)    0
SPECTRAL NORMS -    LOG(PREHYDS)    0.114486678183035E+02     OROGRAPHY      0.7695377
LEV     VORTICITY              DIVERGENCE           TEMPERATURE          KINETIC ENERG
AVE 0.145349189068067E-03 0.118607568255288E-03 0.258827279220224E+03 0.17022768070226
LEV   LOG(PRE/PREHYD)       d4 = VERT DIV + X
AVE 0.000000000000000E+00 0.118979581785690E-03
GPNORM HUMI.SPECIFI         AVERAGE              MINIMUM               MAXIMUM
         AVE   0.467127000488317E-02 0.104325756431456E-05 0.126652722752726E-01
GPNORM CLOUD_WATER          AVERAGE              MINIMUM               MAXIMUM
         AVE   0.000000000000000E+00 0.000000000000000E+00 0.000000000000000E+00
GPNORM ICE_CRYSTAL          AVERAGE              MINIMUM               MAXIMUM
         AVE   0.000000000000000E+00 0.000000000000000E+00 0.000000000000000E+00
GPNORM SNOW                 AVERAGE              MINIMUM               MAXIMUM
         AVE   0.000000000000000E+00 0.000000000000000E+00 0.000000000000000E+00
GPNORM RAIN                 AVERAGE              MINIMUM               MAXIMUM
         AVE   0.000000000000000E+00 0.000000000000000E+00 0.000000000000000E+00
GPNORM GRAUPEL              AVERAGE              MINIMUM               MAXIMUM
         AVE   0.000000000000000E+00 0.000000000000000E+00 0.000000000000000E+00
GPNORM TKE                  AVERAGE              MINIMUM               MAXIMUM
         AVE   0.134999999999999E-05 0.100000000000000E-05 0.100000000000000E-05
GPNORM CLOUD_FRACTI         AVERAGE              MINIMUM               MAXIMUM
         AVE   0.000000000000000E+00 0.000000000000000E+00 0.000000000000000E+00
GPNORM SRC                  AVERAGE              MINIMUM               MAXIMUM
         AVE   0.000000000000000E+00 0.000000000000000E+00 0.000000000000000E+00
GPNORM RAD_LIQUID_WATER     AVERAGE              MINIMUM               MAXIMUM
         AVE   0.000000000000000E+00 0.000000000000000E+00 0.000000000000000E+00
GPNORM RAD_SOLID_WATER      AVERAGE              MINIMUM               MAXIMUM
         AVE   0.000000000000000E+00 0.000000000000000E+00 0.000000000000000E+00
GPNORM EZDIAG01             AVERAGE              MINIMUM               MAXIMUM
         AVE   0.394975897037327E-05 0.000000000000000E+00 0.108039507880727E-02
GPNORM EZDIAG02             AVERAGE              MINIMUM               MAXIMUM
         AVE   0.116713548789190E-01 0.000000000000000E+00 0.907500000000000E+00
GPNORM EZDIAG03             AVERAGE              MINIMUM               MAXIMUM
         AVE   0.121226157800984E-06 0.000000000000000E+00 0.457963670202551E-03
GPNORM INPRRTOT3D           AVERAGE              MINIMUM               MAXIMUM
         AVE   0.326829420323506E-04 0.000000000000000E+00 0.380974206102981E-01
NSTEP =     0 STEPO   A00000000
WRMLPPA NSTEP=           0  CDCONF=A
SUPPDATE WRITES OUT IDATEF =         2016           6           4          12
           0           1           0           0           1           0
           0           1           0       43200           0           0
3_FCST_NHE_SL2_VFD_AROPHYSFEX_GWADV2_PCFMADIOS_AROMALP1300.o39231353 9733,2         28%
```

```
   20160604         728        2010        2010  1.090705652337285E-004
 DATE= 2016    6    4
UPDRGAS, DATE AND GHG CONCENTRATIONS:         2016           6           4
  405.720000000000        1959.37000000000        328.240000000000
  797.360000000000        504.070000000000        500.000000000000
UPDRGAS, USING CMIP5 TOTAL SOLAR IRRADIANCE:         2016
  1361.44821584702
NORMS AT NSTEP CNT4 (PREDICTOR)    0
SPECTRAL NORMS -    LOG(PREHYDS)    0.114486678183035E+02     OROGRAPHY      0.7695377162924
LEV     VORTICITY              DIVERGENCE           TEMPERATURE          KINETIC ENERGY
AVE 0.145349189068067E-03 0.118607568255288E-03 0.258827279220224E+03 0.170227680702267E+02
LEV   LOG(PRE/PREHYD)       d4 = VERT DIV + X
AVE 0.000000000000000E+00 0.118979581785690E-03
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-----------------------------------------------------------------------------------------
-----------------------------------------------------------------------------------------
NSTEP =     0 STEPO   A00000000
WRMLPPA NSTEP=           0  CDCONF=A
SUPPDATE WRITES OUT IDATEF =         2016           6           4          12
           0           1           0           0           1           0
           0           1           0       43200           0           0
<OL3_FCST_NHE_SL2_VFD_AROPHYSFEX_GWADV2_PCFMADIOS_AROMALP1300.o38760739 [RO] 6185,2         88%
```

Fig-1-: Missing GPNORMS in CY45T1_R1 output files (right side) comparing to CY45T1 output files (left side).

The phasing work regarding this issue was based on analyzing routines responsible on printing GFL norms. I have spotted in arpifs/utility/gpnorms_gfl.F90 the code changes that disable the printouts of quite a number of GFL fields in pre-CY46 : a new Boolean argument **LDPRINT_TL** has been introduced, with a tentative to use in combination with a local Boolean:

```
-------------------------------------------------------------
!LLNOT_TL_AD=.NOT.PRESENT(LDPRINT_TL)
-------------------------------------------------------------
```

This commented line means that the write-outs of many microphysics-related GFL fields for any model integration (NL, TL, AD) is disabled. However, the local Boolean eventually reads:

```
--------------------------------------------------
LLNOT_TL_AD=.FALSE.
--------------------------------------------------
```

Indeed, switching back to the original line, allowed us to see again the GFL norms in the logfiles of a regular NL forecast of Arpège or Arome.

Meanwhile, Claude contacted Deborah (ECMWF) in order to have more clarification about this change (was it for specific reasons or by mistake). She replayed that they had already introduced this new argument LDPRINT_TL some time ago to stop NORMS of TL/AD fields which did not exist, when they were having problems (several months ago) with random failures coming from GPNORM. So the correct code was the commented line.

2. 3. Digital Filter Initialization issue:

This issue has been spotted in CY45T1: The DFI test results (**L3_FCTI_HYD_SL2_VFE_ARPPHYISBA_TSTDFI_FRAN**) were not reproducible for **KINETIC ENERGY**, and still not in CY45T1_R1 V01 and V02. Furthermore, Olda found out that even after three consecutive tests (exactly the same tests) the results are not reproducible:

cy45t1_r01.02

```
LEV        VORTICITY                DIVERGENCE               TEMPERATURE              HUMIDITY                 KINETIC ENERGY
AVE   0.373728056180303E-04   0.226390404026426E-04   0.250225441981854E+03   0.189562693109292E-02   0.179448089668179E+03
AVE   0.373728056180303E-04   0.226390404026426E-04   0.250225441981854E+03   0.189562693109292E-02   0.181141875481979E+03
AVE   0.373728056180303E-04   0.226390404026426E-04   0.250225441981854E+03   0.189562693109292E-02   0.247092000704347E+03
```

I have checked many routines supposed as potential candidates regarding this issue. Some parts of arpifs/dfi/dfi2.F90 seem like obsolete and suspected of being the origin of the problem. It concerned the use of ZSPUB and ZSPVB in the final compute of spectral fields in this routine. I have removed the following lines from dfi2.F90:

```
----------------------------------------------------------------------------------
 ZSPUB=> ZSPA1(:,1)
 ZSPVB=> ZSPA1(:,2)
----------------------------------------------------------------------------------
 IF (LELAM) THEN
   DO JL=1,NFLEVL
     YDFIELDS%YRSPEC%SP1D(JL,1)=ZSPUB(JL)  !! was SPA3
     YDFIELDS%YRSPEC%SP1D(JL,2)=ZSPVB(JL)
   ENDDO
 ENDIF
 ----------------------------------------------------------------------------------
  IF (LELAM) THEN
    DO JL=1,NFLEVL
      YDFIELDS%YRSPEC%SP1D(JL,1)=ZSPUB(JL)
      YDFIELDS%YRSPEC%SP1D(JL,2)=ZSPVB(JL)
    ENDDO
  ENDIF
----------------------------------------------------------------------------------
```

After this modification, the DFI test results became bit reproducible after three consecutive tests:

cy45t1_r01.02 + dfi2.F90 fix

LEV	VORTICITY	DIVERGENCE	TEMPERATURE	HUMIDITY	KINETIC ENERGY
AVE	0.373728056180303E-04	0.226390404026426E-04	0.250225441981854E+03	0.189562693109292E-02	**0.178578668292586E+03**
AVE	0.373728056180303E-04	0.226390404026426E-04	0.250225441981854E+03	0.189562693109292E-02	**0.178578668292586E+03**
AVE	0.373728056180303E-04	0.226390404026426E-04	0.250225441981854E+03	0.189562693109292E-02	**0.178578668292586E+03**

But still not reproducible comparing to the reference of CY45. Ultimately, the problem was not only a pending issue from CY45T1, but it goes back till **pre-CY41**. Alex and I have notice that this KINETIC ENERGY issue appeared in CY40T1, which corresponds to some important code changes in dfi2.F90. The comparison between my DFI mitraillette test and Patrick's reference from CY40T1 (beaufix:/home/gmap/mrpm/saez/mitraille /al40t1/mitraille_0113) showed fairly better results than the those obtained before dfi2.F90 fixes:

cy40t1 (before dfi2.F90 modifications)

LEV	VORTICITY	DIVERGENCE	TEMPERATURE	HUMIDITY	KINETIC ENERGY
AVE	0.373700922951002E-04	0.226332457467153E-04	0.250225249341497E+03	0.189574713270919E-02	0.178577890251846E+03

cy45t1_r01.02 + dfi2.F90 fix

LEV	VORTICITY	DIVERGENCE	TEMPERATURE	HUMIDITY	KINETIC ENERGY
AVE	0.373728056180303E-04	0.226390404026426E-04	0.250225441981854E+03	0.189562693109292E-02	0.178578668292586E+03

cy40t1_r02 (After dfi2.F90 modifications)

LEV	VORTICITY	DIVERGENCE	TEMPERATURE	HUMIDITY	KINETIC ENERGY
AVE	0.373700922951002E-04	0.226332457467153E-04	0.250225249341497E+03	0.189574713270919E-02	0.179574309351741E+03

2. 4. Re-factoring suescal.F90: New routines suescal_jb.F90 and suescal_norms.F90.

The routine suescal.F90 is a part of the variationnal code for LAM (aladin/var); it is the counterpart of suscal.F90 in arpege/ifs. This routine is particularly needed to run and validate the model versions which use the tangent linear and adjoint models (TL/AD). As mentioned above, suescal.F90 was one of those LAM issues during the phasing of CY45T1_R1.01 and it was modified by Olda, but he suggested that this routine need to be cleaned or refactored.

Actually, after analyzing the historical evolution of suscal.F90 and suescal.F90, I figured out that the first one has been seriously modified twice and new routines were created based on it, while the second one did not follow this evolution (Fig-2-).

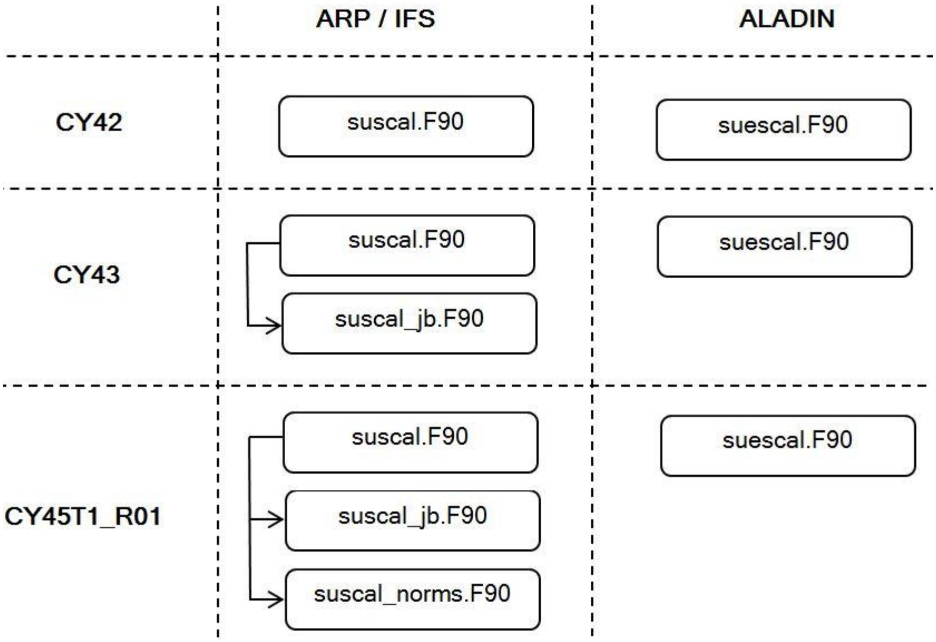


Fig-2- : suscal.F90 and suescal.F90 evolution since CY42.

The first major changes was in pre-CY43, the spectral array initialization and scalar product array initialization (basically was done in suscal.F90) was moved into new routine named **suescal_jb.F90**. This new routine is called from suscal.F90 (with few coding aspects changes). The second major changes happened in the current cycle (pre-CY46), new routine named **suscal_norms.F90** splited out from suscal_jb.F90, but called directly from suscal.F90. It contains all the code part of spectral array initialization, except the 3D Variationnal job which was kept in suscal_jb.F90.

In order to refactor suescal.F90, I have checked the progressive evolution of suscal.F90 and upgrade the LAM routine carefully following the next steps:

Step 1:

Phasing suescal.F90 in CY43 by introducing new routine suescal_jb.F90 (counterpart of suscal_jb.F90 in GM). This new routine splited out from suescal.F90 (Fig-3-) and I tried to keep as much as possible the same structure of its counterpart in GM (suscal_jb.F90). The code compiled successfully and I get the MASTERODB (beaufix:/home/gmap/mrpa/abdenoura/pack/cy43_main_suescal_refact).

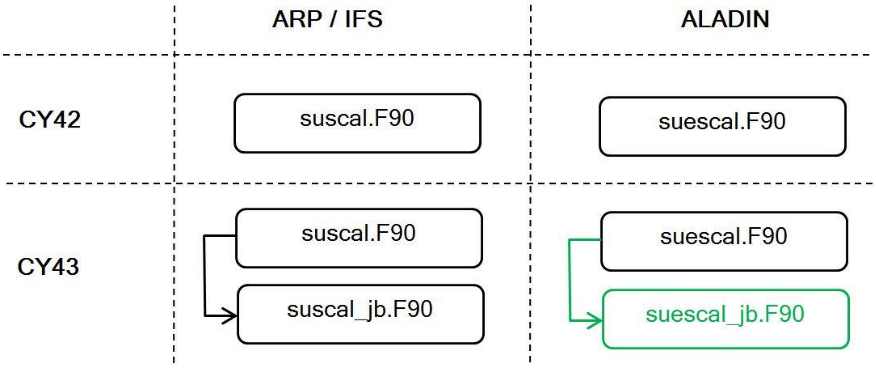
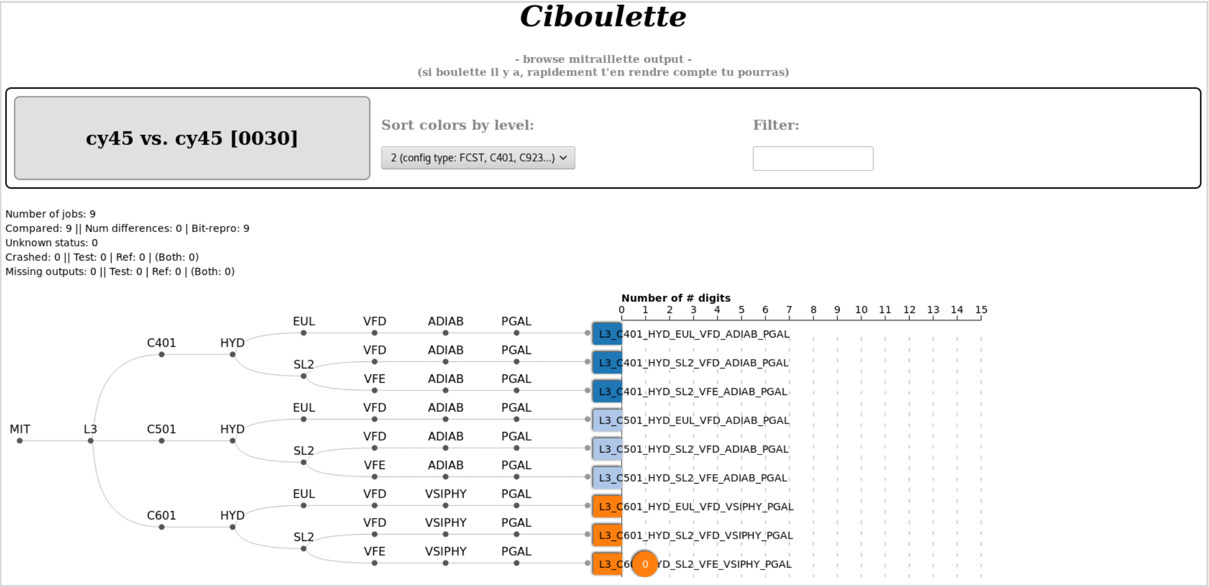


Fig -3- : Introducing new routine suescal_jb.F90 in CY43.

Step 2:

Phasing suescal.F90 and suescal_jb.F90 in CY45_main. The code compiled successfully (beaufix:/home/gmap/mrpa/abdenoura/pack/cy45_main_suescal_refact). At this step, I did the TL/AD mitraillette tests (401, 501 and 601) to be sure that the new routine works fine either technically or scientifically. The results were bit reproducible with our executable comparing to Patrick's reference from the same cycle (beaufix:/home/gmap/mrpm/saez/mitraillette_references/cy45/mitraille_0306), (Fig-4-).



Ciboulette

- browse mitraillette output -
(si boulette il y a, rapidement t'en rendre compte tu pourras)

cy45 vs. cy45 [0030]

Sort colors by level: 2 (config type: FCST, C401, C923...)

Filter:

Number of jobs: 9
Compared: 9 || Num differences: 0 | Bit-repro: 9
Unknown status: 0
Crashed: 0 || Test: 0 | Ref: 0 | (Both: 0)
Missing outputs: 0 || Test: 0 | Ref: 0 | (Both: 0)

Number of # digits
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
MIT
L3
C401
C501
C601
HYD
EUL
SL2
VFD
VFE
ADIAB
VSIPHY
PGAL
L3_C401_HYD_EUL_VFD_ADIAB_PGAL
L3_C401_HYD_SL2_VFD_ADIAB_PGAL
L3_C401_HYD_SL2_VFE_ADIAB_PGAL
L3_C501_HYD_EUL_VFD_ADIAB_PGAL
L3_C501_HYD_SL2_VFD_ADIAB_PGAL
L3_C501_HYD_SL2_VFE_ADIAB_PGAL
L3_C601_HYD_EUL_VFD_VSIPHY_PGAL
L3_C601_HYD_SL2_VFD_VSIPHY_PGAL
L3_C6 YD_SL2_VFE_VSIPHY_PGAL
0

Fig-4- : Mitraillette results of TL/AD tests (with new MF tool Ciboulette):
* <u>Reference:</u> beaufix:/home/gmap/mrpm/saez/mitraillette_references/cy45/mitraille_0306.
* <u>Test:</u> beaufix:/home/gmap/mrpa/abdenoura/mitraillette/cy45/mitraille_0030.

Step 3:

Phasing suescal.F90 and suescal_jb.F90 in pre-CY46 by introducing new routine suescal_norms.F90 (counterpart of suscal_normsF90 in GM). This new routine splited out from suescal_jb.F90, but obviously follow the same structure of its counterpart in GM (suscal_norms.F90) and called directly from suescal.F90 (Fig-5-).

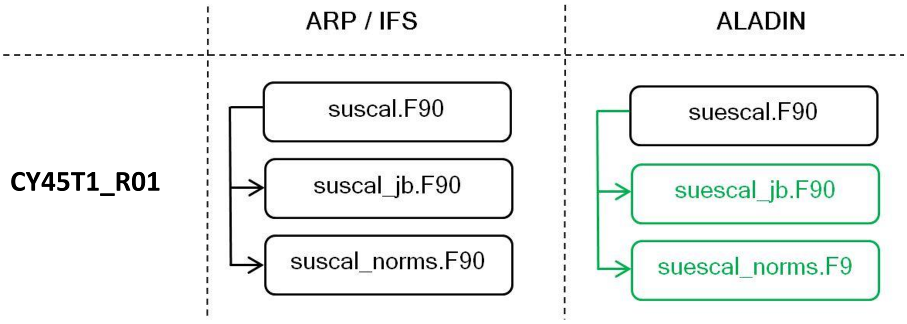
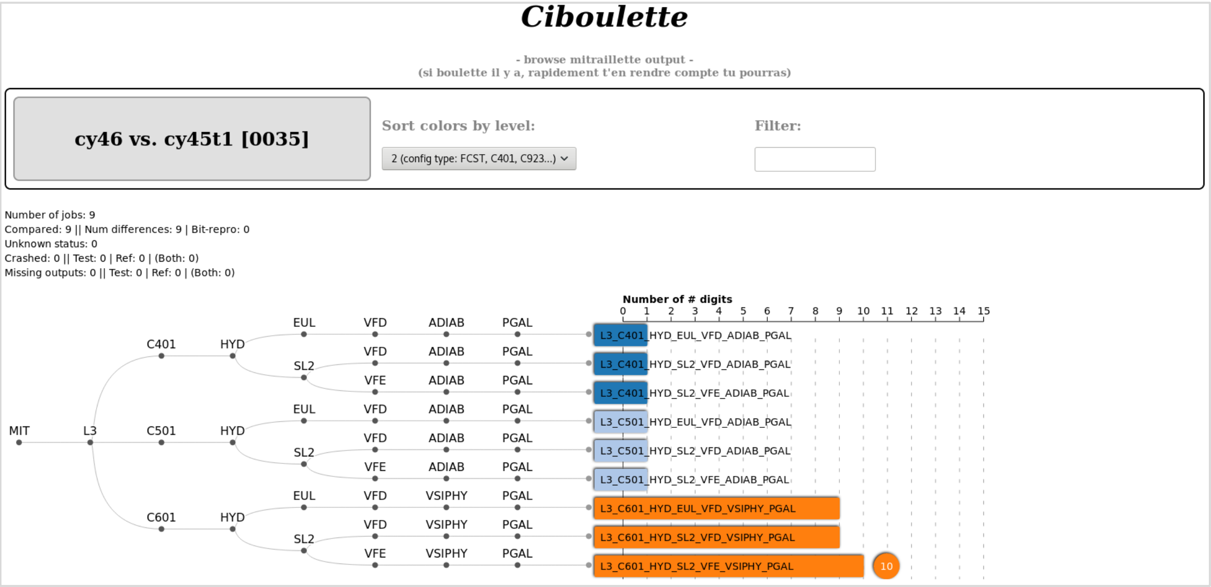


Fig-5- : suescal.F90 and suescal_jb.F90 refactored and new routine suescal_norms.F90 added in pre-CY46.

At first stage, I introduced all those modifications in CY45T1_R1.02 (beaufix:/home/gmap/mrpa/abdenoura/pack/cy45t1_r1.02_suescal_refact), and I performed the TL/AD mitraillette tests comparing to Patrick's reference (beaufix:/home/gmap/mrpm/saez/mitraille/cy45t1/mitraille_0326). The results were bit reproducible and similar to those obtained for CY45T1_R1.02 with old suescal.F90 (Fig -6-).


Ciboulette

- browse mitraillette output -
(si boulette il y a, rapidement t'en rendre compte tu pourras)

cy46 vs. cy45t1 [0035]

Sort colors by level: 2 (config type: FCST, C401, C923...)

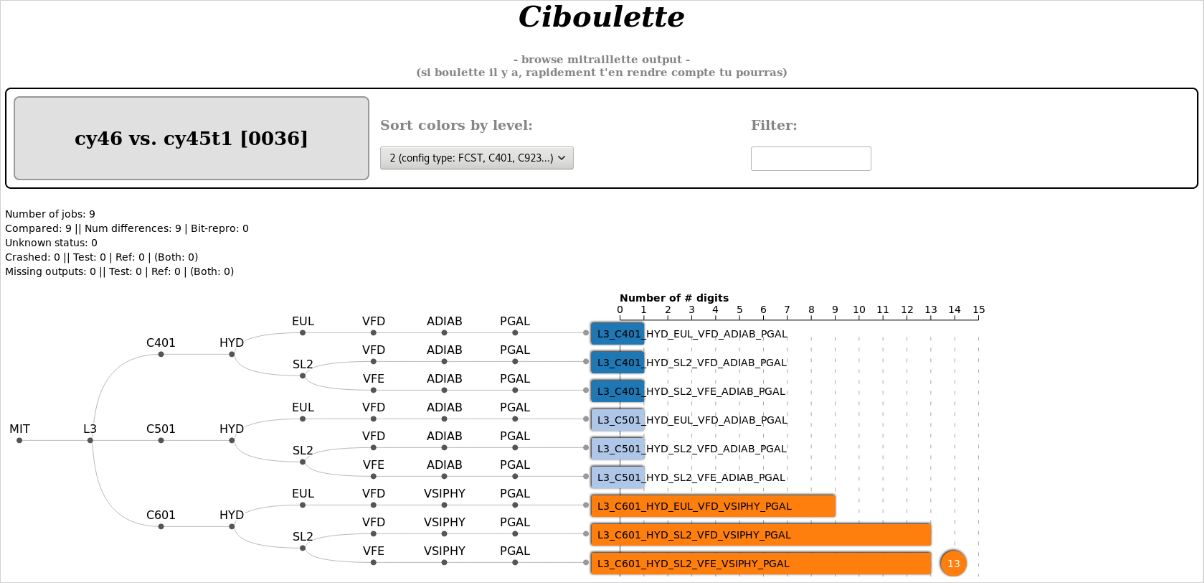
Filter:

Number of jobs: 9
Compared: 9 || Num differences: 9 | Bit-repro: 0
Unknown status: 0
Crashed: 0 || Test: 0 | Ref: 0 | (Both: 0)
Missing outputs: 0 || Test: 0 | Ref: 0 | (Both: 0)

Number of # digits
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
MIT
L3
C401
C501
C601
HYD
EUL
SL2
VFD
VFE
ADIAB
VSIPHY
PGAL
L3_C401_HYD_EUL_VFD_ADIAB_PGAL
L3_C401_HYD_SL2_VFD_ADIAB_PGAL
L3_C401_HYD_SL2_VFE_ADIAB_PGAL
L3_C501_HYD_EUL_VFD_ADIAB_PGAL
L3_C501_HYD_SL2_VFD_ADIAB_PGAL
L3_C501_HYD_SL2_VFE_ADIAB_PGAL
L3_C601_HYD_EUL_VFD_VSIPHY_PGAL
L3_C601_HYD_SL2_VFD_VSIPHY_PGAL
L3_C601_HYD_SL2_VFE_VSIPHY_PGAL
10

Fig-6- : Mitraillette results of TL/AD tests (with new MF tool Ciboulette):
* Reference: beaufix:/home/gmap/mrpm/saez/mitraillette/cy45t1/mitraille_0326 .
* Test: beaufix:/home/gmap/mrpa/abdenoura/mitraillette/cy46/mitraille_0035.

Then, I introduced my modifications into CY45T1_R1.03 (beaufix:/home/gmap/mrpa/abdenoura/pack/cy45t1_r1.03_suescal_refact_ok) and did again the mitraillette tests (401, 501 and 601). The new routines seem to work fine and the results were fairly and similar to those obtained for CY45T1_R1.03 with old suescal.F90 (Fig -7-).



Ciboulette

- browse mitraillette output -
(si boulette il y a, rapidement t'en rendre compte tu pourras)

cy46 vs. cy45t1 [0036]

Sort colors by level: 2 (config type: FCST, C401, C923...)

Filter:

Number of jobs: 9
Compared: 9 || Num differences: 9 | Bit-repro: 0
Unknown status: 0
Crashed: 0 || Test: 0 | Ref: 0 | (Both: 0)
Missing outputs: 0 || Test: 0 | Ref: 0 | (Both: 0)

Number of # digits
0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15
MIT
L3
C401
C501
C601
HYD
EUL
SL2
VFD
VFE
ADIAB
VSIPHY
PGAL
L3_C401_HYD_EUL_VFD_ADIAB_PGAL
L3_C401_HYD_SL2_VFD_ADIAB_PGAL
L3_C401_HYD_SL2_VFE_ADIAB_PGAL
L3_C501_HYD_EUL_VFD_ADIAB_PGAL
L3_C501_HYD_SL2_VFD_ADIAB_PGAL
L3_C501_HYD_SL2_VFE_ADIAB_PGAL
L3_C601_HYD_EUL_VFD_VSIPHY_PGAL
L3_C601_HYD_SL2_VFD_VSIPHY_PGAL
L3_C601_HYD_SL2_VFE_VSIPHY_PGAL
13

Fig-7- : Mitraillette results of TL/AD tests (with new MF tool Ciboulette):
* <u>Reference:</u> beaufix:/home/gmap/mrpm/saez/mitraillette/cy45t1/mitraille_0326 .
* <u>Test:</u> beaufix:/home/gmap/mrpa/abdenoura/mitraillette/cy46/mitraille_0036.

Finally, I tried to lighten the code by removing some commented lines carefully and also some obsolete lines, while doing some technical tests every time to make sure that the code still working fine.

Also, concerning the call of suscalmerr.F90 in suescal.F90, which is done as follows:

```
---------------------------------------------------
IF (LMODERR)  CALL SUSCALMERR (YDMP, STRUCT%YSCALP)
---------------------------------------------------
```

Claude told me that this routine (suscalmerr.F90) needs to get more attention for LELAM case. Obviously it is not used because we have LMODERR set to FALSE by default, but he asked me to add a preventive test in case where the key LMODERR is set to TRUE. So I added the next lines:

```
--------------------------------------------------
If (LMODERR)  THEN

CALL ABOR1 ('SUESCAL: suscalmerr.F90 MUST BE CHECKED FOR LAM')

CALL SUSCALMERR (YDMP, STRUCT%YSCALP)

ENDIF
----------------------------------------------------
```

This will be so helpful because it will remind the user (phaser or developer) to pay more attention and check the suscalmerr.F90.

The refactored suescal.F90 is now ready to fit in the code and it mainly has the same structure as its counterpart in GM suscal.F90.

3. Final phasing contribution:

After getting my user account on "merrou" and been introduced to work with GIT-GCO (by Alex), I provided two Git-branchs to GCO for CY45T1_R1 V03 and V04.

3. 1. Git branch for CY45T1_R1.03:

The first Git-branch was mostly dedicated to not compiled LAM routines, and some fixes (DFI, GPNORM), those modifications were added to CY45T1_R1.03 by GCO.

+ branch: abdenoura_CY45T1_lam_phasing.

+ version: abdenoura_CY45T1_lam_phasing/1.

+ modified:
aladin/var/ecosjr.F90
aladin/var/ecvargpad.F90
aladin/var/ecvargptl.F90
aladin/var/einflation_mean.F90
aladin/var/einflation_pert.F90
aladin/var/ejgnrgg.F90
aladin/var/ejgnrggad.F90
aladin/var/ejgnrggi.F90
aladin/var/ejgnrggiad.F90
aladin/var/ewreini.F90
aladin/var/sueinfce.F90
aladin/var/suescal.F90
aladin/wavelet/suejbwavalloc.F90
arpifs/dfi/dfi2.F90
arpifs/setup/su0yomb.F90
arpifs/utility/gpnorm_gfl.F90

+ doc:
phasing LAM routines.

3. 2. Git branch for CY45T1_R1.03:

The second Git-branch concerned the suescal.F90 refactoring; it has been added to CY45T1_R1.04 by GCO.

+ branch: abdenoura_CY45T1_suescal_refact

+ version: abdenoura_CY45T1_suescal_refact/1

+ added:

aladin/var/suescal_jb.F90
aladin/var/suescal_norms.F90

+ modified:

aladin/var/escaljgs.F90
aladin/var/suescal.F90
arpifs/obs_preproc/sugoms.F90
arpifs/setup/su0yomb.F90
arpifs/var/suscal_norms.F90

+ doc:

SUESCAL refactored and new routines SUESCAL_JB and SUESCAL_NORMS splited out from it, with some modifications in ESCALJGS in order to make it coherent with new SUESCAL.

<u>Appendix: LAM not compiled issues:</u>

```
suescal.F90(67): error #6580: Name in only-list does not exist.   [LTSCV
USE YOMVAR   , ONLY : LTOVSCV  ,LJCDFI   ,LMODERR  ,LTSCV    ,LVARBC
---------------------------------------------------------^
suescal.F90(71): error #6580: Name in only-list does not exist.   [TOVSCVX
USE YOMSATS  , ONLY : TOVSCVX
---------------------------------------------------------^
suescal.F90(75): error #7002: Error in opening the compiled module file.  Check INCLUDE paths.   [YOMTS
USE YOMTS    , ONLY : TSCVX
---------------------------------------------------------^
suescal.F90(147): error #6911: The syntax of this substring is invalid.   [TOVSCVX
IF(LTOVSCV) TOVSCVX(:,:)=1.0_JPRB
---------------------------------------------------------^
sueinfce.F90(257): error #6460: This is not a field name that is defined in the encompassing structure.
[FCERENBUF
   YD_JB_STRUCT%JB_DATA%FCERENBUF(:,:,1+(JKGLO-1)/YDGEOMETRY%YRDIM%NPROMA) = ZFCE
---------------------------------------------------------^
sueinfce.F90(257): error #6366: The shapes of the array expressions do not conform
   YD_JB_STRUCT%JB_DATA%FCERENBUF(:,:,1+(JKGLO-1)/YDGEOMETRY%YRDIM%NPROMA) = ZFCE
---------------------------------------------------------^
ecosjr.F90(148): error #6633: The type of the actual argument differs from the type of the dummy
argument.   [YDVARBC
  CALL STEPO(YDGEOMETRY,YDFIELDS,YDMTRAJ,YDMODEL,'0K0000000',YDVARBC)
---------------------------------------------------------^
ecosjr.F90(243): remark #8291: Recommended relationship between field width 'W' and the number of
fractional digits 'D' in this e...
  WRITE(UNIT=NULOUT,FMT='(1X,''SIMUL= '',I3,2X,''NSTEP = ''&
---------------------------------------------------------^
ejgnrggad.F90(78): error #6580: Name in only-list does not exist.   [NGRBVO
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrggad.F90(78): error #6580: Name in only-list does not exist.   [NGRBD
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrggad.F90(78): error #6580: Name in only-list does not exist.   [NGRBT
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrggad.F90(78): error #6580: Name in only-list does not exist.   [NGRBQ
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrggad.F90(78): error #6580: Name in only-list does not exist.   [NGRBLNSP
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrggad.F90(126): error #6460: This is not a field name that is defined in the encompassing structure.
[FCEBUF
ZFCE = YD_JB_STRUCT%JB_DATA%FCEBUF (:, :, 1+(KSTGLO-1)/YDGEOMETRY%YRDIM%NPROMA)
---------------------------------------------------------^
ejgnrggad.F90(133): error #6404: This name does not have a type, and must have an explicit type.
[NGRBVO
  IF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBVO) THEN
---------------------------------------------------------^
ejgnrggad.F90(136): error #6404: This name does not have a type, and must have an explicit type.
[NGRBD
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBD) THEN
---------------------------------------------------------^
ejgnrggad.F90(139): error #6404: This name does not have a type, and must have an explicit type.
[NGRBT
```

```
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBT) THEN
---------------------------------------------------------^
ejgnrggad.F90(142): error #6404: This name does not have a type, and must have an explicit type.
[NGRBQ
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBQ) THEN
---------------------------------------------------------^
ejgnrggad.F90(146): error #6404: This name does not have a type, and must have an explicit type.
[NGRBLNSP
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBLNSP) THEN
---------------------------------------------------------^
ejgnrgg.F90(79): error #6580: Name in only-list does not exist.   [NGRBVO
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrgg.F90(79): error #6580: Name in only-list does not exist.   [NGRBD
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrgg.F90(79): error #6580: Name in only-list does not exist.   [NGRBT
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrgg.F90(79): error #6580: Name in only-list does not exist.   [NGRBQ
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrgg.F90(79): error #6580: Name in only-list does not exist.   [NGRBLNSP
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrgg.F90(127): error #6460: This is not a field name that is defined in the encompassing structure.
[FCEBUF
ZFCE = YD_JB_STRUCT%JB_DATA%FCEBUF (:, :, 1+(KSTGLO-1)/YDGEOMETRY%YRDIM%NPROMA)
---------------------------------------------------------^
ejgnrgg.F90(134): error #6404: This name does not have a type, and must have an explicit type.
[NGRBVO
  IF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBVO) THEN
---------------------------------------------------------^
ejgnrgg.F90(137): error #6404: This name does not have a type, and must have an explicit type.   [NGRBD
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBD) THEN
---------------------------------------------------------^
ejgnrgg.F90(140): error #6404: This name does not have a type, and must have an explicit type.   [NGRBT
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBT) THEN
---------------------------------------------------------^
ejgnrgg.F90(143): error #6404: This name does not have a type, and must have an explicit type.   [NGRBQ
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBQ) THEN
---------------------------------------------------------^
ejgnrgg.F90(147): error #6404: This name does not have a type, and must have an explicit type.
[NGRBLNSP
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBLNSP) THEN
---------------------------------------------------------^
ejgnrggi.F90(75): error #6580: Name in only-list does not exist.   [NGRBVO
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrggi.F90(75): error #6580: Name in only-list does not exist.   [NGRBD
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrggi.F90(75): error #6580: Name in only-list does not exist.   [NGRBT
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrggi.F90(75): error #6580: Name in only-list does not exist.   [NGRBQ
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
---------------------------------------------------------^
ejgnrggi.F90(75): error #6580: Name in only-list does not exist.   [NGRBLNSP
```

```
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
--------------------------------------------------------^
ejgnrggi.F90(121): error #6460: This is not a field name that is defined in the encompassing structure.
[FCEBUF
ZFCE = YD_JB_STRUCT%JB_DATA%FCEBUF (:, :, 1+(KSTGLO-1)/YDGEOMETRY%YRDIM%NPROMA)
--------------------------------------------------------^
ejgnrggi.F90(128): error #6404: This name does not have a type, and must have an explicit type.
[NGRBVO
  IF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBVO) THEN
--------------------------------------------------------^
ejgnrggi.F90(131): error #6404: This name does not have a type, and must have an explicit type.   [NGRBD
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBD) THEN
--------------------------------------------------------^
ejgnrggi.F90(134): error #6404: This name does not have a type, and must have an explicit type.   [NGRBT
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBT) THEN
--------------------------------------------------------^
ejgnrggi.F90(137): error #6404: This name does not have a type, and must have an explicit type.   [NGRBQ
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBQ) THEN
--------------------------------------------------------^
ejgnrggi.F90(141): error #6404: This name does not have a type, and must have an explicit type.
[NGRBLNSP
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBLNSP) THEN
--------------------------------------------------------^
ejgnrggiad.F90(76): error #6580: Name in only-list does not exist.   [NGRBVO
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
--------------------------------------------------------^
ejgnrggiad.F90(76): error #6580: Name in only-list does not exist.   [NGRBD
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
--------------------------------------------------------^
ejgnrggiad.F90(76): error #6580: Name in only-list does not exist.   [NGRBT
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
--------------------------------------------------------^
ejgnrggiad.F90(76): error #6580: Name in only-list does not exist.   [NGRBQ
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
--------------------------------------------------------^
ejgnrggiad.F90(76): error #6580: Name in only-list does not exist.   [NGRBLNSP
USE YOMGRIB  , ONLY : NGRBVO, NGRBD, NGRBT, NGRBQ,  NGRBLNSP
--------------------------------------------------------^
ejgnrggiad.F90(124): error #6460: This is not a field name that is defined in the encompassing structure.
[FCEBUF
ZFCE = YD_JB_STRUCT%JB_DATA%FCEBUF (:, :, 1+(KSTGLO-1)/YDGEOMETRY%YRDIM%NPROMA)
--------------------------------------------------------^
ejgnrggiad.F90(132): error #6404: This name does not have a type, and must have an explicit type.
[NGRBVO
  IF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBVO) THEN
--------------------------------------------------------^
ejgnrggiad.F90(135): error #6404: This name does not have a type, and must have an explicit type.
[NGRBD
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBD) THEN
--------------------------------------------------------^
ejgnrggiad.F90(138): error #6404: This name does not have a type, and must have an explicit type.
[NGRBT
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBT) THEN
--------------------------------------------------------^
ejgnrggiad.F90(141): error #6404: This name does not have a type, and must have an explicit type.
[NGRBQ
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBQ) THEN
--------------------------------------------------------^
```

```
ejgnrggiad.F90(145): error #6404: This name does not have a type, and must have an explicit type.
[NGRBLNSP
  ELSEIF (YD_JB_STRUCT%SPJB_VARS_INFO(JFIELD)%IGRIBCODE==NGRBLNSP) THEN
---------------------------------------------------------^
ecvargpad.F90(101): error #6460: This is not a field name that is defined in the encompassing structure.
[FCERENBUF
   ZFCE=YD_JB_STRUCT%JB_DATA%FCERENBUF(:,:,1+(JKGLO-1)/YDGEOMETRY%YRDIM%NPROMA)
---------------------------------------------------------^
ecvargptl.F90(99): error #6460: This is not a field name that is defined in the encompassing structure.
[FCERENBUF
   ZFCE=YD_JB_STRUCT%JB_DATA%FCERENBUF(:,:,1+(JKGLO-1)/YDGEOMETRY%YRDIM%NPROMA)
---------------------------------------------------------^
ewreini.F90(88): error #6633: The type of the actual argument differs from the type of the dummy
argument.   [YDVARBC
CALL STEPO(YDGEOMETRY,YDFIELDS,YDMTRAJ,YDMODEL,'A00000000',YDVARBC)
-----------------------------------------------------------^
suejbwavalloc.F90(167): error #6793: The POINTER attribute is required.   [VOR
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_HOR%VOR =>
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_HOR%DATA_3D(:,:,:,:,1)
---------------------------------------------------------^
suejbwavalloc.F90(168): error #6793: The POINTER attribute is required.   [DIV
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_HOR%DIV =>
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_HOR%DATA_3D(:,:,:,:,2)
---------------------------------------------------------^
suejbwavalloc.F90(169): error #6793: The POINTER attribute is required.   [TMP
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_HOR%TMP =>
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_HOR%DATA_3D(:,:,:,:,3)
---------------------------------------------------------^
suejbwavalloc.F90(170): error #6793: The POINTER attribute is required.   [HUM
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_HOR%HUM =>
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_HOR%DATA_3D(:,:,:,:,4)
---------------------------------------------------------^
suejbwavalloc.F90(174): error #6793: The POINTER attribute is required.   [SP
  JB_STRUCT%LAMWAVELET_GRID%WAV_CV_HOR%SP =>
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_HOR%DATA_2D(:,:,:,1)
---------------------------------------------------------^
suejbwavalloc.F90(216): error #6793: The POINTER attribute is required.   [VOR
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_VER%VOR =>
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_VER%DATA_3D(:,:,:,:,1)
---------------------------------------------------------^
suejbwavalloc.F90(217): error #6793: The POINTER attribute is required.   [DIV
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_VER%DIV =>
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_VER%DATA_3D(:,:,:,:,2)
---------------------------------------------------------^
suejbwavalloc.F90(218): error #6793: The POINTER attribute is required.   [HUM
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_VER%HUM =>
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_VER%DATA_3D(:,:,:,:,3)
---------------------------------------------------------^
suejbwavalloc.F90(219): error #6793: The POINTER attribute is required.   [TMPSP
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_VER%TMPSP =>
JB_STRUCT%LAMWAVELET_GRID%WAV_CV_VER%DATA_3DSP(:,:,:,:,1)
---------------------------------------------------------^
suejbwavalloc.F90(232): error #6793: The POINTER attribute is required.   [VOR
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVEC%VOR =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVEC%DATA_3D(:,:,:,:,1)
---------------------------------------------------------^
suejbwavalloc.F90(233): error #6793: The POINTER attribute is required.   [DIV
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVEC%DIV =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVEC%DATA_3D(:,:,:,:,2)
```

```
----------------------------------------------------------------------^
suejbwavalloc.F90(234): error #6793: The POINTER attribute is required.   [HUM
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVEC%HUM =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVEC%DATA_3D(:,:,:,:,3)
----------------------------------------------------------------------^
suejbwavalloc.F90(235): error #6793: The POINTER attribute is required.   [TMPSP
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVEC%TMPSP =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVEC%DATA_3DSP(:,:,:,:,1)
----------------------------------------------------------------------^
suejbwavalloc.F90(244): error #6793: The POINTER attribute is required.   [VOR
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVAL%VOR =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVAL%DATA_3D(:,:,:,:,1)
----------------------------------------------------------------------^
suejbwavalloc.F90(245): error #6793: The POINTER attribute is required.   [DIV
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVAL%DIV =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVAL%DATA_3D(:,:,:,:,2)
----------------------------------------------------------------------^
suejbwavalloc.F90(246): error #6793: The POINTER attribute is required.   [HUM
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVAL%HUM =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVAL%DATA_3D(:,:,:,:,3)
----------------------------------------------------------------------^
suejbwavalloc.F90(247): error #6793: The POINTER attribute is required.   [TMPSP
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVAL%TMPSP =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_EIGVAL%DATA_3DSP(:,:,:,:,1)
----------------------------------------------------------------------^
suejbwavalloc.F90(256): error #6793: The POINTER attribute is required.   [VOR
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_SIGMAB%VOR =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_SIGMAB%DATA_3D(:,:,:,:,1)
----------------------------------------------------------------------^
suejbwavalloc.F90(257): error #6793: The POINTER attribute is required.   [DIV
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_SIGMAB%DIV =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_SIGMAB%DATA_3D(:,:,:,:,2)
----------------------------------------------------------------------^
suejbwavalloc.F90(258): error #6793: The POINTER attribute is required.   [TMP
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_SIGMAB%TMP =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_SIGMAB%DATA_3D(:,:,:,:,3)
----------------------------------------------------------------------^
suejbwavalloc.F90(259): error #6793: The POINTER attribute is required.   [HUM
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_SIGMAB%HUM =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_SIGMAB%DATA_3D(:,:,:,:,4)
----------------------------------------------------------------------^
suejbwavalloc.F90(263): error #6793: The POINTER attribute is required.   [SP
  JB_STRUCT%LAMWAVELET_VCOR%WAV_B_SIGMAB%SP =>
JB_STRUCT%LAMWAVELET_VCOR%WAV_B_SIGMAB%DATA_2D(:,:,:,1)
----------------------------------------------------------------------^
```