

## Export version — CY40T1

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This note goes along with the package of the so-called “*export version*” of CY40T1. It describes some technical details about this cycle and the accompanying material :

- validation upon 2 weeks of AROME-3DVAR.
- pruning of the command-line arguments, transferred to namelist.
- SURFEX specificities.
- shifts in observations formatting.
- advertising about EPyGrAM : a toolbox and a Python library to deal with fields and FA’s.

### 1 Validation

CY40T1\_bf has been run over two October 2014 weeks of AROME-France cycled 3D-VAR configuration. The meteorological acceptability has been evaluated by comparison of scores with the operational AROME-France by that date (based on CY38T1+). The aim is to check that no systematic error or divergence is observed, with regards to synoptic parameters (temperature, moisture, wind and geopotential : bias and rms) and physical processes (precipitation : normalized Brier Skill Score). These scores have been computed against the ECMWF analysis, TEMP radiosondes observations, and rain gauges.

The only negative signal observed concerned temperature around 850hPa with regards to ECMWF analysis. However, as this signal is not observed against TEMP radiosondes, it is not considered worrying.

Figure 1 show the scores against TEMP for temperature, wind and relative humidity at 24h term. Blue curve is CY40T1\_bf, while red curve is the operational AROME-France model at that time. Dashed curves are bias, plain curves are RMS.

Figure 2 show Brier Skill Score for precipitation, with an aggregation square of 52.8km. These scores are though to be taken precautiously, as precipitation scores are ususally computed over a period longer than two weeks to be consolidated.

Validation of the assimilation process is also assessed by so-called *obstats* : repartition of obs-guess and obs-analysis departures in observations space. Figure 3 shows *obstats* for TEMP temperature (bias, rms), SEVIRI brightness temperatures (bias, rms) and CONV 2m-temperature (histogram) observations.

ALARO-0&1 forecast configurations have also been validated (cf. R. Brožková / CHMI). The namelists are herein included.

No ALADIN without SURFEX has been tested with this configuration. However, an ALADIN (with SURFEX) and an ARPEGE forecast have been validated by the routine tests *Mitraillette*.

## 2 Command-line arguments

The command-line arguments have been removed in CY40T1. They now are given in the new namelist block `&NAMARG`. The namelists provided in this export version have been updated accordingly.

However, for a smoother transition, a wrapper has been developed (by R. El Khatib), that converts *on the fly* the command-line arguments to the namelist. It is attached to this package under the name `arg2nam_wrapper`. It should be used as follows :

```
% mpirun [arguments to mpirun] arg2nam_wrapper EXECUTABLE [arguments to EXECUTABLE]
```

## 3 SURFEX specificities

There is a new version of SURFEX in CY40T1 : 7.3

Therefore the PGD file must be rebuilt. As a reminder, PGD/e923 scripts can be found on *beaufix* : `/home/gmap/mrpa/tailleferf/clim/partenaires/cy41/` (these scripts refer to CY41, but they can be used for CY40T1, as the SURFEX version is the same).

A short note describing how to unplug SURFEX is appended at the end of this note. ALADIN without SURFEX has though not been tested with this cycle.

## 4 TAC2BUFR migration

From November 2014, an international format migration of some observations is progressively being performed, from TAC to BUFR. This migration concerns land, marine and aircraft conventional observations, as well as TEMP radiosondes. After a period of parallel diffusion of the observations in both formats, the TAC format is progressively being abandoned. For more information, we highly recommend to consult <https://software.ecmwf.int/wiki/display/TCBUF/TAC+To+BUFR+Migration>.

The code in this export version has been built before the beginning of the migration, and therefore the corresponding BATOR decoding code is not able to process these observations (no more than an older export version, e.g. 38T1, if no adaptation has been done by partners locally). No backphasing has been done on the BATOR code, but the code changes implemented by Météo-France to decode BUFR instead of TAC for these observations may be provided on demand. However, we stress here that any specific TAC2BUFR action shall be arranged in close coordination with the Aladin PM and ACNA, and coordination and support between Aladin countries will be promoted.

## 5 EPyGrAM

The **EPyGrAM** package has been developed recently in Python, in order to provide both :

- a Python object-oriented library (called **epygram**) able to read FA, GRIB and other formats, and providing a consistent and friendly handling of meteorological fields.
- a set of applicative tools, accessible by command-line, and able for instance to plot a field from a FA file somehow quickly.

As an example of the facilities it offers :

- applicative tools : the simple following command  
`fa_plot.py ICMSHAROM+0005 -f SURFTEMPERATURE`  
gives the Figure 4.
- library : the below Python sequence also give the same figure (but for S060TEMPERATURE!).

```
import epygram
epygram.SpecialEnvironment() # setup environment
myfile = epygram.formats_factory.resource('ICMSHAROM+0005', 'r')
myfield = myfile.readfield('S060TEMPERATURE')
myfield.sp2gp() # transform spectral field to gridpoint
fig = myfield.plotfield()
fig.savefig('myfigure.png')
```

It is worth mentioning here that the installation of this package is only possible from this cycle 40T1 onwards, because of the inclusion therein of some Fortran interfaces routines of FA, LFI and spectral transforms for Python. It also requires the latest version of **gmckpack**, namely **v6.6.1**, for building the shared object library `FA_LFI_trans4py.so`, then called from **epygram** Python classes.

A longer description, the installation guide, and the package itself can be obtained on demand (to [alexandre.mary@meteo.fr](mailto:alexandre.mary@meteo.fr)).

FIGURE 1 – Scores against TEMP radiosondes observations at 24h forecasts term. Mean observation number on the domain for each forecast : 24.

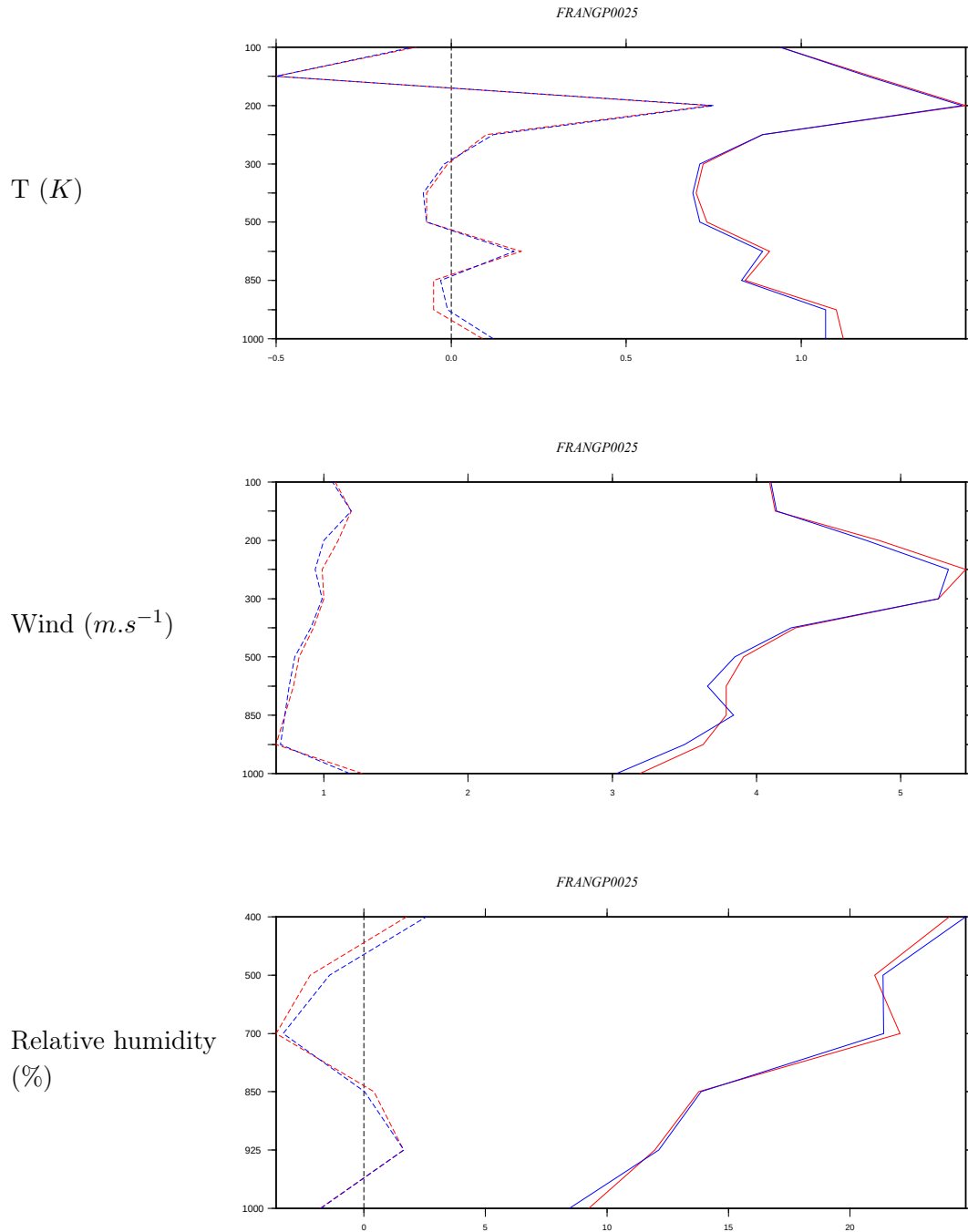


FIGURE 2 – Scores against rain gauges.



FIGURE 3 – “Obstats” : repartition of obs-guess and obs-analysis departures. Operational AROME-France in red, CY40T1\_bf .03 in black.

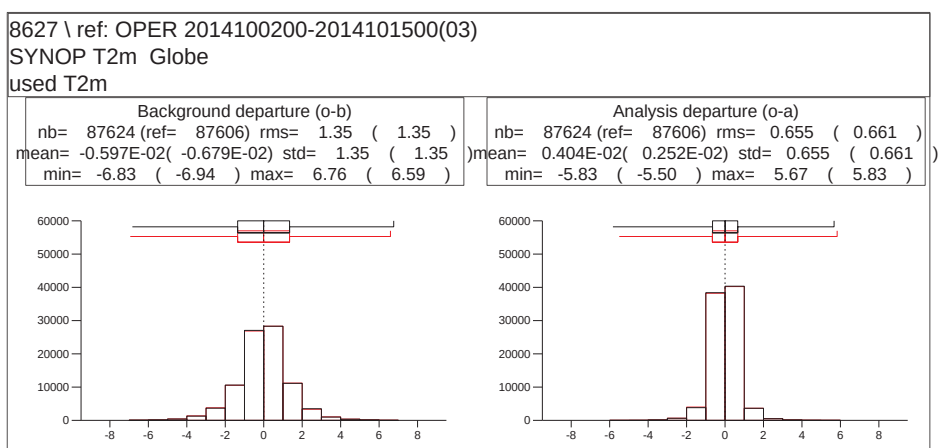
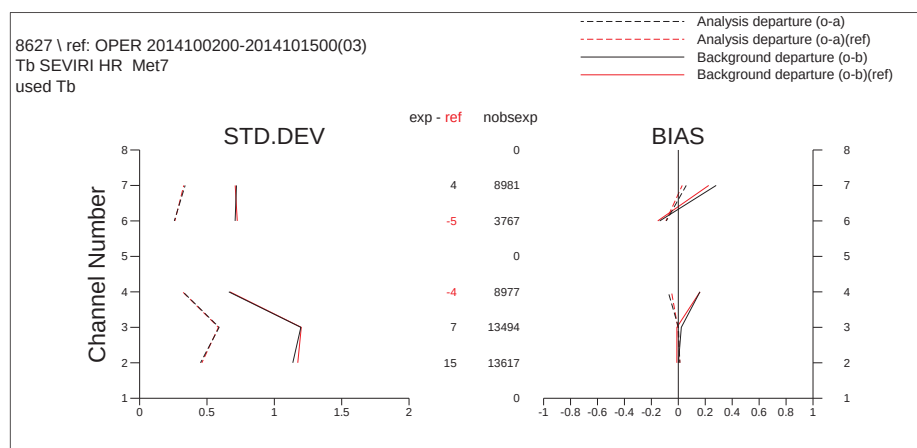
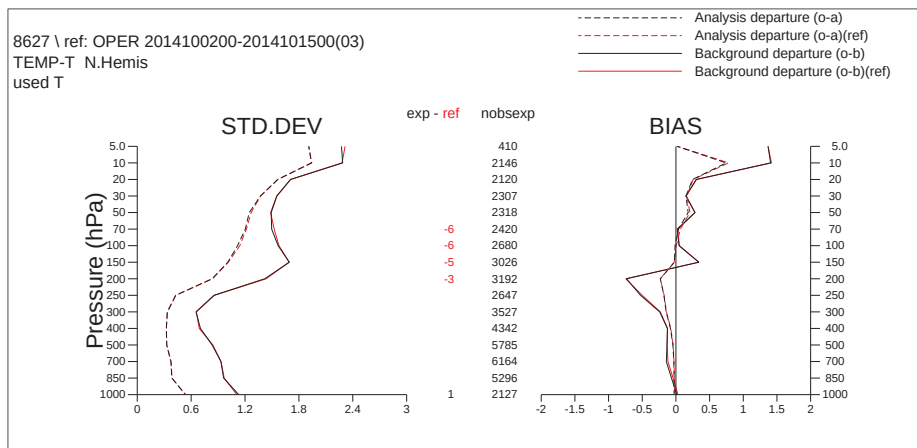
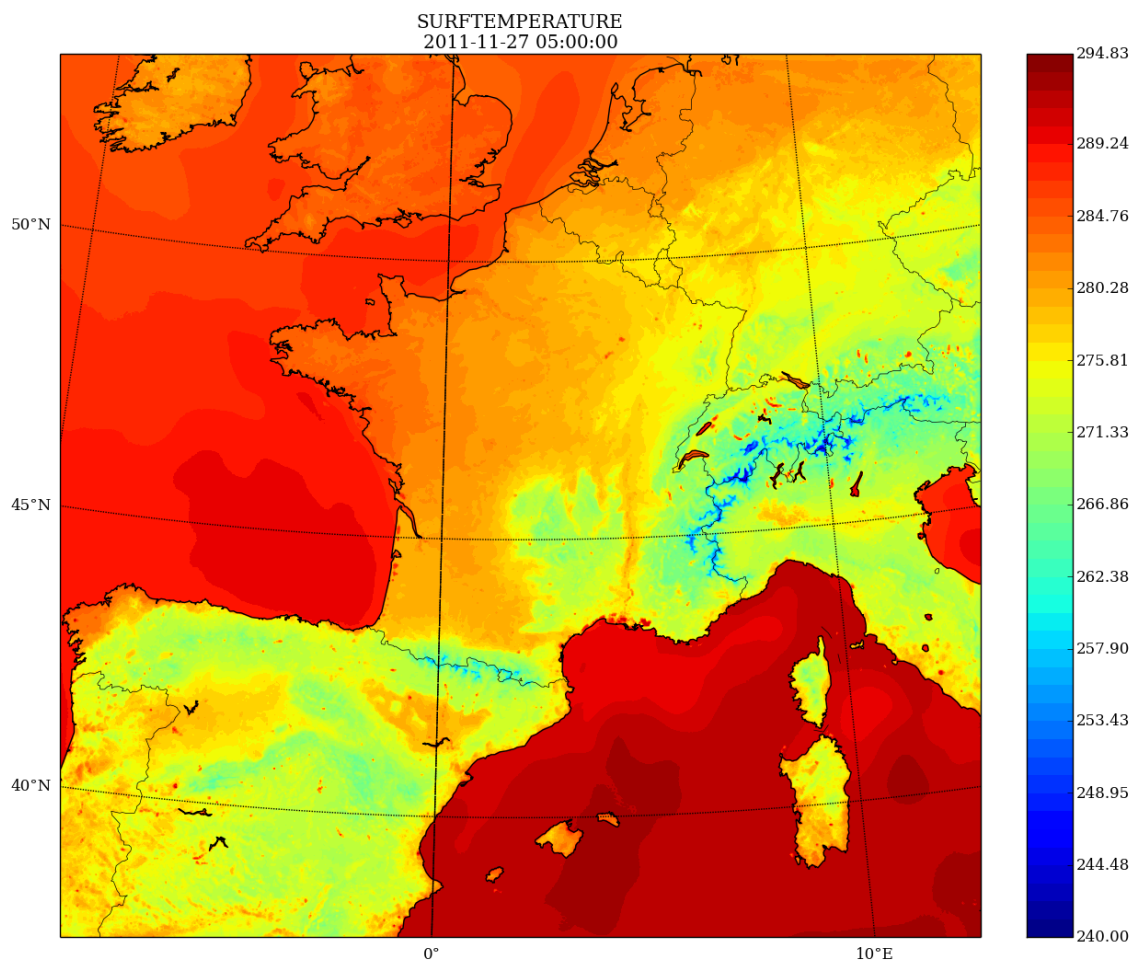


FIGURE 4 – Surface temperature of an AROME-France simulation.



## Differences in Namelist for unplugging SURFEX from ALADIN in CY40T1

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The EXternalised SURFace platform (SURFEX) has been included in ALADIN since al36t1\_op2.

The namelists provided within the export version of CY40T1 do use SURFEX, within AROME; this updated note briefly describes how to unplug SURFEX from an ALADIN configuration.

Plugging/unplugging SURFEX in the model is done specifying key LMSE, along with a few side effects. The deltas below describe it.

```
:::::::::::
```

```
namel_previ
```

```
:::::::::::
```

```
&NAMARPHY
```

```
LMSE=.FALSE.,
```

```
/
```

```
&NAMCT1
```

```
N1SFXHIS=0,
```

```
! no SFX output historical file is needed.
```

```
/
```

```
&NAMFPC
```

```
NFPLI=3,
```

```
! in Full-Pos (inline), to use the climatologic
```

```
fields of the output domain instead of
```

```
interpolating it from the model input grid
```

```
fields. This is not done with SURFEX because then,
```

```
climatologic fields are read from the SURFEX file.
```

```
/
```

```
:::::::::::
```

```
namel_previ_dyn
```

```
:::::::::::
```



```

&NAMARPHY
  LMSE=.FALSE.,
/
&NAMCT1
  N1SFXHIS=0,
/
&NAMFPC
  NFPCLI=3,
/
&NAMINI
  LDFI=.TRUE.,           ! the DFI was unplugged in Dynamical Adaptation
                          ! mode with SURFEX because of a date inconsistency
                          ! bug between SFX files and FA files. Although this
                          ! problem may have been corrected, DFI are not used
                          ! anymore in AROME at Météo-France.
/

```

```

::::::::::::::::::
namel_canari_surf
::::::::::::::::::

```

```

&NACTEX
  LAEICS=.TRUE.,       ! computation of surface and soil fields (done
                          ! within SURFEX when plugged).
/
&NACVEG
  L_SM_WP=.TRUE.,     ! smoothing of Wp, deep soil wetness index (done
                          ! within SURFEX when plugged).
/
&NAMAFN
  TFP_I%LLGP=.TRUE.,  !
  TFP_L%LLGP=.TRUE.,  ! gridpoint writing, linked with ( $\Delta$ ).
/
&NAMFA
  YFAI%NBITS=16,      !
  YFAL%NBITS=16,      !
  YFAR%NBITS=16,      ! compressing options to be restored, linked with ( $\Delta$ ).
  YFAS%NBITS=16,      !
/
&NAMGFL
  YI_NL%LGPINGP=.FALSE., !
  YI_NL%LGP=.TRUE.,     !
  YI_NL%LT1=.TRUE.,     !
  YI_NL%LPHY=.FALSE.,  !
  YI_NL%NREQIN=-1,     !

```

```

YI_NL%REFVALI=0.0,      !
YI_NL%LREQOUT=.TRUE.,  !
YL_NL%LGPINGP=.FALSE., !
YL_NL%LGP=.TRUE.,      !
YL_NL%LT1=.TRUE.,      !
YL_NL%LPHY=.FALSE.,    !
YL_NL%NREQIN=-1,       !
YL_NL%REFVALI=0.0,     !
YL_NL%LREQOUT=.TRUE.,  !
YR_NL%LGPINGP=.FALSE., !
YR_NL%LGP=.TRUE.,      !
YR_NL%LT1=.TRUE.,      !
YR_NL%LPHY=.FALSE.,    !
YR_NL%NREQIN=-1,       !
YR_NL%REFVALI=0.0,     !
YR_NL%LREQOUT=.TRUE.,  !
YS_NL%LGPINGP=.FALSE., !
YS_NL%LGP=.TRUE.,      !
YS_NL%LT1=.TRUE.,      !
YS_NL%LPHY=.FALSE.,    !
YS_NL%NREQIN=-1,       !
YS_NL%REFVALI=0.0,     !
YS_NL%LREQOUT=.TRUE.,  !
YTKE_NL%LGP=.TRUE.,    !
YTKE_NL%LGPINGP=.FALSE., !
YTKE_NL%LREQOUT=.TRUE., !
YTKE_NL%LT1=.TRUE.,    !
YTKE_NL%NREQIN=1,      !
/
&NAMPHY
  LVGSN=.TRUE.,         !
  LO3ABC=.TRUE.,        !
  LAEROSEA=.TRUE.,      ! restore writing of old ISBA snow fields, along
  LAEROLAN=.TRUE.,      ! with Ozone and aerosols in Canari output FA files.
  LAEROSOO=.TRUE.,      !
  LAERODES=.TRUE.,      !
/

```