

User's guide on how to cope with Arpege-surfex. Scripts and namelists

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1/ Introduction

The aim of this user's guide is to give some help on how to 'deal' with LBC files coming from a model run with Surfex (Arpege-surfex in our case).

The base cycle of the tests was cy41t1_op1.10 which has version 7.3 of Surfex.
The coupling model is Arpege T1198 with Surfex on.

2/ Addsurf

The altitude files provided by a model run with Surfex contain less fields than the ones coming from a "classic" run (mainly the ISBA fields), hence the need to use an addsurf in order to be able to run further configurations (like coupling, or postprocessing for example).

Cause the setup of the model is done so it will look for these fields hard in the code.

By namelist, you can turn off some of them (LSOLV, LFGEL, LVGSN, ...), but three fields remain irreducibles :

```
SURFEMISSIVITE  
SURFALBEDO  
SURFZ0.FOIS.G
```

In the case of LAROME, these fields are not activated.

As a first approach, to work around this problem we used an addsurf tool which reads these fields in a climate file and put them in the altitude files.

The best method would be to clean up the code to ignore these fields when the input file comes from a run with SURFEX.

So, if you want to use addsurf, here's how to do it (use of **lfitools** binary from your pack) :

```
file_clim=clim_t1198_isba01
file_previ=$WORKDIR/arp/ICMSHARPE+0000
cp ${file_clim} fic1          # 923 atmosphere clim file
cp ${file_previ} fic2        # atmospheric forecast file

cat << EOF > dirfa
OUV
77 T fic1 OLD T T 2 0 cadre
OUV
88 T fic2 OLD T T 2 0 cadre2
CILE
77 SURF 0 EMISSIVITE F
IENC
88 SURF 0 EMISSIVITE F
CILE
77 SURF 0 ALBEDO F
IENC
88 SURF 0 ALBEDO F
CILE
77 SURF 0 Z0.FOIS.G F
IENC
88 SURF 0 Z0.FOIS.G F
FER
77 KEEP
FER
88 KEEP
FIN
EOF

lfitools testfa < dirfa

mv fic2 ${file_previ}_add
```

The output file `${file_previ}_add` can be used in the coupling procedure without any problem.

The three fields are only added for the model setup purposes (purely technical) and will not be used later.

You will find an example of an addsurf script in this path on beaufix :
`/home/gmap/mrpe/jidanem/scripts/Arpege_to_Arome/addsurf`

To make things cleaner, it was decided to change the code so the reading of these fields is put under a logical key (LCPLMSE in NAMPHY).

The list of modified sources is :

```
arpifs/module/yomphy.F90
arpifs/namelist/namphy.nam.h
arpifs/setup/su0phy.F90
arpifs/setup/su_surf_flds.F90
```

With this modset, no more need of an addsurf before the coupling (e927).
Just put LCPLMSE to TRUE in NAMPHY and you're done.

3/ Coupling

If you did an addsurf before, just put the output file `${file_previ}_add` from your addsurf as input file for your coupling procedure and you're done (the old fashion way).

If you build your binary with the changes mentioned above, for not having any crash in the coupling procedure concerning ISBA fields like those :

```
ABORT! 6 RDFA2GP: FIELD IS MISSING :SURFZ0.FOIS.G
ABORT! 7 RDFA2GP: FIELD IS MISSING :SURFALBEDO
ABORT! 8 RDFA2GP: FIELD IS MISSING :SURFEMISSIVITE
```

just put in the namelist NAMPHY :

```
LCPLMSE=.TRUE. ,
```

(and check you have `LSOLV=.FALSE.`)

And you can use `${file_previ}` as input file to your coupling procedure without having to do previously any addsurf.

You will find examples of coupling scripts in this path on beaufix (Arpege_to_Arome, Arpege_to_Aladin or Aladin_to_Arome depending on what you want to do) :
`/home/gmap/mrpe/jidanem/scripts/*/coupling`

4/ Prep

To make a "surface coupling", just to prepare the initial surface file for the model in fact, we use PREP instead of couplingsurf since our coupling model ran with Surfex.

PREP is a program that allows to switch from one Surfex file to another one (geometry changes, different surface schemes, ...).

It initializes the prognostic variables of the surface scheme as the temperature profiles, water and ice soil contents, interception reservoirs and snow reservoirs.

To do this, PREP needs as input files the surfex file to transform, the corresponding PGD, and the target PGD.

PREP works with LFI format instead of FA format, so we have to do some conversions from FA to LFI for the input files, and from LFI to FA for the output one.

This is done with **SFXTTOOLS** and **lfitools** binaries (main pack) :

```
# ARPEGE FILE TO TRANSFORM
file=/scratch/work/mrpe731/arp/${dat}/ICMSHSURF+0000

cp $file fic.sfx

# PGD FILES
cp /scratch/work/tailefer/SURFEX_FILES/PGD_T1200_cy41t1_op1_conv.fa
const.clim.sfx

cp /scratch/work/tailefer/SURFEX_FILES/PGD_franmg_cy41t1_op1.fa
const.clim.sfx.new

# CONVERT ALL FILES FROM FA TO LFI
SFXTTOOLS sfxfa2lfi --sfx-fa--file const.clim.sfx --sfx-lfi-file
PGD1.lfi

SFXTTOOLS sfxfa2lfi --sfx-fa--file const.clim.sfx.new --sfx-lfi-file
PGD2.lfi

SFXTTOOLS sfxfa2lfi --sfx-fa--file fic.sfx --sfx-lfi-file PREP1.lfi

# Namelist for PREP
cat > OPTIONS.nam <<EOF
&NAM_FILE_NAMES
  HPGDFILE='PGDFILE',
  CINIFILE='INIT_SURF',
/
&NAM_IO_OFFLINE
  LPRINT = .TRUE.,
  CSURF_FILETYPE = 'LFI  ',
  CPREPFIL = 'PREP2',
  CPGDFILE = 'PGD2',
/
&NAM_PREP_ISBA
```

```

    LISBA_CANOPY=.FALSE.,           <---- according to your case
  /
  &NAM_PREP_SEAFLUX
    LSEA_SBL=.FALSE.,             <---- according to your case
  /
  &NAM_PREP_SURF_ATM
    CFILETYPE      = 'LFI  ',
    CFILE           = 'PREP1',
    CFILEPGDTYPE   = 'LFI  ',
    CFILEPGD        = 'PGD1',
  /
  &NAM_PREP_WATFLUX
    LWAT_SBL=.FALSE.,             <---- according to your case
  /
  &NAM_WRITE_SURF_ATM
    LNOWRITE_TEXFILE=.TRUE.,
  /
EOF

# PREP EXECUTION
time $MPIAUTO -np $MPI_TASKS -nnp $MPITASKS_PER_NODE -- ./prep.exe

# CREATION OF A NEW FA FILE WITH THE SAME CADRE AS PGD ONE
lfitools faempty const.clim.sfx.new PREP2.fa

# CONVERT NEW AROME FILE FROM LFI TO FA
SFXTOOLS sfxlfi2fa --sfx-fa--file PREP2.fa --sfx-lfi-file PREP2.lfi

mv PREP2.fa  ${file}_franmg

```

You will find examples of PREP scripts in this path on beaufix :
 /home/gmap/mrpe/jidanem/scripts/*/prep

5/ Fullpos_Prep

Fullpos_Prep is another way to do surface coupling instead of pure PREP (and hence avoiding the conversions between formats FA \leftarrow \rightarrow LFI).

It was developed by Philippe Marguinaud in order to be able to make PREP interpolations using Fullpos (available only from CY41T1).

Fullpos realises the horizontal interpolations and PREP manages tiles and fields names.

The Fullpos_Prep offers the possibility to make interpolations in different ways.
 The default is to make interpolations using 4 points.

A few namelist parameters have been appended to the namelist NAMFPC :

NFPSURFEX	<ul style="list-style-type: none"> • 1 = couplingsurf (ISBA -> SURFEX) • 2 = Fullpos/PREP (SURFEX -> SURFEX)
NFPSLWIDE	Size of the Fullpos halo (default is 3)
NFPSFXINT	<ul style="list-style-type: none"> • 0 = 4-point interpolations (default) • 1 = average over Fullpos halo • 2 = take nearest point
NFPSFXWRT	<ul style="list-style-type: none"> • 0 = write SURFEX file PFFPOSAREA+0000.sfx (default) • 1 = write PREP fields in PFFPOSAREA+0000 (useful for debugging)

In order to avoid reading the whole list of upper air fields, it is possible to specify:

```
&NAMFPG
  NFPLEV=1,
  FPVALH(0)=0.,
  FPVALH(1)=0.,
  FPVBH(0)=0.,
  FPVBH(1)=1.,
/
```

Eventually, let recall that PREP or SURFEX fields to be interpolated should not be specified in the namelist : the list of fields to be interpolated is set up by PREP itself. (cf Marguinaud's documentation for more details).

So that the Fullpos_Prep runs smoothly, it needs the following :

```
# PGD FILES (input and output grids)
cp PGD_T1200_cy41t1_op1_conv.fa      Const.Clim.sfx
cp PGD_franmg_cy41t1_op1.fa        const.clim.sfx.AREA

# Clim files for post-processing
cp $ARPEGE_CLIM/clim_t1198_isba$MM  Const.Clim
cp $AROME_CLIM/clim_franmg_isba$MM  const.clim.AREA

# Init files (altitude and surface)
cp ${WORK}/ICMSHARPE+0000 ICMSHFPOSINIT
cp ${WORK}/ICMSHSURF+0000 ICMSHFPOSINIT.sfx

# PREP namelist
cat<<EOF>EXSEG1.nam
```

```

&NAM_FILE_NAMES
  HPGDFILE='PGDFILE',
  CINIFILE='INIT_SURF',
/
&NAM_PREP_ISBA
  LISBA_CANOPY=.FALSE.,
/
&NAM_PREP_SEAFLUX
  LSEA_SBL=.FALSE.,
/
&NAM_PREP_WATFLUX
  LWAT_SBL=.FALSE.,
/
&NAM_WRITE_SURF_ATM
  LNOWRITE_TEXFILE=.TRUE.,
/
EOF

```

And of course the namelist fort.4 for Fullpos where we put :

```

      NFPSURFEX=2      in      NAMFPC
and  LCPLMSE=.TRUE.  in      NAMPHY

```

You will find examples of Fullpos_Prep scripts in this path on beaufix :
 /home/gmap/mrpe/jidanem/scripts/*/FPprep

In ordre to get Fullpos_Prep runs without any crashes, you should get all the modified sources in this pack :

```

~jidanem/pack/cy41t1_op1.10.IMPI500IFC1500.2y.pack/src/local/

```

6/ Forecast with Fullpos inline

If you are running Arome, LAROME=.TRUE. in NAMCT0 so no need to put LCPLMSE=.TRUE. in NAMPHY (for the time being).
 (cause ISBA fields not activated in arpifs/setup/su_surf_flds.F90 with LAROME=.TRUE.).

But if you are running Aladin, you have to put LCPLMSE=.TRUE. in NAMPHY otherwise you will have an abort concerning ISBA Fields :

```

ABORT!   13  RDFA2GP: FIELD IS MISSING :SURFPROP.ARGILE
ABORT!   14  RDFA2GP: FIELD IS MISSING :SURFPROP.SABLE
ABORT!    7  RDFA2GP: FIELD IS MISSING :SURFRESERV.GLACE
ABORT!   15  RDFA2GP: FIELD IS MISSING :SURFEPAIS.SOL

```

```
ABORT!      3 RDFA2GP: FIELD IS MISSING :PROFRESERV.GLACE
```

So if your coupling model has Surfex on it, why not just put LCPLMSE=.TRUE. on every configuration you are doing (with a binary including the corresponding modifications).

You will find examples of forecast with Fullpos inline scripts in this path on beaufix :
/home/gmap/mrpe/jidanem/scripts/*/previ_24h

7/ Fullpos offline

In the case where you want to do an offline Fullpos of your altitude files, you have to put in the namelist :

```
&NAMPHY
  LSOLV=.FALSE.,
  LFGEL=.FALSE.,
  LCPLMSE=.TRUE.,
/
```

And for some situations, domains too close like Arome France 1.3km, you have to put in namelist NAMFPC : LWIDER_DOM=.TRUE.,

to avoid an abort in SUEFPG3 :

```
SUEFPG3 : THERE ARE POINTS OUT OF THE DOMAIN
          OR TOO NEAR OF THE DOMAIN BORDER
ABOR1 CALLED
```

You will find examples of Fullpos offline scripts in this path on beaufix :
/home/gmap/mrpe/jidanem/scripts/*/fp_offline

8/ PREP_BDAP : Interpolation of Surfex Fields on BDAP grid

In the case where you want to do an interpolation of your Surfex outputs on a BDAP grid (LON, LAT), you have to use PREP for that.

You will find an example of PREP_BDAP script in this path on beaufix :
/home/gmap/mrpe/jidanem/scripts/Arpege_to_Arome/prep_BDAP