

# Phasing report

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# 1 Introduction

This short report summarizes items tackled during the phasing of cy37\_t1 (pre-cycle).

## 2 ALARO validation

Following the report of Mate Mile validation work of ALARO was based on the reference experiment from /cnrm/gp/mrpe/mrpe693/mitraille/al37\_ref\_Karim and the latest pre-cycle executable from /mf/dp/marp/marp001/packs/cy37\_t1.04.SX20r411.x.pack/bin/MASTER. But as additional modifications were provided from Prague team both reference and pre-cycle have to be recompiled.

### 2.1 Status

As the modification related to PTKE were non-reproducible (a bug correction affects the norms) the particular routine (acptke.F90) was for the purpose of the validation first phased in the way to keep the bit-reproducibility with respect to the reference executable. And the new version (with an impact on the norms) was included as the last step of the validation. The latest results gave satisfactory results also with respect to CHMI operational executable. Thus ALARO is supposed to be validated on cy37\_t1\_04 with a few bugfixes. The complete list of the source code modifications, which are supposed to enter cy37\_t1 version 05 are summarized in the next subsection.

The results of Mitraillette can be found on yuki in /cnrm/gp/mrpe/mrpe694/mitraille/al37t1 for mono jobs (mitraille.0027 recompiled reference, mitraille.0028 acptke.F90 version for identical reproduction of the reference, mitraille.0029 acptke.F90 version without bit reproducibility (fix in the PTKE solver)) and for multi jobs (mitraille.0030 recompiled reference, mitraille.0031 acptke.F90 version for identical reproduction of the reference, mitraille.0032 acptke.F90 version without bit reproducibility (fix in the PTKE solver)). The reference and pre-cycle executables were following: /cnrm/gp/mrpe/mrpe694/pack/cy37\_t1\_04\_alarobfix/bin/MASTER and /cnrm/gp/mrpe/mrpe694/pack/dev37pour37t1dalarobf/bin/MASTER.

### 2.2 Source code modifications

This subsection summarizes the source code modification done during the validation of ALARO configuration. All of them are available in ClearCase branch **arp\_mrpe694\_CY37\_abf**.

#### 2.2.1 Additional modifications

Two additional modifications were provided from Prague team at the beginning of the validations to be included both in the reference and pre-cycle (CY37-T1).

- **arp/setup/sudyn.F90** change of default value for parameter SLHDRATDDIV to 1.0\_JPRB (recommendation by Filip Vana)
- **arp/phys\_dmn/aplpar.F90** two lines marked by !fix were deleted accidentally during last phasing. The lines concern downdraft evaporation to be subtracted from precipitations (after call to ACMODO): these lines are present in CY35 and should stay. (bug and fix found by Radmila Brozkova)

```
! -----  
! UPDATE VARIABLES BY DOWNDRAUGHT CONTRIBUTION  
! -----  
!  
  
DO JLEV=KTDIA,KLEV
```

```

DO JLON=KIDIA,KFDIA

!   UPDATE CONVECTIVE DIFFUSION AND EVAPORATION FLUXES
!   -----

PDIFCS(JLON,JLEV) =PDIFCS(JLON,JLEV) +ZDIFCS(D(JLON,JLEV)
PDIFCQ(JLON,JLEV) =PDIFCQ(JLON,JLEV) +ZDIFCQ(D(JLON,JLEV)
PDIFCQL(JLON,JLEV)=PDIFCQL(JLON,JLEV)+ZDIFCQLD(JLON,JLEV)
PDIFCQI(JLON,JLEV)=PDIFCQI(JLON,JLEV)+ZDIFCQID(JLON,JLEV)
PSTRCU(JLON,JLEV)=PSTRCU(JLON,JLEV)+ZSTRCUD(JLON,JLEV)
PSTRCV(JLON,JLEV)=PSTRCV(JLON,JLEV)+ZSTRCVD(JLON,JLEV)
PFPLSL(JLON,JLEV)=PFPLSL(JLON,JLEV)-PFPEVPCL(JLON,JLEV) !fix
PFPLSN(JLON,JLEV)=PFPLSN(JLON,JLEV)-PFPEVPCN(JLON,JLEV) !fix
ENDDO
ENDDO

CALL ACUPD(KIDIA,....

```

### 2.2.2 Missing branch

Based on the analysis of the source code and debugging it was found that the branch **mrpe684\_CY36T1\_3mtbf** was not included both in the reference and CY37T1. This was also confirmed by Olivier Riviere. So the branch was phased.

- **arp/phys\_dmn/acmodo.F90** - correction of downdraft sigma, protection on possible evaporation
- **arp/phys\_dmn/acupd.F90** - correction of evaporating fluxes computation due to downdraft

### 2.2.3 Duplication of GPNORMS print

During validation it was noticed that "GPNORMS OF FIELDS TO BE WRITTEN OUT ON FILE" print is duplicated in the listing of forecast configuration. A fix was provided by Philippe MARGUINAUD.

- **arp/utility/wrgp2fa.F90**

### 2.2.4 Bugfix for PTKE

Filip Vana provided the modifications related to the optimization of NPROMA, bug fixes for PTKE (fixed ACPTKE, added missing computation of Richardson number to ACHMT necessary for ACMIXLEN).

- **ald/setup/suemp.F90** - optimization of NPROMA
- **arp/setup/su0phy.F90**
- **arp/phys\_dmn/acptke.F90**
- **arp/pp\_obs/ppobsac.F90**
- **arp/phys\_dmn/achmt.F90**
- **arp/phys\_dmn/actkehmt.F90**
- **arp/phys\_dmn/acmripp.F90**
- **arp/phys\_dmn/hl\_aplpar.F90**
- **arp/canari/caclsi.F90**
- **arp/fullpos/fpachmt.F90**
- **arp/phys\_dmn/aplpar.F90**

### 2.2.5 DDH - fix of the "old" DDH data-flow in case of ALARO

This fix provided by Radmila Brozkova restores development made originally by Tomislav Kovacic in 2007. It defines physical fluxes according to new interface by Catry et al (2007) and coded in `cptend_new.F90`, plus it defines their position in DHCV array. It should be cleaned up when new data-flow in DDH is reliable.

New decks:

- `arp/module/yomphft.F90`
- `arp/dia/addft.F90`
- `arp/dia/iniapft_bp002.F90`

Modified decks:

- `arp/dia/sualtdh.F90`
- `arp/dia/ppfidh.F90`

## 3 Interface for ALARO+Surfex

Filip Vana provided a bug fix for the ALARO+Surfex configuration. In particular case of ALARO there is a need to have available the exchange coefficients Cd/Ch before the first call of Surfex to be used in upper-air part of the physics. And on the top of that there is missing dependency of the exchange coefficients on the snow, as snow information from Surfex was introduced only recently. This dependency is to be coded/phased.

### 3.1 Status

Concerning computation of the exchange coefficients there is a need to properly initialize all necessary input parameters (at the moments it seems that roughness lengths should be sufficient). Several ways to do that were proposed in short term:

- temporarily initialize roughness length by an artificial value for the diagnostic time-step 0. This option was tested but the initial value affects the results of the subsequent forecast of ALARO
- to get the diagnostics values of the roughness length from the Surfex at the beginning of the physic's computation (via `ARP_GROUN_DIAG`). This fails on "Floating-point zero division"
- proper initialization of the roughness length from the Surfex (via `PGPAR` or alternatively).

As the first two options were not successful and the last one was not tackled due to lack of time, this issue was stopped as a phasing action and is being discussed to be rather considered as a further R&D one.

### 3.2 Source code modifications

The source code modification (including temporarily initialization of roughness length by an artificial value for the diagnostic time-step 0 to avoid crash during an execution) are stored in ClearCase branch `arp_mrpe694_CY37_alarosfx`. This branch was not considered to enter the pre-cycle for the time being.

- `arp/phys_dmn/achmtls.F90`
- `arp/phys_dmn/actkehmtls.F90`
- `arp/phys_dmn/aplpar.F90`

## 4 ALADIN+Surfex data assimilation - CY37\_t1

A three days cycling of ALADIN+Surfex experiment (based on the current double suite - cy36t1\_op2) was considered as reference (OLIVE experiment **83YE** on **sxcoope1**, user **mrpe694**). And a new experiment **83YM** was set up to test CY37<sup>1.04</sup> + the latest modsets for the pre-cycle, e.g. ALARO branch (arp\_mrpe694\_CY37\_abf) and the modification for Surfex from Yann Seity (/cnrm/gp/mrpm/mrpm637/pack/test\_bccasepour37\_t1v5/). A specific setting of the pre-cycle experiment is more detailed in separate subsection.

### 4.1 Encountered problems

- surface canari

```
1:57:54 Fin initialisation sur obs.
```

```
**** 90 Fatal exception PROG=mdl_broadcast_mod.mdl_broadcast_int_scalar ELN=656(4078e
```

```
SIGXABT: Distributed parallel program aborted
```

```
Called from caclsst ELN=577(400f4853c)
```

```
Called from canari ELN=1065(4007184a8)
```

```
Called from can1 ELN=193(40070c208)
```

```
Called from cnt0 ELN=331(4000034f0)
```

```
Called from master ELN=92(400000db0)
```

```
Meteo::Binary_ARPIFS[221]: cat( stdout.canari-0000.0 )
```

Most probably problem of the merge of HIRLAM modset. There is an attempt to read SURFTEMPERATURE from SST file, which in Meteo France configuration contains only SURFSST.CLIM used for relaxation towards NESDIS analysis. After discussion with Françoise Taillefer this modset was suppressed (using CACLSST from main release). Afterwards surface canari runs ok. In separate experiment (Olive **83YO**) with the guess from the reference the OBD-MOD and norms are identical.

- screening

```
ADDVIEWDB("links_modsurf" : db="ECMA") : total#, dbhandle, viewhandle, thread-id =
```

```
**** 90 Fatal exception PROG=odb.odb_select ELN=1215(400862d10)
```

```
SIGBUS: Bus error
```

```
Called from ctxgetdb ELN=1162(4096b6770)
```

```
Called from getdb ELN=1098(40966efa8)
```

```
Called from init_odb_tables ELN=851(415958a6c)
```

```
Called from obadat ELN=635(4116ae5dc)
```

```
Called from sudimo ELN=175(40b534e0c)
```

```
Called from su0yomb ELN=683(40a71eea8)
```

```
Called from cnt0 ELN=270(400002238)
```

```
Called from master ELN=92(400000db0)
```

This crash can be avoided by setting variable SWAPP\_ODB\_TKVERSION to cy37.

### 4.2 Status

At the moment the ALADIN+Surfex data assimilation configuration works technically on pre-cycle, more appropriate solution could be considered for the surface CANARI problem related to SST and further scientific validation is needed.

### 4.3 Olive - specific setting for pre-cycle experiment

- updated ODB related executables (aladin, batodb, ioassign, odbtools, mergevarbc)
- parambator (configuration file obtained from Françoise Taillefer)
- parambator added to task surfan/batodb
- new variables to be set

```
SWAPP_DEBUG_NOBS      1
SWAPP_ODB_TKVERSION   cy37
```

- gnam

```
&NACIETEO
/
&NAEAEM7
/
&NAERAD
  NCALLRAD=--,
/
&NAMCA
/
&NAMENKF
/
&NAMGWD
/
&NAMGWMS
/
&NAMJG
  LSBQ_STRATOLOW=--,
/
&NAMOBS
  LHDREJ=--,
  LHDRRH2=--,
  LHDRT2=--,
  LHDRW10=--,
  LOBCLN=--,
  LSCATT_NEUTRAL=--,
  LSLRRH2=--,
  LSLRT2=--,
  LSLRW10=--,
/
&NAMPHMSE
/
&NAMPHY
  NCALLRAD=2,
/
&NAMPPC
  LMOVIE=--,
  MPLEV=--,
/
&NAMSATS
  LCO2_DIAG_IASI=.TRUE.,
  LCO2_DIAG_IASI=.FALSE.,
/
&NAMVARBC_AIREP
  LBC_ACARS=.FALSE.,
  LBC_AIRCT=.FALSE.,
  LBC_AIREP=.FALSE.,
  LBC_AMDAR=.FALSE.,
  LBC_CODAR=.FALSE.,
  LBC_COLBA=.FALSE.,
/
&NAM_SEAFLUXn
  LPWG=--,
/
&NAM_SSO_n
  XFRACZO=10.,
/
&NEMCTO
  NBICOP=--,
  NBICOQ=--,
  NBICOT=--,
  NBICOU=--,
```

```
NECRIPL=--,
/
&NEMDYN
  TEFRCL=--,
/
&NEMELBCOA
  NBICOP=2,
  NBICOQ=2,
  NBICOT=2,
  NBICOU=2,
  NECRIPL=1,
/
&NEMELBCOB
  TEFRCL=10800.,
/
```