*FullP*OS users guide
since cycle 46
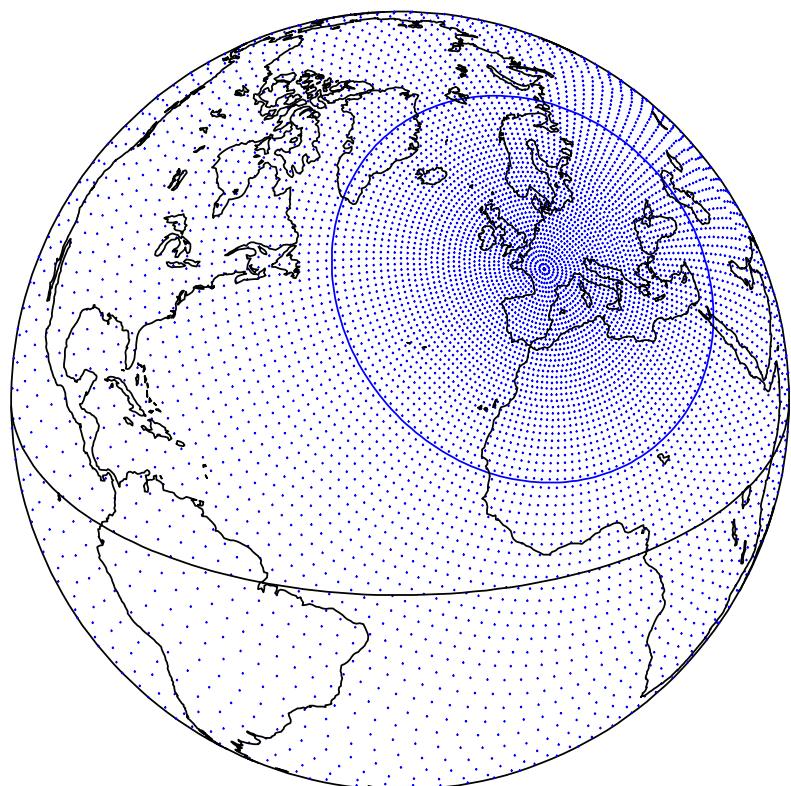
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Chapter 1

Introduction

*FullP*OS is a powerful and sophisticated post-processing package. It is intended to be used for operation and research as well.

*FullP*OS can perform vertical interpolations, horizontal interpolations and spectral filtering.

1.1 Organisation of this manual

This manual contains information about the installation, the use and the management of the code of *FullP*OS .

It is assumed that the user is familiar with the general handling of ARPEGE/IFS or ALADIN/AROME and understands the basic features of post-processing operations.

Much of the information presented in this document is in principle available inside the code via the comments , especially in the data modules.

1.2 Reporting bugs

If you find any bugs or deficiencies in this software, then please write a short report and send it to the author : *FullP*OS has so many features that it is difficult to validate all the possible namelists configurations.

If you have wishes for new developments inside *FullP*OS , then please write a short report to the author, that could be discussed.

1.3 Summary of features

*FullP*OS is a post-processing package containing many features. The following is just a small list of the main available ones :

- Multiple fields from the dynamics, the physics, the cumulated fluxes or the instantaneous fluxes

- post-processing available on any pressure level, height (above output orography) level, potential vorticity level, potential temperature level, isotherm, flight level or model η level

- Multiple latitudes x longitudes output domains, gaussian grids, Lambert or Mercator projection grids including a biperiodicized extension area for spectral limited area models

- Multiple optimisations tunings for the best computational performance (MPI distribution, Open-mp parallelization, vectorization)

- Possible spectral filtering for any field from the dynamic part of the host model

- Customization of the FA names or the GRIB codes of the post-processed fields

- Support for computing extra fields without diving too deeply into the code of *FullP*os

- Possibility to perform post-processing in-line (ie : during the host model integration) or off-line (out of the model integration)

- Possibility to make ARPEGE,IFS, ALADIN/AROME or ALADIN/AROME history files, starting from a file ARPEGE, IFS, ALADIN/AROME or ALADIN/AROME

- Server mode, to process consecutively several input files of the same nature (same geometry and content)

- Multi-objects mode, to process simultaneously several output geometries of different kinds, starting from the same input file

Chapter 2

Basic usage

2.1 Getting started

2.1.1 Installing the software

*FullP*OS is embedded in the software ARPEGE/IFS/ALADIN/AROME. For now, no standalone installation is possible : one has to install the forecasting model at least.

2.1.2 Preparing the namelists file

The namelists file should correspond to the running cycle ARPEGE/IFS/ALADIN/AROME. *FullP*OS is driven by several specific namelists and also several namelists belonging to the model.

2.1.3 Setting the model namelists variables

This section describes the high level variables to be set :

NCONF :

> **Definition** : General configuration of the ARPEGE/IFS/ALADIN/AROME software.
>
> **Scope** : Integer which must be either 001 to execute the post-processing during the forecasting model, or 302 to execute it in the ECMWF surface ensemble Kalman filter, or 903 to execute the post-processing only ("off-line" mode).
>
> **Default value** : 001
>
> **Namelist location** : NAMARG

CNMEXP :

> **Definition** : Name of the experiment. Data filenames will depend on it.
>
> **Scope** : string of 4 characters.
>
> **Default value** : '0123'
>
> **Namelist location** : NAMARG

LECMWF :

> **Definition** : Setup version.
>
> **Scope** : boolean. .TRUE. for ECMWF and .FALSE. for Météo-France and partners.

Default value : .TRUE.

Namelist location : NAMARG

LELAM :

Definition : Geometry of the model.

Scope : boolean. .TRUE. for the limited area model and .FALSE. for the global model.

Default value : .FALSE.

Namelist location : NAMARG

LARPEGEF :

Definition : Output file format.

Scope : boolean. .TRUE. to write out ARPEGE files and .FALSE. to write out GRIB files.

Default value : equivalent to LECMWF

Namelist location : NAMCT0

NFPOS :

Definition : Configuration and main switch to trigger *FullP*OS .

Scope : Integer between 0 and 2. 0 will completely disable the post-processing. 1 will activate the traditional backend post-processing ; 2 should be used either to keep the post-processed fields on the same horizontal geometry and representation than the model (ECMWF configuration) or to change the geometry of the model fields (to change their resolution or to make lateral boundary conditions for a limited area model).

Default value : 1 if NCONF=903 ; 0 otherwise.

Namelist location : NAMCT0

N1POS :

Definition : Secondary switch to trigger *FullP*OS .

Scope : Integer between 0 and 1. N1POS=0 disables the post-processing computations but not its setup.

Default value : 1

Namelist location : NAMCT1

NFRPOS, NPOSTS :

Definition : Post-processing outputs main monitor, working as follows :

- if NPOSTS(0) = 0 then the post-processing runs every NFRPOS step (including step 0).
- if NPOSTS(0) > 0 then NPOSTS(0) is the number of post-processing events and the post-processing runs on the steps NPOSTS(1)*NFRPOS, NPOSTS(2)*NFRPOS, ...NPOSTS(NPOSTS(0))*NFRPOS.

- if `NPOSTS(0) < 0` then `-NPOSTS(0)` is the number of post-processing events and the post-processing runs on the hours `-NPOSTS(1)*NFRPOS`, `-NPOSTS(2)*NFRPOS`, `...-NPOSTS(NPOSTS(0))*NFRPOS`.

Scope : Respectively positive integer, and integer array sized 0 to 960.

Default value : If `LECMWF=.FALSE.` and `NCONF=1` then `NFRPOS=1` and `NPOSTS` is set for output at hours 0, 6, 12, 18, 24, 30, 36, 48, 60 and 72 ; else if `LECMWF=.TRUE.` and `NCONF=1` then `NFRPOS=-1` and `NPOSTS(:)=0` (no outputs) ; else `NPOSTS(:)=0` (single output).

Namelist location : `NAMCT0`

2.1.4 Example

If nothing else is specified, then *FullP*OS will run but it will not make any output file because no output field was requested.

ARPEGE, ALADIN or ALADIN/AROME users, imagine now that you add in the namelist `NAMFPC` the following variables :
`CFP3DF='GEOPOTENTIEL','TEMPERATURE',`
`RFP3P=50000.,70000.,85000.,`
then you will get a post-processing file which will contain the geopotential and the temperature at 500 hPa, 700 hPa and 850 hPa as gridpoint fields on the model grid (stretched gaussian grid in the case of ARPEGE, geographical "C+I" grid in the case of ALADIN/AROME. The output file will be a file ARPEGE/ALADIN/AROME named `PF${CNMEXP}000+`*nnnn*, where `${CNMEXP}` is the name of the experiment (`CNMEXP(1:4)`), and *nnnn* the forecast range.

For IFS users, fields names for each kind of post-processing level are identified by their GRIB codes ; and the number of fields should be specified. Consequently the namelist variables are slightly different : you will add in the namelist `NAMFPC` the following variables (two fields of grib codes 129 and 130 to be computed on pressure levels 500 hPa, 700 hPa and 850 hPa) :
`NFP3DFP=2,`
`MFP3DFP=129,130,`
`RFP3P=50000.,70000.,85000.,`
The output file will be a grib file named `ICMUA${CNMEXP}+`*nnnnnn*, where `${CNMEXP}` is the name of the experiment (`CNMEXP(1:4)`), and *nnnnnn* the forecast range.

2.2 Configuration of the post-processor

The set-up has been built in such a way that it attempts to use the namelists default values as much as possible, with respect to a hierarchy of variables.
This section will describe the purpose of the main variables in different namelists.

2.2.1 Fields representation

Fields can be post-processed in various formats : spectral coefficients, gaussian grid, LAM grid or LAT X LON grids) :

CFPFMT :

> **Definition** : format of output data.
>
> **Scope** : character variable which can be either 'MODEL', 'GAUSS', 'LELAM' or 'LALON', respectively for the model native representation, a global model grid, a LAM grid, or a set of LAT X LON grids.
> Selecting the the model native representation means that by default spectral fields or fields deriving from the model spectral fields will be written out in spectral coefficients ; while gridpoint fields or fields deriving from the model gridpoint fields will be written out in the model native grid (gaussian grid or LAM, depending on the model).
>
> **Default value** : 'GAUSS' in ARPEGE/IFS ; 'LELAM' in ALADIN/AROME.
>
> **Namelist location** : NAMFPC

CFPDOM :

> **Definition** : names of the output domains.
>
> **Scope** : array of 20 characters ; if CFPFMT is 'MODEL', 'GAUSS' or 'LELAM' then only one output domain can be computed by a post-processor ; otherwise there can be up to 15 domains.
>
> **Default value** : CFPDOM(1)='000' ; CFPDOM(i)=' ' for i greater than 1. This means that by default, only one output domain is made.
>
> **Namelist location** : NAMFPC

2.2.2 Fields request for ARPEGE or ALADIN/AROME

Fields are classified according to their origin in the forecasting model : 3D fields from dynamics 2D fields from dynamics, surface fields from physics, diagnostic cumulated or instantaneous fluxes. The namelists variables defining them depend on the target format of fields : ARPEGE files or ECMWF GRIB files (respectively : LARPEGEF=.TRUE. or LARPEGEF=.FALSE.). Therefore the variables in this section require LARPEGEF=.TRUE.

CFP3DF :

> **Definition** : ARPEGE names of the 3D upper-air dynamics fields.
>
> **Scope** : array of 12 characters, maximum size : 511 items. The reference list of these fields is written in appendix A.1 on page 88.
>
> **Default value** : blank strings (no 3D upper-air dynamics fields to post-process).
>
> **Namelist location** : NAMFPC

CFP2DF :

> **Definition** : ARPEGE names of the 2D dynamics fields.
>
> **Scope** : array of 16 characters, maximum size : 212 items. The reference list of these fields is written in appendix A.2 on page 90.
>
> **Default value** : blank strings (no 2D dynamics fields to post-process).
>
> **Namelist location** : NAMFPC

CFPPHY :

> **Definition** : ARPEGE names of the surface grid-point fields from physical parameterizations.
>
> **Scope** : array of 16 characters, maximum size : 2388 items. The reference list of these fields is written in appendix A.3 on page 92.
>
> **Default value** : blank strings (no surface fields to post-process).
>
> **Namelist location** : NAMFPC

CFPCFU :

> **Definition** : ARPEGE names of the cumulated fluxes.
>
> **Scope** : array of 16 characters, maximum size : 82 items. The reference list of these fields is written in appendix A.4 on page 95.
>
> **Default value** : blank strings (no cumulated fluxes to post-process).
>
> **Namelist location** : NAMFPC

CFPXFU :

> **Definition** : ARPEGE names of the instantaneous fluxes.
>
> **Scope** : array of 16 characters, maximum size : 65 items. The reference list of these fields is written in appendix A.5 on page 96.
>
> **Default value** : blank strings (no instantaneous fluxes to post-process).
>
> **Namelist location** : NAMFPC

2.2.3   Fields request for IFS

Fields are classified according to their origin in the forecasting model : 3D fields from dynamics 2D fields from dynamics, or fields from physics. The namelists variables defining them depend on the target format of fields : ARPEGE files or ECMWF GRIB files (respectively : LARPEGEF=.TRUE. or LARPEGEF=.FALSE.). Therefore the variables in this section require LARPEGEF=.FALSE.

MFP3DFP, NFP3DFP :

> **Definition** : Respectively : ECMWF GRIB codes of the 3D upper-air dynamics fields to compute on pressure levels, and actual number of these fields.
>
> **Scope** : MFP3DFP : integer array, maximum size : 511 items. The reference list of these fields is written in appendix B.1 on page 100. NFP3DFP : integer.
>
> **Default value** : zero (undefined - no 3D upper-air dynamics fields to compute on pressure levels).
>
> **Namelist location** : NAMFPC

MFP3DFH, NFP3DFH :

> **Definition** : Respectively : ECMWF GRIB codes of the 3D upper-air dynamics fields to compute on height levels, and actual number of these fields.
>
> **Scope** : MFP3DFH : integer array, maximum size : 511 items. The reference list of these fields is written in appendix B.1 on page 100. NFP3DFH : integer.
>
> **Default value** : zero (undefined - no 3D upper-air dynamics fields to compute on height levels).
>
> **Namelist location** : `NAMFPC`

MFP3DFT, NFP3DFT :

> **Definition** : Respectively : ECMWF GRIB codes of the 3D upper-air dynamics fields to compute on potential temperature levels, and actual number of these fields.
>
> **Scope** : MFP3DFT : integer array, maximum size : 511 items. The reference list of these fields is written in appendix B.1 on page 100. NFP3DFT : integer.
>
> **Default value** : zero (undefined - no 3D upper-air dynamics fields to compute on potential temperature levels).
>
> **Namelist location** : `NAMFPC`

MFP3DFV, NFP3DFV :

> **Definition** : Respectively : ECMWF GRIB codes of the 3D upper-air dynamics fields to compute on potential vorticity levels, and actual number of these fields.
>
> **Scope** : MFP3DFV : integer array, maximum size : 511 items. The reference list of these fields is written in appendix B.1 on page 100. NFP3DFV : integer.
>
> **Default value** : zero (undefined - no 3D upper-air dynamics fields to compute on potential vorticity levels).
>
> **Namelist location** : `NAMFPC`

MFP3DFS, NFP3DFS :

> **Definition** : Respectively : ECMWF GRIB codes of the 3D upper-air dynamics fields to compute on η levels, and actual number of these fields.
>
> **Scope** : MFP3DFS : integer array, maximum size : 511 items. The reference list of these fields is written in appendix B.1 on page 100. NFP3DFS : integer.
>
> **Default value** : zero (undefined - no 3D upper-air dynamics fields to compute on η levels).
>
> **Namelist location** : `NAMFPC`

MFP2DF, NFP2DF :

> **Definition** : Respectively : ECMWF GRIB codes of the 2D dynamics fields, and actual number of these fields.
>
> **Scope** : MFP2DF : integer array, maximum size : 212 items. The reference list of these fields is written in appendix B.2 on page 101. NFP2DF : integer.
>
> **Default value** : blank strings (no 2D dynamics fields to post-process).
>
> **Namelist location** : `NAMFPC`

MFPPHY, NFPPHY :

> **Definition** : Respectively : ECMWF GRIB codes of the surface grid-point fields from physical parameterizations, and actual number of these fields.
>
> **Scope** : MFPPHY : integer array, maximum size : 1241 items. The reference list of these fields is written in appendix B.3 on page 101. NFPPHY : integer.
>
> **Default value** : zero (undefined - no surface fields to post-process).
>
> **Namelist location** : `NAMFPC`

2.2.4   Post-processing levels

Various post-processing levels can be defined for upper-air fields, from dynamics only :

RFP3P :

> **Definition** : post-processing pressure levels.
>
> **Scope** : array of real values, maximum size : 75 items. Unit : Pascal.
>
> **Default value** : None.
>
> **Namelist location** : `NAMFPC`

RFP3H :

> **Definition** : post-processing height levels above orography.
>
> **Scope** : array of real values, maximum size : 127 items. Unit : meter.
>
> **Default value** : None.
>
> **Namelist location** : `NAMFPC`

RFP3TH :

> **Definition** : post-processing potential temperature levels.
>
> **Scope** : array of real values, maximum size : 75 items. Unit : Kelvin.
>
> **Default value** : None.
>
> **Namelist location** : `NAMFPC`

RFP3PV :

> **Definition** : post-processing potential vorticity levels.
>
> **Scope** : array of real values, maximum size : 75 items. Unit : Potential Vorticity Unit.
>
> **Default value** : None.
>
> **Namelist location** : `NAMFPC`

RFP3I :

Definition : post-processing isotherms above orography.

Scope : array of real values, maximum size : 75 items. Unit : Kelvin.
If the value is negative then its absolute value is considered and the research of the isotherm is computed from the top of the atmosphere to its bottom ; otherwise the research of the isotherm is computed from the bottom of the atmosphere to its top.

Default value : None.

Namelist location : `NAMFPC`

RFP3F :

Definition : post-processing altitude above sea (flight levels).

Scope : array of real values, maximum size : 75 items. Unit : meter.

Default value : None.

Namelist location : `NAMFPC`

NRFP3S :

Definition : post-processing η levels, defined by the variables `NFPLEV`, `FPVALH` and `FPVBH` below

Scope : array of integer values, between `1` and `NFPLEV` ; maximum size : 200 items. Unit : adimensional.
There is a magic value : if `NRFP3S=-99` then all the levels are selected.

Default value : None.

Namelist location : `NAMFPC`

NFPLEV :

Definition : number of levels in the η vertical coordinate system of the post-processor.

Scope : Integer bigger or equal to 1, and limited to 200 .

Default value : the number of vertical η level in the model : `NFPLEV=NFLEVG`

Namelist location : `NAMFPG`

FPVALH, FPVBH :

Definition : respectively the "A" and "B" coefficients of the vertical coordinate system of the post-processor.

Scope : real arrays, size : 0:200 . Unit : `FPVALH` is in Pascal ; `FPVBH` is adimensional.

Default value : if `NFPLEV=NFLEVG` then `FPVALH(1:NFPLEV)=VALH(1:NFLEVG)` and `FPVBH(1:NFPLEV)=VBH(1:NFLEVG)` (model levels). Otherwise the program will attempt to recompute `FPVALH` and `FPVBH` to fit `NFPLEV` and using vertical levels that may have been used in operations in the past.

Namelist location : `NAMFPG`

Notice : when asking for fluxes there is no need to activate the corresponding model fluxes in the namelists `NAMCFU` or `NAMXFU` : these namelists should be automatically modified by *FullP*OS in order to activate the required fluxes.

2.2.5 Horizontal geometry

Depending on the output format previously defined by `CFPFMT`, various geometry parameters can be defined, or redefined from default values.

Note that `CFPFMT='MODEL'` self-defines the host model geometry, therefore its geometry cannot be changed at the user interface.

NLAT, NLON :

> **Definition** : for each output (sub-)domain : maximum number of rows, respectively over latitudes and longitudes (Lat x Lon domains or gaussian grid) or Y and X axes (LAM area including its extension zone : "C+I+E"). For the model grid they corresponds to the variables `NDGLG` and `NDLON`.
>
> **Scope** : arrays of integers, maximum size : 15 .
>
> **Default value** : depending on the variables `CFPFMT`, `LELAM` and `CFPDOM`, these variables may be predefined as hard-coded or soft values (see table 2.1 on page 19).
>
> **Namelist location** : `NAMFPD`

NFPMAX :

> **Definition** : A truncation order which definition depends on the variable `CFPFMT` :
> - Case `CFPFMT='GAUSS'` : truncation order of the output grid.
> - Case `CFPFMT='LELAM'` : *meridional* truncation order of the output grid.
> - Case `CFPFMT='LALON'` : truncation used to filter in spectral space the post-processed fields.
>
> **Scope** : array of integers, maximum size 15 .
>
> **Default value** :
> - If `CFPFMT='GAUSS'` then `NFPMAX` is equal to the model truncation `NSMAX`
> - If `CFPFMT='LELAM'` then `NFPMAX` is computed for a quadratic grid :
>   `3*NFPMAX(:)+1` $\geq$ `NLAT(:)`
> - If `CFPFMT='LALON'` `NFPMAX` is computed for a quadratic grid :
>   `3*NFPMAX(:)+1` $\geq$ `min(NLAT(:),NLON(:))`
>
> **Namelist location** : `NAMFPG`

NFPHTYP :

> **Definition** : reduction of the gaussian grid. Used only if `CFPFMT='GAUSS'`.
>
> **Scope** : Integer which value can be either 0 for a regular grid or 2 for a reduced grid.
>
> **Default value** : `NFPHTYP=NHTYP` in ARPEGE/IFS if `NLAT(1)=NDGLG` ; otherwise `NFPHTYP=0`
>
> **Namelist location** : `NAMFPG`

NFPRGRI :

> **Definition** : number of active points on each parallel of a gaussian grid. Used only if `CFPFMT='GAUSS'`.
>
> **Scope** : Integer array of 4000 elements, to be filled from subscript 1 to `NLAT(1)/2` (Northern hemisphere only) : subscript 1 corresponds to row the nearest to the pole ; subscript `NLAT(1)/2` corresponds to the row the nearest to the equator. Hemispheres are assumed to be symetric.

Default value : same as the host model ARPEGE/IFS if NLAT(1)=NDGLG ; otherwise
NFPRGRI(1:NLAT(1))=NLON(1).

Namelist location : NAMFPG

NFPTTYP :

Definition : Transformation type (used to rotate to sphere). This variable is used only if
CFPFMT='GAUSS' in ARPEGE/IFS.

- Case NFPTTYP=1 : the pole of interest is at the North pole of the geographical
  sphere.
- Case NFPTTYP=2 : the pole of interest is anywhere on the geographical sphere.

Scope : Integer which value can be only 1 or 2.

Default value : NFPTTYP=NSTTYP in ARPEGE/IFS.

Namelist location : NAMFPG

FPMUCEN, FPLOCEN :

Definition : respectively Sine of the latitude, and longitude of either the pole of interest if
CFPFMT='GAUSS'. This variable is useless if CFPFMT='LALON' or |CFPFMT='LELAM'|.

Scope : reals ; unit : adimentional for FPMUCEN ; radians for FPLOCEN

Default value : respectively RMUCEN and RLOCEN in ARPEGE/IFS.

Namelist location : NAMFPG

FPSTRET :

Definition : stretching factor. Used only if CFPFMT='GAUSS'.

Scope : Real value. Unit : adimensional.

Default value : FPSTRET=RSTRET in ARPEGE/IFS ; FPSTRET=1. in ALADIN/AROME.

Namelist location : NAMFPG

NMFPMAX :

Definition : Truncation order in the *zonal* direction (used only if CFPFMT='LELAM').

Scope : integer.

Default value : NMFPMAX is computed for a quadratic grid : 3*NMFPMAX+1 $\geq$ NLON(1)

Namelist location : NAMFPG

NFPGUX, NFPLUX :

Definition : for each output (sub-)domain : number of geographical rows, respectively
over Y and X axes for each output (sub-)domain for LAM domains only (CFPFMT='LELAM')
: they defines the area "C+I".

Scope : arrays of integers, maximum size : 15 .

Default value : It depends from the variable CFPDOM. Refer to the table 2.3 on page 20.

Namelist location : NAMFPD

RLATC, RLONC :

> **Definition** : for each output (sub-)domain : respectively latitude and longitude of the center of each output (sub-)domain (if `CFPFMT='GAUSS'` then these variables are useless).
>
> **Scope** : arrays of reals, maximum size : 15 ; unit : degrees.
>
> **Default value** : It depends from the variable `CFPFMT`.
>   If `CFPFMT='LALON'` then refer to the table 2.2 on page 19.
>   If `CFPFMT='LELAM'` then refer to the table 2.3 on page 20.
>
> **Namelist location** : `NAMFPD`

RDELY, RDELX :

> **Definition** : for each output (sub-)domain : mesh size, respectively over latitudes and longitudes (Lat x Lon domains) or Y and X axes (if `CFPFMT='GAUSS'` these variables are useless).
>
> **Scope** : arrays of reals, maximum size : 15 ; unit : degrees if `CFPFMT='LALON'`, meters if `CFPFMT='LELAM'`.
>
> **Default value** : It depends from the variable `CFPFMT`.
>   If `CFPFMT='LALON'` then refer to the table 2.2 on page 19.
>   If `CFPFMT='LELAM'` then refer to the table 2.3 on page 20.
>
> **Namelist location** : `NAMFPD`

FPLAT0, FPLON0 :

> **Definition** : respectively the geographic latitude and longitude of reference for the projection (used only if `CFPFMT='LELAM'`).
>
> **Scope** : Real values. Unit : degrees.
>
> **Default value** : depends from the variable `CFPDOM`. Refer to the table 2.3 on page 20.
>
> **Namelist location** : `NAMFPG`

LFPMRT :

> **Definition** : Mercator rotated/tilted geometry, used only if `CFPFMT='LELAM'`.
>
> **Scope** : Boolean.
>
> **Default value** : equivalent to the model (`LMRT`).
>
> **Namelist location** : `NAMFPG`
>
> Remark : `LFPMRT=.TRUE.` overwrites `FPLAT0` to zero.

Table 2.1: Default values for `NLAT` and `NLON` depending of `CFPFMT` and `LELAM`

NLAT,NLON	GAUSS	LELAM	LALON
`LELAM=.FALSE.`	`(NDGLG,NDLON)`	See table 2.3	See table 2.2
`LELAM=.TRUE.`	(32,64)	`(NFPGUX,NFPLUX)`	See table 2.2

Table 2.2: Default values for LAT x LON subdomains depending of the value of `CFPDOM`

CFPDOM	NLAT	NLON	RLATC	RLONC	RDELY	RDELX
HENORD	60	180	45.	179.	1.5	2.
HESUDC	60	180	-45.	179.	1.5	2.
HESUDA	30	90	-45.	178.	3.	4.
ATLMED	65	129	-48.75	-20.	0.75	1.
EURATL	103	103	45.75	2.	0.5	2/3
ZONCOT	81	81	48.75	0.	0.375	0.5
FRANCE	61	61	45.75	2.	0.25	1/3
GLOB15	121	240	0.	179.25	1.5	1.5
EURAT5	105	149	46.	5.	0.5	0.5
ATOUR10	81	166	40.	-17.5	1.	1.
EUROC25	105	129	48.	1.	0.25	0.25
GLOB25	73	144	0.	178.75	2.5	2.5
EURSUD	41	54	38.25	-19/3	0.5	2/3
EUREST	39	73	50.75	16/3	0.5	2/3
GRID25	21	41	50.	0.	2.5	2.5
MAROC	158	171	31.05	-6.975	23.7/157	25.65/170
OCINDIEN15	67	89	-16.5	66.	1.5	1.5
REUNION05	61	141	-20.	65.	0.5	0.5
GLOB05	361	720	179.75	0.	0.5	0.5
GLOB025	721	1440	179.875	0.	0.25	0.25
ATOUR05	241	401	0.	20.	0.5	0.5
ATOURX05	181	401	0.	35.	0.5	0.5
ATOURX01	901	2001	0.	35.	0.1	0.1
EURAT01	521	741	5.	46.	0.1	0.1
GLOB01	1801	3600	179.95	0.	0.1	0.1
EURAT005	1041	1481	5.	46.	0.05	0.05
EURAT1S20	1041	1481	5.	46.	0.05	0.05
else - case ARPEGE	0	0	0.	0.	0.	0.
else - case ALADIN/AROME	`NDGUXG`	`NDLUXG`	computed	computed	computed	computed

Table 2.3: Default values for LAM subdomains depending of the value of CFPDOM

CFPDOM	NLAT	NLON	RLATC	RLONC
BELG	72	72	50.44595488554766	4.90727841961041
SLOV	48	48	46.05017943078632	13.52668207859151
MARO	160	160	31.56059442218072	-7.00000000285346
OPMA	108	108	31.56059442218072	-7.00000000285346
LACE14	192	216	46.24470063381371	16.99999999944358
LACE12	216	240	46.2447006	17.
LACE20	150	135	46.24470062058892	17.00000000009107
ROUM	72	72	44.77301981937139	25.00000000483406
FRAN	200	200	45.31788242335041	1.27754303826285
else - case ARPEGE	169	169	46.46884540633992	2.57831063089259
else - case ALADIN/AROME	NDGUXG	NDLUXG	EDELY	EDELX

CFPDOM	NFPGUX	NFPLUX	RDELY	RDELX
BELG	61	61	12715.66669793411	12715.66669793552
SLOV	37	37	26271.55175398597	26271.55175829969
MARO	149	149	18808.17793051683	18808.17792427479
OPMA	97	97	31336.13991686922	31336.13988918715
LACE14	181	205	14734.91380550296	14734.913810093
LACE12	205	229	12176.15632814142	12176.15632814141
LACE20	139	124	20678.82820101414	20678.82820101414
ROUM	61	61	33102.6285617361	33102.62857952392
FRAN	189	189	12715.67301977791	12715.66779231173
else - case ARPEGE	169	169	12715.6635946432	12715.66736292664
else - case ALADIN/AROME	NDGUXG	NDLUXG	EDELY	EDELX

CFPDOM	FPLON0	FPLAT0
BELG	2.57831001	46.46884918
SLOV	17.0	46.24470064
MARO	-7.0	31.56059436
OPMA	-7.0	31.56059436
LACE14	17.0	46.24470064
LACE12	17.0	46.24470064
LACE20	17.0	46.24470064
ROUM'	25.0	44.77301983
FRAN	25.0	44.77301983
else - case ARPEGE	2.57831001	46.46884918
else - case ALADIN/AROME	ELON0	ELAT0

2.3　Output files handling

2.3.1　Names

There is one post-processing file for each post-processing time step and each (sub-)domain.

The output files are named : `PF${CNMEXP}${CFPDOM}+`*nnnn*, where :

`PF` is a prefix

`${CNMEXP}` is the so-called "name of the experiment" (value : `CNMEXP(1:4)`)

`${CFPDOM}` is the name of the output (sub-)domain (`CFPDOM`)

nnnn is the time stamp.

Example : if you ask for post-processing at time 0, with `CNMEXP='FPOS'` and `CFPDOM='ANYWHERE'`, then the output file will be named : `PFFULLANYWHERE+0000`

2.3.2　Format and content

Depending of `LARPEGEF`, output files will be generally ARPEGE/ALADIN/AROME FA files or GRIB files, with GRIB encoded data.
The representation of data is gridpoint, unless `CFPFMT='MODEL'` is defined and the post-processed field derives from model spectral fields.
Depending on the format FA or GRIB, the fields inside are identified by their FA name (string of 16 characters) or their GRIB code, as given in the namelist `NAMFPC`.
For upper air fields in FA files the name of 12 characters is preceded by 4 characters identifying the kind of post-processing level and the post-processing level value, as described in the table 2.4 on page 21.
The same prefix is used to print norms of fields in listing, whatever the output format is.

Table 2.4: Prefix, unit and number of letters of upper air post-processed fields prefix.

Level type	Prefix	Unit	Number of letters for level value
Pressure	P	Pascal	5
Height	H	Meter	5
Potential vorticity	V	deciPVU	3
Potential temperature	T	Kelvin	3
Isotherms (searched from top)	KT	Kelvin	3
Isotherms (searched from bottom)	KB	Kelvin	3
Flight levels	F	Flight levels	3
η	S	adimensional	3

Example : temperature at 2 PVU in FA files is `V020TEMPERATURE`

Notice : Isotherms and flight levels are not implemented in IFS.

Warning : fields on pressure levels bigger or equal to 1000 hPa are written out with truncated names ; for example, temperature at 1000 hPa is `P00000TEMPERATURE` while `P00500TEMPERATURE` could be as well the temperature at 5 hPa or the temperature at 1005 hPa !

Chapter 3

Advanced usage

The purpose of this chapter is to describe supplementary namelists variables which users may need, but which are either too complex, or too rarely needed to warrant complicating the previous chapter.

3.1 Scientific options

3.1.1 Horizontal interpolations

Horizontal interpolations can extend on different number of points, for dynamic fields or for physical fields :

NFPINDYN :

>   **Definition** : control of horizontal interpolations for dynamic fields :
>   - `NFPINDYN=12` : quadratic interpolations
>   - `NFPINDYN=4` : bilinear interpolations
>   - `NFPINDYN=0` : to adopt the nearest point rather than interpolating.
>
>   **Scope** : Integer which value can be only 0, 4 or 12.
>
>   **Default value** : 12
>
>   **Namelist location** : `NAMFPC`

TFP_{*}%INTER :

>   **Definition** : Number of points used in horizontal interpolations for a given dynamical field. This option does not work properly : for now it only allows to replace 12-points or 4-points interpolations by the search of the nearest point.
>
>   **Scope** : Integer. "{*}" represents the field identifier
>
>   **Default value** : equal to `NFPINDYN`
>
>   **Namelist location** : `NAMAFN`

NFPINPHY :

>   **Definition** : control of horizontal interpolations for physical fields and fluxes :
>   - `NFPINPHY=12` : quadratic interpolations
>   - `NFPINPHY=4` : bilinear interpolations

- NFPINPHY=0 : to adopt the nearest point rather than interpolating.

Scope : Integer which value can be only 0, 4 or 12.

Default value : 12

Namelist location : NAMFPC

Notice: setting NFPINPHY=NFPINDYN=0 enables to run the post-processing without any climatology file, even when any ISBA field is requested.

GFP_{*}%INTER :

Definition : Number of points used in horizontal interpolations for a given physical field. This option does not work properly : for now it only allows to replace 12-points or 4-points interpolations by the search of the nearest point.

Scope : Integer. "{*}" represents the field identifier

Default value : equal to NFPINPHY

Namelist location : NAMAFN

GFP_{*}%IANO :

Definition : Method used within the horizontal interpolations for a given physical field :
0 : plain interpolation of the field
1 : interpolate the anomaly of the field with respect to a reference

Scope : Integer. "{*}" represents the field identifier

Default value : tailored for each field. There can be several methods.

Namelist location : NAMAFN

GFP_{*}%LLMON :

Definition : if .TRUE. the horizontal interpolations are kept monotonic for this physical field. This option prevent from undesired overshoots or undershoots if the corresponding interpolations are quadratic.

Scope : Boolean. "{*}" represents the field identifier

Default value : tailored for each field

Namelist location : NAMAFN

LFPML_STD, RFPCR_STD :

Definition : LFPML_STD=.TRUE. then quadratic or bilinear interpolations are replaced by multi-linear interpolations for dynamic fields, and RFPCR_STD(1:2) are the coefficients for the ratio of mesh-sizes. Note that multi-linear interpolations are more diffusive. This option is deprecated.

Scope : Respectively Boolean, and array of two real variables.

Default value : Respectively .FALSE. and (1.,0.)

Namelist location : NAMFPC

LFPML_LAN, RFPCR_LAN :

> **Definition** : LFPML_LAN=.TRUE. then quadratic or bilinear interpolations are replaced by multi-linear interpolations for surface fields using a land-sea mask or a land mask for interpolations, and RFPCR_LAN(1:2) are the coefficients for the ratio of mesh-sizes. Note that multi-linear interpolations are more diffusive. This option is deprecated.
>
> **Scope** : Respectively Boolean, and array of two real variables.
>
> **Default value** : Respectively .FALSE. and (1.,0.)
>
> **Namelist location** : NAMFPC

LFPML_SEA, RFPCR_SEA :

> **Definition** : LFPML_SEA=.TRUE. then quadratic or bilinear interpolations are replaced by multi-linear interpolations for surface fields using a sea mask for interpolations, and RFPCR_SEA(1:2) are the coefficients for the ratio of mesh-sizes. Note that multi-linear interpolations are more diffusive. This option is deprecated.
>
> **Scope** : Respectively Boolean, and array of two real variables.
>
> **Default value** : Respectively .FALSE. and (1.,0.)
>
> **Namelist location** : NAMFPC

3.1.2 Vertical interpolations

The variables in this section help to drive the vertical interpolations but they are not specific to *FullP*os : they belong to the model and they are used in the observations operators, too.

LOLDPP :

> **Definition** : alternative way of vertical interpolations for wind, temperature and geopotential. If LOLDPP=.FALSE. quadratic interpolations are preferred to linear interpolations.
>
> **Scope** : Boolean.
>
> **Default value** : equal to LECMWF
>
> **Namelist location** : NAMCT0

NDLNPR :

> **Definition** : Discretization of $\delta(\ln p)$. Set NDLNPR=1 to adopt the proper discretization to conform the non-hydrostatic model or whenever "non-hydrostatic" field (pressure departure, vertical divergence or true vertical velocity) are post-processed.
>
> **Scope** : Integer between 0 and 1
>
> **Default value** : 0
>
> **Namelist location** : NAMDYN

LAPRXPK :

> **Definition** : way of computing full-levels pressures in primitive equation hydrostatic model. If `.TRUE.` the full levels are computed by a cheaper approximation which is the mean value of the surrounding half-levels.
>
> **Scope** : Boolean.
>
> **Default value** : equal to `LECMWF`
>
> **Namelist location** : `NAMDYNA`

LVERTFE :

> **Definition** : If `.TRUE.` use finite elements for the vertical discretization.
>
> **Scope** : Boolean.
>
> **Default value** : equal to `LECMWF.AND.LSLAG.AND..NOT.(LNHDYN.OR.LR2D)`
>
> **Namelist location** : `NAMCVER`

LRPPUV_CSTEXT :

> **Definition** : If `.TRUE.` use of constant top extrapolation for wind : above the first model level the wind remains equal to its value on the first model level ; otherwise it is extrapolated from the first and second model levels.
>
> **Scope** : Boolean.
>
> **Default value** : `.FALSE.`
>
> **Namelist location** : `NAMPPVI`

LRPPUV_CALLITPQ : If `.TRUE.`, quadratic interpolation/extrapolation is performed for wind above the second model level.

> **Definition** : If `.TRUE.`
>
> **Scope** : Boolean.
>
> **Default value** : equal to `LOLDPP`
>
> **Namelist location** : `NAMPPVI`

LESCALE :

> **Definition** : if `.TRUE.`, combine two post-processing profiles (an altitude profile and a boundary layer profile) to compute post-processing fields on levels depending of the output orography (height levels, η levels, etc) : the purpose is to preserve simultaneously the vertical structure of the atmosphere on isobaric levels in the upper part of the atmosphere and in the boundary layer on height or σ levels above the target orography.
>
> **Scope** : Boolean.
>
> **Default value** : equal to `.NOT.LECMWF.OR.LARPEGEF` (in other words : `.TRUE.` for ARPEGE or ALADIN/AROME, and `.FALSE.` for IFS).
>
> **Namelist location** : `NAMPPVI`

LESCALE_T :

> **Definition** : Use this key only to disable `LESCALE` on temperature.
>
> **Scope** : Boolean.
>
> **Default value** : equal to `LESCALE`
>
> **Namelist location** : `NAMPPVI`

LESCALE_Q :

> **Definition** : Use this key only to disable `LESCALE` on specific or relative humidity.
>
> **Scope** : Boolean.
>
> **Default value** : equal to `LESCALE`
>
> **Namelist location** : `NAMPPVI`

LESCALE_PD :

> **Definition** : Use this key only to disable `LESCALE` on pressure departure.
>
> **Scope** : Boolean.
>
> **Default value** : equal to `LESCALE`
>
> **Namelist location** : `NAMPPVI`

LESCALE_U :

> **Definition** : Use this key only to disable `LESCALE` on horizontal wind and true vertical velocity (w) or vertical divergence (computed from w).
>
> **Scope** : Boolean.
>
> **Default value** : equal to `LESCALE`
>
> **Namelist location** : `NAMPPVI`

LESCALE_GFL :

> **Definition** : Use this key only to disable `LESCALE` on other upper air fields.
>
> **Scope** : Boolean.
>
> **Default value** : equal to `LESCALE`
>
> **Namelist location** : `NAMPPVI`

LPPVIVX :

> **Definition** : If `LESCALE=.TRUE.`, and even if `LESCALE_U=.FALSE.`, limit the maximum horizontal wind velocity.
>
> **Scope** : Boolean.
>
> **Default value** : `.FALSE.`
>
> **Namelist location** : `NAMPPVI`

RPPVIVX :

    Definition : If `LESCALE=.TRUE.` and `LPPVIVX=.TRUE.`, maximum horizontal wind velocity.

    Scope : Real. Unit : m/s

    Default value : 120. m/s

    Namelist location : `NAMPPVI`

RPPVIVP :

    Definition : If `LESCALE=.TRUE.` and `LPPVIVX=.TRUE.`, pressure threshold above which to limit the maximum wind velocity.

    Scope : Real. Unit : Pa

    Default value : 1000. Pa

    Namelist location : `NAMPPVI`

LNOTS_T :

    Definition : If `.TRUE.`, extrapolate temperature at the bottom of the atmosphere without the help of a surface temperature.

    Scope : Boolean.

    Default value : `.FALSE.`

    Namelist location : `NAMPPVI`

3.1.3 Biperiodicization

For limited area domains, fields can be made be-periodic by the addition of an extension zone, computed using splines.
Alternatively, the algorithm of Boyd can be used. This method is scientifically better, and technically more scalable.

Another option for handling the biperiodicization consists in computing it within the spectral transforms framework only, making it invisible to grid-point space. In this case the dimensions should be such that the width of the explicit extension zone is null (ie : set `NLON=NFPLUX` and `NLAT=NFPGUX`) otherwise two extension zones would coexist. Note that this method has not yet been a scientific success.

NFPBOYD :

    Definition : Use the biperiodicization of Boyd if set to 1 ; otherwise use the splines method if set to 0.

    Scope : Integer between 0 and 1 ; however, -1 or any value bigger than 1 would also trigger the biperiodicization of Boyd, here is the justification : for surface fields interpolations the land-sea mask has to be provided on an output domain bigger than the needed output domain, therefore it cannot be provided by the usual climatology output file and instead it has to be partly provided by the interpolation of the model land-sea mask. In the initial implementation, the field was simply extended to 0 beyond the output domain ; but this was an arbitrary choice, it could have been extended to 1 as well. The option `NFPBOYD=1` extends the value to 0, like in the initial code. The option `NFPBOYD=-1` extends the value to 1 ; while any other value than 0, 1 or -1 compute

the values following the conventional interpolations algorithm. This last method is more general because it allows to compute potentially any other auxilary fields than those which values remains between 0. and 1.

Scope : Integer, bigger or equal to -1

Default value : 0

Namelist location : `NAMFPC`

NFPBWX, NFPBWY :

Definition : width of Boyd window, respectively in x and y directions.

Scope : Integer, positive.

Default value : 0

Namelist location : `NAMFPD`

RFPBSCAL :

Definition : Window function scaling parameter for the biperiodicization of Boyd (the "L" parameter in Boyd's paper).

Scope : Real.

Default value : 3.

Namelist location : `NAMFPC`

NFPNOEXTZL, NFPNOEXTZG :

Definition : width of the alternative extension zone in the spectral space framework only, respectively in x and y directions.

Scope : Integer, positive.

Default value : 0

Namelist location : `NAMFPD`

3.1.4 Handling of missing data

The post-processing does not support the process of input fields containing missing data because the interpolation would damage the output fields. There are partial workarounds, however, if a binary mask can be used. This is the case for surface fields for example, for which a land-sea mask is used to compute the horizontal weights of interpolation : only points of the same nature among the 12 or 16 neighboring points are used. Still, if all of the 12 or 16 neighboring points are not of the same nature, then all the current neighboring points are use and hence, the quality of the result of interpolations is not warrantied.

Besides, in the framework of the LAM model the post-processing supports output domains larger than the input one. In this case the user must specify this situation by a key in namelist ; and choose the value of the missing data (and then a binary mask can be computed as an output field).

Remark : in the framework of the LAM model the output domains should not contain points from the relaxation area "I" even if this is possible, because this area is influenced by the large scale coupling data. Considering the fields are bi-periodic, a tolerance is allowed, however, even to pick up points from the extension area border in order to enable a change of resolution without any reduction of the geographical area.

NFPLAKE :

Definition : given an output point, if all the neighbouring points from the input grid are of a different nature, then a singular point is created, which can be either an isolated lake or an isolated island. The option `NFPLAKE=1` overwrites the surface temperature, deep soil temperature, surface water content and deep soil water content computed on that point with the values picked up from the climatology data, which is expected to be more realistic. The option `NFPLAKE=-1` does the same, except that the climatological surface temperature is replaced by the raw interpolated surface temperature (ie : not using altitude correction) : this is the recommended option, if necessary. `NFPLAKE=0` does not alter the interpolations process.

Scope : Integer between -1 and 1.

Default value : 0

Namelist location : `NAMFPC`

LISOT_ABOVEG :

Definition : To set the altitude of an isothermic surface to -9999. if it is below the orography. Should this option be used, then the resulting field should not be packed in output file or damages can be expected.

Scope : Boolean.

Default value : `.FALSE.`

Namelist location : `NAMFPC`

LWIDER_DOM :

Definition : `.TRUE.` to allow the output domains to be larger than the limit fixed by the input one.

Scope : Boolean.

Default value : `.FALSE.`

Namelist location : `NAMFPC`

RWIDOM :

Definition : Global missing value. Beware of its influence while packing data in file !

Scope : Real.

Default value : `HUGE()`

Namelist location : `NAMFPC`

NFPRLX, NFPRLY, NFPRUX, NFPRUY :

Definition : number of rows used respectively on left/right (X/Y) and lower/upper (L/U) sides to reduce the size of the output domain, leaving more missing data during horizontal interpolations : this is a workaround to be used if the output domain is picking up points from the relaxation area "I" and if the definition of the output domain cannot be changed, while wider domain is allowed.

Scope : Integer, positive.

Default value : 0

Namelist location : `NAMFPD`

3.1.5 Spectral fit and spectral filters

Vertical interpolation may generate numerical noise of small magnitude, beyond the truncation of the model. A spectral fit operation after the vertical interpolations would remove this numerical noise. Such an operation is possible only for post-processing levels independent of the orography (pressure levels, PV levels, isentropic levels). For surface-dependent levels it should not be desirable to alter the fields near the surface ; furthermore, on a technical point of view, such a spectral fit is more difficult to develop. However, this operation can be performed for gaussian grids or LAM grids in output if horizontal interpolations are disabled (`CFPFMT='MODEL'`) or in the framework of a change of resolution (`NFPOS=2`).

To go further, each dynamic fields can be smoothed by tunable filters activated in spectral space. These filters can be either a gaussian filter or a low-pass filter (refer to appendix E on page 112 for the formulation of these filters). Gaussian filters are helpful to smooth certain elaborated fields like geopotential ; while low-pass filters are preferably used to make fields with a high horizontal variability more homogeneous. Low-pass filters are working only for back-end post-processing (`NFPOS=1`).

NFITP :

> **Definition** : Spectral fit option for post-processed fields on pressure levels.
>
> **Scope** : Integer between 0 and 2. Possible options :
> - 0 : spectral fit disabled
> - 1 : spectral fit in the model geometry (needs `NFPOS=1`)
> - 2 : spectral fit in the target geometries (needs `NFPOS=2`)
>
> **Default value** : 1 if `NFPOS=1` ; 2 if `NFPOS=2`
>
> **Namelist location** : NAMFPC

NFITT :

> **Definition** : Spectral fit option for post-processed fields on potential temperature levels.
>
> **Scope** : Integer between 0 and 2. Possible options :
> - 0 : spectral fit disabled
> - 1 : spectral fit in the model geometry (needs `NFPOS=1`)
> - 2 : spectral fit in the target geometries (needs `NFPOS=2`)
>
> **Default value** : 1 if `NFPOS=1` ; 2 if `NFPOS=2`
>
> **Namelist location** : NAMFPC

NFITV :

> **Definition** : Spectral fit option for post-processed fields on potential vorticity levels.
>
> **Scope** : Integer between 0 and 2. Possible options :
> - 0 : spectral fit disabled
> - 1 : spectral fit in the model geometry (needs `NFPOS=1`)
> - 2 : spectral fit in the target geometries (needs `NFPOS=2`)
>
> **Default value** : 1 if `NFPOS=1` ; 2 if `NFPOS=2`
>
> **Namelist location** : NAMFPC

NFITI :

    Definition : Spectral fit option for post-processed fields on isotherms.

    Scope : Integer between 0 and 2. Possible options :
- 0 : spectral fit disabled
- 1 : spectral fit in the model geometry (needs `NFPOS=1`)
- 2 : spectral fit in the target geometries (needs `NFPOS=2`)

    Default value : `0` if `NFPOS=1` ; `2` if `NFPOS=2`

    Namelist location : `NAMFPC`

NFITF :

    Definition : Spectral fit option for post-processed fields on flight levels.

    Scope : Integer between 0 and 2. Possible options :
- 0 : spectral fit disabled
- 1 : spectral fit in the model geometry (needs `NFPOS=1`)
- 2 : spectral fit in the target geometries (needs `NFPOS=2`)

    Default value : `0`

    Namelist location : `NAMFPC`

NFITH :

    Definition : Spectral fit option for post-processed fields on height levels.

    Scope : Integer between 0 and 2.

    Default value : `0`

    Namelist location : `NAMFPC`

NFITS :

    Definition : Spectral fit option for post-processed fields on η levels.

    Scope : Integer between 0 and 2. Possible options :
- 0 : spectral fit disabled
- 1 : spectral fit in the model geometry (needs `NFPOS=1`)
- 2 : spectral fit in the target geometries (needs `NFPOS=2`)

    Default value : `0` if `NFPOS=1` ; `2` if `NFPOS=2`

    Namelist location : `NAMFPC`

LFITBETWEEN :

    Definition : To perform a spectral fit on the horizontally interpolated model primitive variables on model levels prior to the final vertical interpolations.

    Scope : Boolean.

    Default value : `.FALSE.` (will become equivalent to `LECMWF` in cycles newer than 48t1).

    Namelist location : `NAMFPC`

NSPFILP :

> **Definition** : Spectral filter option for post-processed fields on pressure levels.
>
> **Scope** : Integer between 1 and 3. Possible options :
>
> - 1 : spectral fit only
> - 2 : gaussian spectral filter
> - 3 : low-pass spectral filter
>
> **Default value** : 1
>
> **Namelist location** : `NAMFPC`

NSPFILT :

> **Definition** : Spectral filter option for post-processed fields on potential temperature levels.
>
> **Scope** : Integer between 1 and 3. Possible options :
>
> - 1 : spectral fit only
> - 2 : gaussian spectral filter
> - 3 : low-pass spectral filter
>
> **Default value** : 1
>
> **Namelist location** : `NAMFPC`

NSPFILV :

> **Definition** : Spectral filter option for post-processed fields on potential vorticity levels.
>
> **Scope** : Integer between 1 and 3. Possible options :
>
> - 1 : spectral fit only
> - 2 : gaussian spectral filter
> - 3 : low-pass spectral filter
>
> **Default value** : 3 if `CFPFMT='LALON'` ; 1 otherwise.
>
> **Namelist location** : `NAMFPC`

NSPFILI :

> **Definition** : Spectral filter option for post-processed fields on isotherms.
>
> **Scope** : Integer between 1 and 3. Possible options :
>
> - 1 : spectral fit only
> - 2 : gaussian spectral filter
> - 3 : low-pass spectral filter
>
> **Default value** : 2 if `CFPFMT='LALON'` ; 1 otherwise.
>
> **Namelist location** : `NAMFPC`

NSPFILF :

> **Definition** : Spectral filter option for post-processed fields on flight levels.
>
> **Scope** : Integer between 1 and 3. Possible options :
>
> - 1 : spectral fit only
> - 2 : gaussian spectral filter
> - 3 : low-pass spectral filter
>
> **Default value** : 1
>
> **Namelist location** : `NAMFPC`

NSPFILH :

> **Definition** : Spectral filter option for post-processed fields on height levels.
>
> **Scope** : Integer between 1 and 3. Possible options :
>
> - 1 : spectral fit only
> - 2 : gaussian spectral filter
> - 3 : low-pass spectral filter
>
> **Default value** : 1
>
> **Namelist location** : `NAMFPC`

NSPFILS :

> **Definition** : Spectral filter option for post-processed fields on η levels.
>
> **Scope** : Integer between 1 and 3. Possible options :
>
> - 1 : spectral fit only
> - 2 : gaussian spectral filter
> - 3 : low-pass spectral filter
>
> **Default value** : 1
>
> **Namelist location** : `NAMFPC`

NSPFIL2 :

> **Definition** : Spectral filter option for 2D post-processed fields.
>
> **Scope** : Integer between 1 and 3. Possible options :
>
> - 1 : spectral fit only
> - 2 : gaussian spectral filter
> - 3 : low-pass spectral filter
>
> **Default value** : 3 if `CFPFMT='LALON'` ; 1 otherwise.
>
> **Namelist location** : `NAMFPC`

LFPBED :

    Definition : The function used to shape the low-pass filter is by default an hyperbolic tangent. If `LFPBED=.FALSE.` then this function is replaced by an exponential, making the filter less selective (the function is less sharp). Deprecated option, for the global model only.

    Scope : boolean.

    Default value : `.TRUE.`

    Namelist location : `NAMFPF`

RFPBED :

    Definition : Intensity k of the low-pass filter (*for the global model only*).

    Scope : Real. Unit : adimensional

    Default value : ≈ 3.08[1].

    Namelist location : `NAMFPF`

NFMAX :

    Definition : Truncation threshold of each (sub-)domain for the low-pass filter, beyond which, with respect to the spectral resolution on the sphere at homogeneous resolution (`NFPCMAX`), the filters become inactive. If negative or null, then the filter is disabled.

    Scope : Integer array, maximum size : 15 .

    Default value : If `CFPFMT='GAUSS'` then `NFMAX(1)=NFPMAX(1)*FPSTRET`.
    Otherwise (`LELAM`, `LALON`) `NFPMAX` is computed as close as it would if the output grid is considered as a quadratic grid with this truncation.
    Retuning of this parameter is recommended.

    Namelist location : `NAMFPF`

NFPCMAX :

    Definition : For the global stretched model, maximum truncation at homogeneous resolution. This variable is used to compute the dilatation/contraction matrixes.

    Scope : Integer.

    Default value : `NSMAX*RSTRET`. This value is actually insufficient to compute the matrixes when the low-pass filter is active, but it gives a starting point. There is no restriction in the value of this variable and the less it is increased, the cheaper the computation of dilatation/contraction matrixes will be. Until this variable is big enough, the program will abort on testing if the deviation of the composition of dilatation/contraction matrixes is too far from identity.

    Namelist location : `NAMFPF`

---

[1]This odd value stands here for a historical continuity reason.

RFPMAXDEV :

>   **Definition** : Maximum deviation against identity of dilatation/contraction matrixes composition
>
>   **Scope** : Real. Unit : adimensional
>
>   **Default value** : `1.E-10` in double precision model ; `0.2E-5` in single precision model.
>
>   **Namelist location** : `NAMFPF`

RFPLTF :

>   **Definition** : coefficient of the exponential function in the gaussian filter
>
>   **Scope** : Real. Unit : adimensional
>
>   **Default value** : 4. in the global model ; 6. in the LAM model.
>
>   **Namelist location** : `NAMFPF`

RFPSEL :

>   **Definition** : a parameter used to alter the intensity k of the low-pass filter (see `RFPBED` above). Deprecated.
>
>   **Scope** : array of real positive values, maximum size 15 . Unit : adimensional.
>
>   **Default value** : 1.
>
>   **Namelist location** : `NAMFPF`

Notice :

- dynamic fields which are not represented by spectral coefficients in the model will not be spectrally fitted, even if the corresponding key `NFIT*` is active.

- dynamic fields which are represented by spectral coefficients in the model will be spectrally fitted only if the corresponding key `NFIT*` is active.

- However it is possible to change the horizontal representation of any field (see page 47) and hence, change the impact of the keys `NFIT*` on each of them.

TFP_{*}%ISF :

>   **Definition** : Spectral fit or filter option for a given field if represented by spectral coefficients :
>
>   >   - 1 : spectral fit
>   >   - 2 : gaussian spectral filter
>   >   - 3 : low-pass spectral filter
>
>   **Scope** : Integer. "{*}" represents the field identifier.
>
>   **Default value** : defined by the former namelist variables `NFIT*` and `NSPFIL*`
>
>   **Namelist location** : `NAMAFN`

TFP_{*}%ZFK :

>   **Definition** : Coefficient k of the spectral filter for a given field if represented by spectral coefficients (see appendix E on page 112)
>
>   **Scope** : Real. "{*}" represents the field identifier.
>
>   **Default value** :
>
>   **Namelist location** : NAMAFN

Notice :

- Only one filter can be applied to a given field ; consequently, in case of an ambiguous situation (like : geopotential on an iso-PV surface), only the strongest filter is applied (in this example that will be the low-pass filter).

- Filters may be applied even when the post-processed fields should be represented in spectral coefficients (in the case of a change of geometry).

3.1.6 Support of climatology data

In horizontal interpolations the usage of climatology data can improve the accuracy of several surface fields. Upper air fields interpolated on surface-dependent levels can be more accurate, too, with the help of an external orography. Appendix D on page 110 explains how to make such files.

NFPCLI :

>   **Definition** : Options for using climatology data :
>   - NFPCLI=0 : climatology data is not used.
>   - NFPCLI=1 : output surface geopotential and land-sea mask from the target climatology files are used for horizontal interpolations.
>   - NFPCLI=2 : a larger set of constant climatology surface fields from the target climatology files are used for the horizontal interpolations.
>   - NFPCLI=3 : a larger set of climatology surface fields, including constant and monthly values, are used for the horizontal interpolations. In this case two sets of climatology files are used : one from the source geometry and the other one with the target geometry. The climatology data inside the model is supposed to be identical to the source climatology file provided ; however a small difference can be tolerated on surface geopotential, ISBA sand percentage or root depth.
>
>   **Scope** : Integer between 0 and 3.
>
>   **Default value** : 0
>
>   **Namelist location** : NAMFPC

LCLIMALBEDOS :

>   **Definition** : .TRUE. to read albedos in climatology files (for compatibility with old climatology files not having them)
>
>   **Scope** : Boolean.
>
>   **Default value** : .TRUE.
>
>   **Namelist location** : NAMFPC

LCLIMAEROSOL :

>   **Definition** : .TRUE. to read aerosols in climatology files (for compatibility with old climatology files not having them)
>
>   **Scope** : Boolean.
>
>   **Default value** : .TRUE.
>
>   **Namelist location** : NAMFPC

LCLIMOZONE :

>   **Definition** : .TRUE. to read ozone coefficients in climatology files (for compatibility with old climatology files not having them)
>
>   **Scope** : Boolean.
>
>   **Default value** : .TRUE.
>
>   **Namelist location** : NAMFPC

RFPCORR :

>   **Definition** : maximum allowed difference of surface geopotential between the model and the source climatology, in order to correct surface temperature with the help of the standard vertical profile if this difference is not null.
>
>   **Scope** : Real. Unit : J/kg
>
>   **Default value** : 300.*g
>
>   **Namelist location** : NAMFPC

RFPCSAB :

>   **Definition** : maximum allowed difference of sand percentage between model and source climatology, in order to compute the relative soil moisture.
>
>   **Scope** : Real. Unit : adimensional.
>
>   **Default value** : 0.01
>
>   **Namelist location** : NAMFPC

RFPCD2 :

>   **Definition** : Critical difference of root depth between model and source climatology in order to compute the relative soil moisture.
>
>   **Scope** : Real. Unit : m.
>
>   **Default value** : 0.001 m.
>
>   **Namelist location** : NAMFPC

3.1.7 Model options influencing the post-processing

Fields not present in the model but requested by the post-processor will be created and filled with zeroes, unless they can be diagnosed from other model fields.

LNHEE, LNHQE (formerly LNHDYN) :

> **Definition** : Control of the non-hydrostatic model ; if `.TRUE.` then pressure departure and vertical divergence or true vertical velocity fields are interpolated. Otherwise pressure departure is filled with zero, and vertical divergence or true vertical velocity is diagnosed.
>
> **Scope** : Boolean. To run the model with this option the ALADIN/AROME software is needed.
>
> **Default value** : `.FALSE.`
>
> **Namelist location** : `NAMCT0`

Y*_NL%LSP, Y*_NL%LGP :

> **Definition** : Respectively spectral and gridpoint representation of the GFL field ***** of the model.
>
> **Scope** : Boolean. Possible values : any pair of booleans except (`.TRUE.`,`.TRUE.`)
>
> **Namelist location** : `NAMGFL`

Y*_NL%NREQIN :

> **Definition** : binary indicator telling if the GFL field ***** of the model is to be read from input file (1) or if a default value should be used (0).
>
> **Scope** : Integer between 0 and 1.
>
> **Namelist location** : `NAMGFL`

Y*_NL%REFVALI :

> **Definition** : Default value of the GFL field *****.
>
> **Scope** : Real.
>
> **Namelist location** : `NAMGFL`

LSPRT :

> **Definition** : if `.TRUE.` then the virtual temperature is used in the model instead of the temperature.
>
> **Scope** : Boolean.
>
> **Default value** : `.FALSE.`
>
> **Namelist location** : `LSPRT`

3.1.8 Interoperability from IFS to ARPEGE/ALADIN/AROME and from ARPEGE to IFS

The conversion of IFS data to ARPEGE or ALADIN/AROME data in a FA file format, and reversely the conversion of ARPEGE data to IFS data in a GRIB file format is a post-processing request where the input model is defined by the namelist variable `LECMWF`, the output format is defined by the namelist variable `LARPEGEF` and the format of the requested fields is defined by the target file format ; which means in practice :

- to convert IFS data to ARPEGE or ALADIN/AROME data on should set :
  `LECMWF=.TRUE.`, `LARPEGEF=.TRUE.` ; and use the variables `CFP3DF`, `CFP2DF` and `CFPPHY` to defined the fields to get.
  Also note that the setting of `LECMWF=.TRUE.` will require a proper setting of the physical package with `LEPHYS=.TRUE.` and `LMPHYS=.FALSE.`

- to convert ARPEGE data to IFS data on should set :
  `LECMWF=LECMWF=.FALSE.`, `LARPEGEF=.FALSE.` ; and use the variables `MFP3DF*`, `NFP3DF*`, `MFP2DF`, `NFP2DF` and `MFPPHY`, `NFPPHY` to defined the fields to get.
  Also note that the setting of `LECMWF=.FALSE.` will require a proper setting of the physical package with `LMPHYS=.TRUE.` and `LEPHYS=.FALSE.`

Note that the simultaneous activation of both physical packages (`LEPHYS=.TRUE.` *and* `LMPHYS=.TRUE.`) is theorically possible but risky (at least considering the state of the art of *FullP*OS) because of possible confusions in the way how to convert surface fields.

3.1.9 Interoperability from TESSEL to ISBA

In the framework of the conversion of IFS data to ARPEGE or ALADIN/AROME data , several parameters can be used to fine-tune the conversion of TESSEL surface fields to ISBA ones :

TSRESERV1 :

> **Definition** : Icing temperature for surface soil frost.
> **Scope** : Real.
> **Default value** : 272.15 K.
> **Namelist location** : `NAMFPC`

TSRESERV2 :

> **Definition** : Icing temperature for deep soil frost.
> **Scope** : Real.
> **Default value** : 269.15 K.
> **Namelist location** : `NAMFPC`

TDELTA1 :

> **Definition** : Threshold of icing temperature for surface soil frost.
> **Scope** : Real.
> **Default value** : 3. K.
> **Namelist location** : `NAMFPC`

TDELTA2 :

> **Definition** : Threshold of icing temperature for deep soil frost.
>
> **Scope** : Real.
>
> **Default value** : 7. K.
>
> **Namelist location** : `NAMFPC`

NFPSWI :

> **Definition** : Soil water and frost interpolation method :
> `NFPSWI=0` : without using the Soil Wetness Index `NFPSWI=1` : interpolate Soil Wetness Index then scale following the so-called "OI trick" `NFPSWI=2` : Interpolate Soil Wetness Index then scale with Leaf Area Index
>
> **Scope** : Integer between 0 and 2.
>
> **Default value** : 0
>
> **Namelist location** : `NAMFPC`

3.1.10 Interoperability from ISBA to SURFEX

The purpose of the following options is to convert the ISBA surface fields into a comprehensive SURFEX data file.
It requires the physics from Météo-France to be activated (`LMPHYS=.TRUE.`) but with ISBA and not SURFEX (`LMSE=.FALSE.`).

NFPSURFEX :

> **Definition** : If set to 1, then SURFEX is invoked in order to convert the model surface fields ISBA into SURFEX surface fields and produce a so-called "PREP" file (SURFEX data file).
> The horizontal interpolations are performed by *FullP*OS then the fields transformations and the production of the output PREP file is subcontracted to SURFEX.
> This is a special option which will disable the post-processing of the traditional surface fields ; consequently, no surface field should be requested : `CFPPHY` should remain empty.
>
> **Scope** : Integer between 0 and 1.
>
> **Default value** : 0
>
> **Namelist location** : `NAMFPC`

NFPMASK :

> **Definition** : number of masks used for the interpolation of surface fields :
> `NFPMASK=0` : do not use any mask.
> `NFPMASK=1` : use a land-sea mask.
> `NFPMASK=2` : use a land mask and a sea mask.
> This option is used with `NFPSURFEX=1` in order to provide to SURFEX a field of SST which is different of the traditional surface temperature : given a point on the target grid, if the neighboring points are partly on sea and partly on land ,then two values can be computed : one with only the neighboring points over sea (SST) and one with only the neighboring points over land (Ts). With a single mask only one field can be computed, and its nature is the one of the dominant kind.

Scope : Integer between 0 and 2.

Default value : 1

Namelist location : NAMFPC

LPUTZS :

Definition : if set to .TRUE. then the orography of the atmospheric model is used to convert the ISBA surface fields to SURFEX ones.

Scope : Boolean.

Default value : .TRUE.

Namelist location : NAMFPC

3.1.11 Interoperability from TESSEL to SURFEX

Like for ISBA, the transformation of TESSEL surface fields into a comprehensive SURFEX data file is possible.

Similarly, it only requires the physics from ECMWF to be activated (LEPHYS=.TRUE.). The same parameters as for the transformation from ISBA should be used.

3.1.12 Interoperability from SURFEX to ISBA

The purpose of the following options in not to convert native SURFEX fields into ISBA fields, but only to convert surface fields from an atmospheric model using SURFEX into surface fields compatible with ISBA scheme. It only requires the physics from Météo-France to be activated (LMPHYS=.TRUE.).

RWPITPN :

Definition : minimum deep soil temperature for melting of frozen water.

Scope : Real.

Default value : 273. K.

Namelist location : NAMFPC

RWPITPX :

Definition : maximum deep soil temperature for melting of frozen water.

Scope : Real.

Default value : 273. K.

Namelist location : NAMFPC

RSNSTPN :

Definition : minimum deep soil temperature for melting of snow.

Scope : Real.

Default value : 272. K.

Namelist location : NAMFPC

RSNSTPX :

Definition : maximum deep soil temperature for melting of snow.

Scope : Real.

Default value : 272. K.

Namelist location : `NAMFPC`

RSNSMOD :

Definition : Reference snow depth for normalization.

Scope : Real.

Default value : 80. m.

Namelist location : `NAMFPC`

3.1.13   Post-processing of humidity

LFPQ :

Definition : To control the interpolation of relative humidity against specific humidity on any surface-dependent post-processing level (height, levels, η levels, etc). Relative humidity is known to have better conservative properties through interpolations than mixing ratio, even if it is not a conservative quantity. If `LFPQ=.TRUE.` the specific humidity is interpolated then the relative humidity is deduced. If not, the relative humidity is interpolated then the specific humidity is deduced.

Scope : Boolean.

Default value : `.FALSE.`

Namelist location : `NAMFPC`

FPRHMIN, FPRHMAX :

Definition : minimum and maximum values allowed for relative humidity. Especially `FPRHMAX` can be used to control sursaturation.

Scope : real, adimensional.

Default value :
    FPRHMIN=0.
    if (`LECMWF.AND..NOT.LARPEGEF`) then FPRHMAX=2. ; else FPRHMAX=1.

Namelist location : `NAMFPC`

LFPRH100 :

Definition : Representation of relative humidity : set `LFPRH100=.TRUE.` to get a percentage rather than a ratio.

Scope : Boolean.

Default value : equivalent to `LECMWF.AND..NOT.LARPEGEF`

Namelist location : `NAMFPC`

LSATURCAP :

Definition : To cap the horizontally interpolated specific humidity to saturation on each model level prior to the final vertical interpolations.

Scope : Boolean.

Default value : `.FALSE.` (will become equivalent to `LECMWF` in cycles newer than 48t1).

Namelist location : `NAMFPC`

3.1.14 Computation of potential vorticity

LFPISOPV :

> **Definition** : if `.TRUE.` an enhanced algorithm is used to compute the iso potential vorticity surfaces, which consider the case of area folding and stratospheric bulb of potential vorticity.
>
> **Scope** : Boolean.
>
> **Default value** : `.TRUE.`
>
> **Namelist location** : `NAMFPC`

NITERPV :

> **Definition** : number of iterations used in the research of the iso potential vorticity level when `LFPISOPV=.TRUE.`
>
> **Scope** : Integer between 0 and 6, or 8.
>
> **Default value** : 3
>
> **Namelist location** : `NAMFPC`

RFPVCAP :

> **Definition** : Minimum pressure of model level to provide an equatorial cap for fields computed on potential vorticity levels.
>
> **Scope** : Real. Unit : Pascal.
>
> **Default value** : if (`LECMWF.AND..NOT.LARPEGEF`) then `RFPVCAP`=8900. Pa ; else `RFPVCAP`=15000. Pa
>
> **Namelist location** : `NAMFPC`

3.1.15 Post-processing options for the CAPE

NFPCAPE :

> **Definition** : Algorithm of computation for the CAPE :
> - `NFPCAPE=1` : computation starts from the lowest model level
> - `NFPCAPE=2` : computation starts from the parcel at the most unstable model level
> - `NFPCAPE=3` : computation starts from the temperature and relative moisture at 2 meters
> - `NFPCAPE=5` : select the maximum value between the algorithms 2 and 3 above.
> - `NFPCAPE=6` : computation of Mixed Layer CAPE.
>
> **Scope** : Integer between 1 and 6 but not 4.
>
> **Default value** : 2
>
> **Namelist location** : `NAMFPC`

LFPCAPEX :

Definition : When relevant, origin of the temperature and relative moisture at 2 meters used in the computation of CAPE.

- `.TRUE.` : use fields from the model instantaneous fluxes.
- `.FALSE.` : use fields recomputed by the post-processing.

Scope : Boolean.

Default value : `.FALSE.`

Namelist location : `NAMFPC`

RENTRA :

Definition : entrainement coefficient. This option allows to have an even more complicated choice of options for the post-processing of the CAPE. If set to 0., a null entrainement is considered.

Scope : real.

Default value : `RENTRA=0.`

Namelist location : `NAMFPC`

3.1.16 Additional model options for the CAPE

NCAPEITER :

Definition : Number of iterations in the Newton's loops.

Scope : Integer.

Default value : 2

Namelist location : `NAMCAPE`

NETAPES :

Definition : Number of intermediate layers used for calculation of vertical ascent between two model pressure levels.

Scope : Integer.

Default value : 2

Namelist location : `NAMCAPE`

GCAPEPSD :

Definition : When relevant, depth of layer above the ground in which most unstable parcel is searched for.

Scope : Real. Unit : Pascal.

Default value : 30000 Pa.

Namelist location : `NAMCAPE`

GCAPERET :

Definition : Fraction of the condensate which is retained (ie : which does not precipitate).

Scope : real value between 0. and 1.

Default value : `GCAPERET=0.` ("irreversible" or pseudo-adiabatic moist ascent : clouds condensates precipitate instantaneously and thus does not affect the buoyancy).

Namelist location : `NAMCAPE`

3.1.17 Other post-processing specific options

LCRITSNOWTEMP :

> **Definition** : Alternative option to interpolate snow cover. If `.FALSE.` then the output snow cover is corrected in order to remain null over sea and positive over land. If `.TRUE.` then the output snow cover is corrected in order to remain null over sea, and positive over land only if the surface temperature at this point is below zero degrees Celsius.
>
> **Scope** : Boolean.
>
> **Default value** : equivalent to `(.NOT.LECMWF).OR.LARPEGEF`
>
> **Namelist location** : `NAMFPC`

RSTRMMH :

> **Definition** : Upper boundary of the vertical integral (lower is the ground) in the computation of the storm motion.
>
> **Scope** : Real. Unit : meters.
>
> **Default value** : 6000.
>
> **Namelist location** : `NAMFPC`

RSRHH :

> **Definition** : Upper boundary of the vertical integral (lower is the ground) in the computation of the storm relative helicity (an indication of potential for mesocyclone development (in case RSRHH is 3000. m) or potential for tornado formation (in case RSRHH=1000. m).
>
> **Scope** : Real. Unit : meters.
>
> **Default value** : 3000.
>
> **Namelist location** : `NAMFPC`

LUBIQUITAIRE :

> **Definition** : For the computation of RTTOV radiances, to have the satellite at the vertical of all the grid points (Arpege/Arome only).
>
> **Scope** : Boolean.
>
> **Default value** : `.FALSE.`
>
> **Namelist location** : `NAMMTS` of the model namelist up to cycle 48t1, `NAMMTS` of the post-processor namelist later.

LISP_HYBRID :

> **Definition** : For the computation of RTTOV radiances, to compute MSG simulated data in "real" conditions over the MSG domain and `LUBIQUITAIRE` computation elsewhere (Arpege/Arome only).
>
> **Scope** : Boolean.
>
> **Default value** : `.FALSE.`
>
> **Namelist location** : `NAMMTS` of the model namelist up to cycle 48t1, `NAMMTS` of the post-processor namelist later.

3.2 Output fields conditioning

3.2.1 Horizontal representation of dynamic fields

For any post-processed dynamic field it is possible to choose the horizontal representation (spectral or gridpoint), providing the field can be computed in both representation. This is independant from the representation of the field in the model. So it is a way to convert fields from spectral space to gridpoint space or vice-versa) :

TFP_{*}%LLGP :

>   **Definition** : Horizontal representation of fields : `.TRUE.` for gridpoint, `.FALSE.` for spectral.
>
>   **Scope** : Boolean. "{*}" represents the field identifier.
>
>   **Default value** : should be the same representation as it is (or it would be) in the model.
>
>   **Namelist location** : `NAMAFN`

3.2.2 Data encoding

NFPGRIB :

>   **Definition** : (for ARPEGE/ALADIN/AROME files only) Control on GRIB encoding level for fields.
>
>   **Scope** : Integer, with the following possible values :
>
>   - NFPGRIB = 0 : packing disabled.
>   - NFPGRIB = 1 : standard GRIB level 0.
>   - NFPGRIB = 2 : enhanced GRIB level 0 : extreme values are preserved and a Dolby effect is applied on spectral fields.
>   - NFPGRIB = 3 : GRIB level 1. Deprecated as it uses Gribex software.
>   - NFPGRIB = -1 : GRIB level 1. Deprecated as it uses Gribex software.
>   - NFPGRIB = 4 : GRIB level 1 for hollow fields (aka "frames"). Deprecated as it uses Gribex software.
>   - NFPGRIB = 120 : GRIB level 2 with simple packing for gridpoint fields (option reserved for "frames" ?)
>   - NFPGRIB = 121 : GRIB level 2 with simple packing *for gridpoint fields exclusively (spectral fields not supported)*
>   - NFPGRIB = 122 : GRIB level 2 with simple packing for gridpoint fields and GRIB level 0 in spectral space.
>   - NFPGRIB = 123 : GRIB level 2 with simple packing for gridpoint fields and complex packing in spectral space
>   - NFPGRIB = 140 : GRIB level 2 with second order packing for hollow fields (option reserved for "frames").
>   - NFPGRIB = 141 : GRIB level 2 with second order packing *for gridpoint fields exclusively (spectral fields not supported)*
>   - NFPGRIB = 142 : GRIB level 2 with second order packing for gridpoint fields and GRIB level 0 in spectral space.
>   - NFPGRIB = 143 : GRIB level 2 with second order packing for gridpoint fields and complex packing in spectral space.

- NFPGRIB = 200 : GRIB level 2 with complex packing in gridpoint space (spectral representation not documented).

Recommended values are 141 for backend gridpoint post-processing, and 123 for historical/coupling files.

Default value : Equivalent to the corresponding model variable `NVGRIB`.

Namelist location : `NAMFPC`

NIDCEN :

Definition : GRIB originating center identifier (used by GRIB2 encoder only)

Scope : Integer

Default value : 85 (Météo-France)

Namelist location : `NAMFA`

CMODEL :

> **Definition** : default name of the model (GRIB2 specific key `"faModelName"`)
>
> **Scope** : string of maximum 64 characters.
>
> **Default value** : empty string
>
> **Namelist location** : `NAMFA`

CFAMODEL :

> **Definition** : *FullP*OS -specific name of the model (GRIB2 specific key `"faModelName"`). This variable is available only in cycle 46t1_op1.02, and will be available in cycles newer than 48t1.
>
> **Scope** : string of maximum 64 characters.
>
> **Default value** : `CMODEL`
>
> **Namelist location** : `NAMFPIOS`

NBITPG :

> **Definition** : Default number of bits for packing fields.
>
> **Scope** : Integer which value can be either -1, or any positive number between 1 and 64. If `NBITPG`=-1 then the default value is internally computed by the FA (File ARPEGE) software.
>
> **Default value** : 24 ; if `NBITPG`=-1 the actual default value will be 16.
>
> **Namelist location** : `NAMFA`

NSTRON :

> **Definition** : Default threshold for the truncation beyond which the spectral fields are packed.
>
> **Scope** : Integer which value can be either -1, or any positive number between 1 and the model truncation `NSMAX`.
>
> **Default value** : 10 ; if `NSTRON`=-1 the actual default depends on the model truncation `NSMAX`.
>
> **Namelist location** : `NAMFA`

NPULAP :

> **Definition** : "Dolby exposant" for the packing of spectral fields.
>
> **Scope** : Integer between -5 and +5.
>
> **Default value** : 1
>
> **Namelist location** : `NAMFA`

GFP_{*}%IBITS :

   Definition : Number of bits for packing physical fields and fluxes.

   Scope : Integer. "{*}" represents the field identifier (there is one variable per field)

   Default value : given by `NBITPG`. Notice : surface geopotential should not be packed in the model in order to keep consistency between spectral and gridpoint orography.

   Namelist location : `NAMAFN`

TFP_{*}%IBITS :

   Definition : Number of bits for packing dynamic fields.

   Scope : Integer. "{*}" represents the field identifier (there is one variable per dynamic field)

   Default value : given by `NBITPG`. Notice : surface geopotential should not be packed in the model in order to keep consistency between spectral and gridpoint orography.

   Namelist location : `NAMAFN`

3.2.3   Inline/Offline reproducibility

To ensure bitwise reproducibility of the post-processing when executed along the model integration or after the model integration, the input data used by the post-processing should be encoded then decoded to mimic the process performed when a model data file is written an read again :

LFPPACKING :

   Definition : if `.TRUE.`, then perform packing/unpacking of model fields before running a post-processing step. This option is valid only for FA files.

   Scope : Boolean.

   Default value : `.FALSE.`

   Namelist location : `NAMFPC`

Notice : for now, the bitwise reproducibility of "GFL" fields or any post-processed field involving a "GFL" field is not working. This will be fixed in cycle 48t2.

3.2.4   Output format

In the case of FA files and if the encoding algorithm is GRIB1 or GRIB2, then output files for backend production can be split so that fields can be written out into separate files in GRIB format :

LEXTERN :

   Definition : Default file format. if `.TRUE.`, write FA fields encoded in GRIB1 or GRIB2 to a separate GRIB file.

   Scope : Boolean.

   Default value : `.FALSE.`

   Namelist location : `NAMFA`

LFAEXTERN :

    Definition : *FullP*OS -specific file format. if `.TRUE.`, write FA fields encoded in GRIB1 or GRIB2 to a separate GRIB file. This variable is available only in cycle 46t1_op1.02, and will be available in cycles newer than 48t1.

    Scope : Boolean.

    Default value : `LEXTERN`

    Namelist location : `NAMFPIOS`

Remarks :

- Beside the GRIB files, a FA file with the traditional name and containing the FA traditional frame is still created and cannot be removed.

- The created GRIB files will be prefixed with "GRIB". This prefix cannot be removed nor customized.

3.3 Fine-grain selection of output fields

By default, at each post-processing step, all the post-processing fields are written out at all post-processing levels and, if relevant, for all output sub-domains. However it is possible to specify a selective list of fields to write out at each post-processing step by choosing for each field the specific list of post-processing levels, and for each post-processing level of each field the specific list of (sub-)domains.

3.3.1 General handling

A special namelist file, called the *selection file*, should be written for each post-processing step. This file should be named either :

- **xxs**_DDDDDDHHMM_ where _DDDDDDHHMM_ specifies the date/time

- **xxt**_DDDDHHMM_ where _DDDDHHMM_ specifies the date/time

- **xxu** specifying uninitialised data (there must be at least one trailing **u**)

- **xxf**_DHHMM_**t**_DHHMM_ where _DHHMM_ specify from/to date/times (the range includes the upper time but does not include the lower time)

- **xxF**_DDDHH_**t**_DDDHH_ where _DDDHH_ specify from/to date/times (the range includes the upper time but does not include the lower time)

_D_ (days) may be replaced by **d** to act as a wild character for days
_H_ (hours) may be replaced by **h** to act as a wild character for hours
_M_ (minutes) may be replaced by **m** to act as a wild character for minutes
However, wild characters will not match with date/time=0

The selection files should be located in a directory defined by the variable `CNPPATH` :

CNPPATH :

> **Definition** : directory of the selection files. The selection files being usually located in the current working directory, the custom is to set `CNPPATH='.'` ;
>
> **Scope** : string of 120 characters.
>
> **Default value** : blank string (meaning : no selection files should be searched).
>
> **Namelist location** : `NAMCTO`

Should the selection files be located in another directory than the current working directory, the it is better to set the variable `CFPMONIPATH_IN` to define it, and let `CNPPATH=.` :

CFPMONIPATH_IN :

> **Definition** : pathname of control files in input.
>
> **Scope** : character strings, maximum length 180.
>
> **Default value** : .
>
> **Namelist location** : `NAMFPC`

The post-processing will then list the content of the directory where the selection files are located and use this list as an internal control file :

CFDIRLST :

> **Definition** : name of the file containing the list of files in the directory `CNPPATH`, and hence the list of selection files. This variable can be used if the default name (`"dirlst"`) causes an issue.
>
> **Scope** : string of 120 characters.
>
> **Default value** : `dirlst` if `CNPPATH` is set.
>
> **Namelist location** : `NAMCTO`

3.3.2 Specific handling for IFS

The selection files should contain a namelist block `NAMFPC` describing the fields request for the corresponding post-processing step.

Furthermore, to reduce the number of I/O opening and closing of files, an additional file named `"ppnamelist"` and put in the same directory as the selection files should be written : it should contain sequentially the concatenation of the selection files names and the selection files content. Example :

```
touch ppnamelist
for i in xxt* ; do
  echo "./${i}" >> ppnamelist
  cat       ${i}  >> ppnamelist
done
```

3.3.3 Specific handling for ARPEGE and ALADIN/AROME

The selection files should contain the following namelist blocks :

- `NAMFPPHY`

- `NAMFPDY2`

- `NAMFPDYP`

- `NAMFPDYH`

- `NAMFPDYV`

- `NAMFPDYT`

- `NAMFPDYS`

- `NAMFPDYI`

- `NAMFPDYF`

And the following variables should be documented :

CLPHY :

> **Definition** : selected physical fields names.
>
> **Scope** : array of 16 characters, maximum size : 2388 items. All the selected fields should be present in the array `CFPPHY`.
>
> **Default value** : blank string (no fields).
>
> **Namelist location** : `NAMFPPHY` in the selection file.

CLDPHY :

> **Definition** : selected subdomains for each selected physical field.
>
> **Scope** : array of ((15 *(20 + 1))-1) characters. Maximum size : 2388 items. It should contain for each selected physical field the list of selected subdomains separated with the character `":"`. All the selected subdomains should be present in the array `CFPDOM`.
>
> **Default value** : blank string (ALL subdomains)
>
> **Namelist location** : `NAMFPPHY` in the selection file.

CLCFU :

> **Definition** : selected cumulated fluxes names.
>
> **Scope** : array of 16 characters, maximum size : 82 items. All the selected fields should be present in the array `CFPCFU`.
>
> **Default value** : blank string (no fields).
>
> **Namelist location** : `NAMFPPHY` in the selection file.

CLDCFU :

Definition : selected subdomains for each selected cumulated flux.

Scope : array of ((15 *(20 + 1))-1) characters. Maximum size : 82 items. It should contain for each selected cumulated flux the list of selected subdomains separated with the character ":". All the selected subdomains should be present in the array `CFPDOM`.

Default value : blank string (ALL subdomains)

Namelist location : `NAMFPPHY` in the selection file.

CLXFU :

Definition : selected instantaneous fluxes names.

Scope : array of 16 characters, maximum size : 65 items. All the selected fields should be present in the array `CFPXFU`.

Default value : blank string (no fields).

Namelist location : `NAMFPPHY` in the selection file.

CLDXFU :

Definition : selected subdomains for each selected instantaneous flux.

Scope : array of ((15 *(20 + 1))-1) characters. Maximum size : 65 items. It should contain for each selected instantaneous flux the list of selected subdomains separated with the character ":". All the selected subdomains should be present in the array `CFPDOM`.

Default value : blank string (ALL subdomains)

Namelist location : `NAMFPPHY` in the selection file.

CL2DF :

Definition : selected dynamic 2D fields names.

Scope : array of 16 characters, maximum size : 212 items. All the selected fields should be present in the array `CFP2DF`.

Default value : blank string (no fields).

Namelist location : `NAMFPDY2` in the selection file.

CLD2DF :

Definition : selected subdomains for each selected dynamic 2D field.

Scope : array of ((15 *(20 + 1))-1) characters. Maximum size : 212 items. It should contain for each selected dynamic 2D field the list of selected subdomains separated with the character ":". All the selected subdomains should be present in the array `CFPDOM`.

Default value : blank string (ALL subdomains)

Namelist location : `NAMFPDY2` in the selection file.

CL3DF :

> **Definition** : selected upper air dynamic fields names.
>
> **Scope** : array of 12 characters, maximum size : 511 items. All the selected fields should be present in the array `CFP3DF`.
>
> **Default value** : blank string (no fields).
>
> **Namelist location** : `NAMFPDYP` for pressure levels, `NAMFPDYH` for height levels, `NAMFPDYV` for potential vorticity levels, `NAMFPDYT` for isentropic levels, `NAMFPDYI` for isothermic levels, `NAMFPDYF` for flight levels and `NAMFPDYS` for η levels. All in the selection file.

IL3DF :

> **Definition** : the *subscripts* of the selected post-processing levels for each selected upper air dynamic field.
>
> **Scope** : integer array of strictly positive values, maximum size : 511 items. All the selected subscripts should correspond to an effective post-processing level.
>
> **Default value** : 0
>
> **Namelist location** : `NAMFPDYP` for pressure levels, `NAMFPDYH` for height levels, `NAMFPDYV` for potential vorticity levels, `NAMFPDYT` for isentropic levels, `NAMFPDYI` for isothermic levels, `NAMFPDYF` for flight levels and `NAMFPDYS` for η levels. All in the selection file.

CLD3DF :

> **Definition** : selected subdomains for each selected level of each selected upper air dynamic field.
>
> **Scope** : bi-dimensional array of ((15 *(20 + 1))-1) characters. Maximum size : (200 , 212) items. It should contain for each selected level of each selected upper air dynamic field the list of selected subdomains separated with the character ":". All the selected subdomains should be present in the array `CFPDOM`.
>
> **Default value** : blank string (ALL subdomains)
>
> **Namelist location** : `NAMFPDYP` for pressure levels, `NAMFPDYH` for height levels, `NAMFPDYV` for potential vorticity levels, `NAMFPDYT` for isentropic levels, `NAMFPDYI` for isothermic levels, `NAMFPDYF` for flight levels and `NAMFPDYS` for η levels. All in the selection file.

Appendix C on page 108 shows an example of selection file.

3.4   Options to optimize the computational performance

This section describes parameters that can influence the computational performance. Certain variables are specific to the post-processing, others are originating from the model.

3.4.1 Model options

NPROMA[2] :

Definition : cache-blocking factor (on cache-based computers), or maximum vector length (on vector computers)[3] in the model gridpoint space. In the post-processing it is in use during the vertical interpolations when they are computed in the model geometry, in the model spectral transforms, and before the horizontal interpolations. On cache-based computers the optimal value depends on the memory cache size in the machine, and should optimally be a multiple of the AVX registers on machines supporting the AVX instructions. On vector computers the optimal value should be a multiple of the vector length registers (usually 256) minus 1 in order to avoid memory banks conflicts.

Scope : integer. If negative, the absolute value is used as is. If null, the default value is used. If positive or null, then the program will attempt to compute an optimal value, starting from the given value as a first guess. However, a manually tuned negative value is recommended.

Default value : if `LOPT_SCALAR=.TRUE.` then `NPROMA`=16, else `NPROMA`=2047.

Namelist location : `NAMDIM`

LFFTW, LUSEFLT :

Definition : to respectively use the FFTW algorithm (based on Discrete Fourier Transforms) or the Fast Legendre Transforms in the model spectral transforms.

Scope : Booleans

Default value : `LFFTW=.FALSE.` (use of the internal "FFT992" algorithm) ; `LUSEFLT=.TRUE.` for truncations above 1280 only.

Namelist location : `NAMTRANS`

LSPLIT :

Definition : Control of latitude row splitting in Fourrier space. Set `LSPLIT=.TRUE.` to improve the balance of distribution.

Scope : Boolean.

Default value : `.TRUE.`

Namelist location : `NAMPAR1`

LOPT_SCALAR :

Definition : A key to used the source code path optimized for a scalar computer rather than for a vector computer. Today it is useless in the post-processing but this may change without notice as the software is changing.

Scope : Boolean.

Default value : It depends on predefined cpp macros.

Namelist location : `NAMPAR0`

---

[3]NPROMA must stand for "PROfondeur MAximale"

NPROC :

    Definition : Number of tasks used for the MPI distribution.

    Scope : Integer, strictly positive.

    Default value : 0 (consequently this parameter *must* be set explicitely !)

    Namelist location : `NAMPAR0`

NPRTRW, NPRTRV :

    Definition : Numbers of MPI tasks used respectively for the waves and the vertical distributions in spectral space.

    Scope : Integers, strictly positive and such that `NPRTRW*NPRTRV=NPROC`.

    Default value : Self-computed, depending on `LOPT_SCALAR`

    Namelist location : `NAMPAR0`

NPRGPNS, NPRGPEW :

    Definition : Numbers of MPI tasks used respectively for the North-South and East-West distributions in gridpoint space.

    Scope : Integers, strictly positive and such that `NPRGPNS*NPRGPEW=NPROC`.

    Default value : Self-computed, depending on `LOPT_SCALAR`

    Namelist location : `NAMPAR0`

LEQ_REGIONS :

    Definition : if `.TRUE.`, use the equi-repartition algorithm for gridpoint space distribution in the global model ; then the variables `NPRGPNS` and `NPRGPEW` become meaningless. This variable is meaningless in the LAM model.

    Scope : Boolean.

    Default value : `LECMWF`

    Namelist location : `NAMPAR1`

NSTRIN :

    Definition : Numbers of tasks used for reading and unpacking data from input FA files (variable not used in IFS, then).

    Scope : Integer between 1 and `NPROC`. The best performance should be obtained with `NSTRIN=NPROC`.

    Default value : `NPROC`

    Namelist location : `NAMPAR1`

NSTROUT :

    Definition : Numbers of tasks used for packing data before writing to output FA file (variable not used in IFS, then).

    Scope : Integer between 1 and `NPROC`. The best performance in a compromise to find with respect to the extra communications it will cause.

Default value : 1

Namelist location : `NAMPAR1`

LIOLEVG :

Definition : if set to `.FALSE.` this key enables the number of vertical levels in the model (`NFLEVG` in the namelist `NAMDIM`) to be smaller than the number of vertical levels in the input FA files headers. This key is useful if only surface fields or PBL post-processing is requested because less vertical levels need be read and transformed. Setting `NFLEVG=2` together with `LIOLEVG=.FALSE.` should be enough ; but in any case the user should control that this setting has a neutral impact on the results.

Scope : Boolean.

Default value : `.TRUE.`

Namelist location : `NAMCT0`

NPROMATR, NEPROMATR :

Definition : maximum number of fields to be transformed per call to respectively the global and the LAM spectral transforms. These variables can be used to limit the memory cost, to the detriment of the CPU time.

Scope : Integer, strictly positive.

Default value : self-determined to be the maximum value.

Namelist location : `NAMTRANS0`

LALLOPERM :

Definition : to allocate certain big arrays permanently in the spectral transforms.

Scope : Boolean.

Default value : equivalent to `NOPT_MEMORY >= 1`,
where `NOPT_MEMORY` is a memory strategy option, located in `NAMCT0`, for the forecasting model :
= 0 : prefer heap, and deallocate/reallocate systematically (slower but less memory consuming)
= 1 : prefer stack (faster but more memory consuming)
= 2 : prefer heap but reallocate only if size has changed (best compromise and default value)

Namelist location : `NAMTRANS0`

NSTACK_MEMORY_TR :

Definition : to drive the memory allocation in Fourier and gridpoint space in the stack (1) or in the heap (0).
This option has been available since cycle 48t1.

Scope : Integer.

Default value : For continuity reasons, default is 1 (stack) for Météo-France and 0 (heap) for ECMWF.

Namelist location : `NAMTRANS0`

3.4.2 Post-processing-specific options

NFPROMA :

Definition : cache-blocking factor (on cache-based computers), or maximum vector length (on vector computers) in the post-processing gridpoint space. In the post-processing it is in use after the horizontal interpolations and in the vertical interpolations when they are computed in the post-processing geometry. Its tuning is similar to the tuning of `NPROMA`.

Scope : integer, limited to the number of post-processing gridpoints in the current task. If negative, the absolute value is used as is, limited to the number of post-processing gridpoints in the current task. If null, the default value is used, limited to the number of post-processing gridpoints in the current task. If positive or null, then the program will attempt to compute an optimal value, starting from the given value as a first guess. However, a manually tuned negative value is recommended.

Default value : equal to the final value of `NPROMA`

Namelist location : `NAMFPSC2`

NFPROMA_DEP :

Definition : cache-blocking factor (on cache-based computers), or maximum vector length (on vector computers) in the model gridpoint space for the post-processing arrays during the horizontal interpolations. Its tuning is similar to the tuning of `NPROMA`.

Scope : integer, limited to the number of post-processing gridpoints in the current task. If negative, the absolute value is used as is, limited to the number of post-processing gridpoints in the current task. If null, the default value is used, limited to the number of post-processing gridpoints in the current task. If positive or null, then the program will attempt to compute an optimal value, starting from the given value as a first guess. However, a manually tuned negative value is recommended.

Default value : equal to the final value of `NPROMA`

Namelist location : `NAMFPSC2_DEP`

NFPFFTW, NFPFLT :

Definition : to respectively use the FFTW algorithm (based on Discrete Fourier Transforms) or the Fast Legendre Transforms in the post-processing spectral transforms of each output domain.

Scope : Integer arrays, between 0 and 1.

Default value : `NFPFFTW(:)=1` if `LFFTW=.TRUE.`; `NFPFLT(:)=1` if `LUSEFLT=.TRUE.`

Namelist location : `NAMFPG`

NFPDISTRIB :

Definition : to apply a gridpoint data transposition from the model departure geometry
to the target arrival geometry. This parameter helps to reduce the computational load
imbalance, in exchange of an additional step of communications.

Scope : integer with three possible values :
   `0` : no transposition
   `1` : basic transposition for gridpoint outputs only
   `2` : advanced transposition, compatible with spectral outputs (but not yet working
   with `LALON` output)

Default value : internally computed to be active, depending on the output geometry.

Namelist location : `NAMFPG`

NFPXFLD :

Definition : Maximum size of a chunk of fields during communications, prior to in-
put/output operations or during post-processing transpositions of gridpoint data.
This parameter helps to reduce the overall memory cost or the intensity of com-
munications, to the detriment of the time spent in communications or input/output
operations.

Scope : Integer bigger than zero and limited to the biggest meaningful value (ie : the
number of post-processed fields). If negative or null, then the value is internally
recomputed as the biggest meaningful value.

Default value : -999 (then internally recomputed as the biggest meaningful value).

Namelist location : `NAMFPIOS`

NSTACK_MEMORY_FP :

Definition : to drive the memory allocation in *FullP*OS gridpoint transpositions in the
stack (1) or in the heap (0).
This option has been available since cycle 48t1.

Scope : Integer.

Default value : 1 (stack)

Namelist location : `NAMFPC`

NFP_SYNC_LEVEL :

Definition : to drive the messages reception protocol and use either blocking standard
(-1), non-blocking standard (1), or self-define which of these two protocols should be
more efficent or robust (0).
This option has been available since cycle 48t1.

Scope : Integer between -1 and 1.

Default value : 0 (self-defined).

Namelist location : `NAMFPC`

NMAXFPHOLD :

> **Definition** : If post-processing uses a selection file and is performed with a high frequency, then a performance issue may be observed, due to the multiple disk accesses while reading the selection files. With this variable, selection files can be saved in a memory, avoiding them to be read from disk over and over again. This variable defines the maximum number of different selection files hold in this memory cache.
> This option has been available since cycle 48t1.

> **Scope** : Integer, positive.

> **Default value** : *not initialized.*

> **Namelist location** : `NAMFPC`

3.5 Miscellaneous

3.5.1 Customization of output filenames

By default for ARPEGE/ALADIN/AROME users, the name of the output FA files are following this pattern :
`${CFPDIR}${CNMEXP}${CFPDOM(`i`)}`$nnnnn$
where `CNMEXP` is the name of the experiment, `CFPDOM(`i`)` is name of the output domain item i and $nnnnn$ the time stamp.
However, to extend the control on the files names, the pattern could be changed as follows :
`${CFPFN(`i`)}`$nnnnn$
Note that the time stamp can be made optional, or can be composed of either the number of (time) steps, the forecast range in hours, the forecast range in hours and minutes, or the forecast range in hours, minutes and seconds.

By default for IFS users, the name of the output files are following this pattern :
$KIND$`${CNMEXP}+`$nnnnnn$
where `CNMEXP` is the name of the experiment, $nnnnnn$ the time stamp, and $KIND$ a pre-defined prefix depending on the nature of the data : `"ICMSH"` for spherical harmonics, `"ICMUA"` for gridpoint upper air, and `"ICMGG"` for surface gridpoint fields.
The time stamp can be composed either of the number of (time) steps, or the forecast range in hours.

CFPDIR :

> **Definition** : Prefix of the output FA files names when the default naming pattern is used. For instance it can be an absolute UNIX path.

> **Scope** : String of 180 characters.

> **Default value** : `'PF'`

> **Namelist location** : `NAMFPC`

CFPFN :

    Definition : names of the output FA files names without the time stamp.

    Scope : Array of string of (180 +4+15) characters, size 15 .

    Default value : `${CFPDIR}${CNMEXP}${CFPDOM(:)}`

    Namelist location : `NAMFPIOS`

LINC :

    Definition : Time stamp unit used for the output files names : `.TRUE.` to write the stamp in hours, `.FALSE.` to write it in time steps. This parameter is used only in presence of a time integration, that is : in configuration `NCONF=1`

    Scope : Boolean.

    Default value : `.FALSE.`

    Namelist location : `NAMOPH`

NTIMEFMT :

    Definition : time stamp format in output files (working for FA files ; will work for IFS in cycle 50). Works only if `LINC=.TRUE.`
    0 : in hours ($+nnnnn$)
    1 : in hours and minutes ($+nnnnn$:`MM`)
    2 : in hours, minutes ans seconds ($+nnnnn$:`MM`:`SS`)
    The use of options 1 or 2 supposes that the variable `NPOSTSMIN` is set to define the precise minute or second for each output.

    Scope : Integer between 0 and 2

    Default value : 0

    Namelist location : `NAMOPH`

NPOSTSMIN :

    Definition : Array complementing NPOSTS to define the minute for each post-processing outputs when the frequency of outputs is not defined as time steps :

- `NPOSTSMIN(0)` is the number of post-processing events. It should be equal to `ABS(NPOSTS(0))` (setting `NPOSTSMIN(0)` will not be necessary anymore in cycles newer than 48t1).
- The post-processing runs on the minute `NPOSTSMIN(1)` of the hour `-NPOSTS(1)*NFRPOS`, `NPOSTSMIN(2)` of the hour `-NPOSTS(2)*NFRPOS`, . . . `NPOSTSMIN(NPOSTS(ABS(NPOSTS(0)))` of the hour `-NPOSTS(ABS(NPOSTS(0)))*NFRPOS`.

    Scope : integer array sized 0 to 960.

    Default value : `NPOSTSMIN(:)=0`

    Namelist location : `NAMCT0`

NFPDIGITS :

> **Definition** : number of digits used for the time stamp extension, preceded by the character "+" if strictly positive. If negative the number of digits is the absolute value of NFPDIGITS and the preceding character "+" is omitted. This last facility can help to mimic the traditional name of the LAM coupling files. Consequently, too, if NFPDIGITS=0 the whole time stamp is omitted. This would not work if more than one file is computed, for instance in a configuration of on-line post-processing, because the date of an existing file is checked before appending more date to it.

> **Scope** : Integer between -16 and +6 (will be allowed up to +16 in cycles newer than 48t1).

> **Default value** : 4 if LARPEGEF=.TRUE. (FA files in output), 6 if not (IFS GRIB outputs).

> **Namelist location** : NAMFPIOS

3.5.2 Customization of climatology filenames

In the local script the source climatology file name should be : "Const.Clim while the target climatology file name should be : "const.clim.CFPDOM(i)" where i is the (sub-)domain subscript. However the names can be customized :

CFNCLIMOUT :

> **Definition** : filename prefix for output climatology files

> **Scope** : character string, maximum length 256 characters.

> **Default value** : const.clim.

> **Namelist location** : NAMOPH

CFPCLIFNAME :

> **Definition** : filenames of the traditional climatology files on target geometry

> **Scope** : array of character strings, maximum length 180 characters, maximum size 15 .

> **Default value** : for each domain : const.clim.${CFPDOM$(i)$} (see CFNCLIMOUT above).

> **Namelist location** : NAMFPIOS

CFNCLIMIN :

> **Definition** : filename for input climatology files

> **Scope** : character string, maximum length 256 characters.

> **Default value** : Const.Clim

> **Namelist location** : NAMOPH

CCLIMINC :

> **Definition** : if climatology files should depend on the month value, a suffix is appended to the file name in order to specify the month value. This is the prefix in front of the month value for climatology files. No month value is used if the string is blank.

> **Scope** : character string, maximum length 8 characters.

> **Default value** : blank string.

> **Namelist location** : NAMOPH

CFPEXTSFX :

> **Definition** : filename extension for SURFEX FA files.
>
> **Scope** : character string, maximum length 8 characters. Beware, if it is a blank or empty string, not to conflict with the traditional climatology filenames. If so, consider the use of the variable `CFPSFXFNAME` below, which completely redefines the SURFEX climatology filenames on target geometry.
>
> **Default value** : `.sfx`.
>
> **Namelist location** : `NAMOPH`

CFPSFXFNAME :

> **Definition** : filename of the SURFEX climatology file on target geometry
>
> **Scope** : array of character strings, maximum length 180 characters, maximum size 15 .
>
> **Default value** : for each domain : `const.clim.sfx.${CFPDOM(i)}` (see CFNCLIMOUT and CFPEXTSFX above).
>
> **Namelist location** : `NAMFPIOS`

3.5.3 Customization of fields names or GRIB codes

GFP_{*}%CLNAME :

> **Definition** : ARPEGE/ALADIN/AROME field names for physical fields and fluxes.
>
> **Scope** : String of 16 characters. "{*}" represents the field identifier.
>
> **Default value** : Refer to appendix A.3 on page 92.
>
> **Namelist location** : `NAMAFN`

GFP_{*}%IGRIB :

> **Definition** : GRIB codes for physical fields and fluxes.
>
> **Scope** : Integer. "{*}" represents the field identifier.
>
> **Default value** : Refer to appendix B.3 on page 101.
>
> **Namelist location** : `NAMAFN`

TFP_{*}%CLNAME :

> **Definition** : ARPEGE/ALADIN/AROME field names for dynamic fields.
>
> **Scope** : String of 16 characters. "{*}" represents the field identifier. However the string length is limited to 12 characters for upper air fields.
>
> **Default value** : Refer to appendix A.1 on page 88 for upper air fields, and to appendix A.2 on page 90 for 2D fields.
>
> **Namelist location** : `NAMAFN`

TFP_{*}%IGRIB :

> **Definition** : GRIB codes for dynamic fields.
>
> **Scope** : Integer. "{*}" represents the field identifier.
>
> **Default value** : Refer to appendix B.1 on page 100 for upper air fields, and to appendix B.2 on page 101 for 2D fields.
>
> **Namelist location** : `NAMAFN`

3.5.4   Post-processing monitoring

To monitor the production of the post-processing, whenever a post-processing FA file is written, the corresponding time stamp is written out to a control file. Monitoring the content of the control file can be used to trigger tasks that will operate on the newly produced data.
Remark : this action cannot be disabled. It will be possible to disable it in cycles newer than 48t1.

CFPNCF :

> **Definition** : Name of the control file monitoring the post-processing output FA file. Though it can be a filename preceded by an absolute UNIX path, it is recommended to set it as a simple filename, and use the variable `CFPMONIPATH_OUT` to define its UNIX path. If set to a blank string, then the control file is not written.
>
> **Scope** : character strings, maximum length 128.
>
> **Default value** : `ncf927`
>
> **Namelist location** : `NAMCT0`

CFPMONIPATH_OUT :

> **Definition** : pathname of control file in output.
>
> **Scope** : character strings, maximum length 180.
>
> **Default value** : .
>
> **Namelist location** : `NAMFPC`

3.5.5   Ocean fields

LOCEDELAY :

> **Definition** : To trigger the post-processing of ocean fields after WAM/NEMO model has been called.
>
> **Scope** : Boolean.
>
> **Default value** : equivalent to `LECMWF`
>
> **Namelist location** : `NAMFPC`

3.5.6   Missing fields

Fields not present in the model but requested by the post-processor will be created and filled with zeroes, unless they can be diagnosed from other model fields.
Uncomputable fields (ie : fields fairly requested but that *FullP*os cannot make) or obviously flat fields (like pressure on a pressure level) will be silently skipped.

3.5.7   Relaxation area (LAM only)

For LAM coupling files and initial files, the width of the relaxation area should be written inside the frame of the FA output files, therefore is has to be provided to the post-processing which will propagate the information to write the files, even if it is not used by the post-processing by itself.

NFPBZONL, NFPBZONG :

> **Definition** : half-width of the relaxation area, respectively in x and y directions.
>
> **Scope** : Integer, positive.
>
> **Default value** : 8
>
> **Namelist location** : `NAMFPD`

3.5.8 Academic domain (LAM only)

An academic domain can be made for the limited area model, starting from a geographical domain or not. The resulting domain will be a torus, defined by wavelengths instead of geographical coordinates.

LFPMAP :

> **Definition** : tells if the domain is defined by geographical coordinates (`.TRUE.`) or by wavelengths (`.FALSE.`). The geographical mesh sizes and the horizontal dimensions will be used to define the wavelengths. **Important notice** : in cycles older or equal to 48t1 the variable `FPSTRET` from the namelist `NAMFPG` was used as set to `-1.` in place of `LFPMAP`/
>
> **Scope** : Boolean.
>
> **Default value** : `.TRUE.` in the global model ; equivalent to the situation of the model geometry in the LAM model.
>
> **Namelist location** : `NAMFPG`

3.5.9 Verbosity

NPRINTLEV :

> **Definition** : verbosity option on the listing (variable from the model).
>
> **Scope** : Integer between 0 (minimum prints) and 2 (maximum prints).
>
> **Default value** : 0
>
> **Namelist location** : `NAMPARO`

LTRACEFP :

> **Definition** : post-processing traceback : set `LTRACEFP=.TRUE.` to get more information printed out on the listing (for debugging purpose). This option is coupled with the variable `NPRINTLEV`.
>
> **Scope** : Boolean.
>
> **Default value** : `.FALSE.`
>
> **Namelist location** : `NAMFPC`

LALLOPR :

> **Definition** : if `.TRUE.` print information about main allocations/deallocations from the model part.
>
> **Scope** : Boolean.
>
> **Default value** : `.FALSE.`
>
> **Namelist location** : `NAMCTO`

66

LALLOFP :

Definition : if .TRUE. print information about main allocations/deallocations from the post-processing part.

Scope : Boolean.

Default value : .FALSE.

Namelist location : NAMFPC

LFPDISPLAY_PARAMETERS :

Definition : if .TRUE. display hard-coded parameters in *FullP*OS software (for documentation, mostly). This variable is available only in cycles newer than 48t1.

Scope : Boolean.

Default value : .FALSE.

Namelist location : NAMFPOBJ

LFPNORM :

Definition : Control of the norms of the output fields (mean, minimum and maximum value for each field and each (sub-)domain.

Scope : Boolean.

Default value : .TRUE.

Namelist location : NAMFPC

LRFILAF :

Definition : verboose option to control the content of any ARPEGE/ALADIN/AROME files used. Set LRFILAF=.TRUE. to get the content of the files at each I/O operation.

Scope : Boolean.

Default value : .TRUE.

Namelist location : NAMCT1

Chapter 4

Using *FullP*OS to compute model historical files

In its configuration `NFPOS=2`, *FullP*OS is able to produce fields in spectral coefficients in a geometry which is not necessary the input model spectral space. Combined with the variable `CFPFMT`, it becomes possible to create initial conditions or boundary conditions for another model, once the target geometry is completely described by parameters of the namelists `NAMFPD` and `NAMFPG`, *valid for a forecasting model*, and if all the target model fields are supported by the post-processing :

- `NFPOS=2` with `CFPFMT='GAUSS'` and `LELAM=.FALSE.` can change the geometry of a global spectral model with a gaussian grid, changing the resolution, truncation, stretching coefficient or pole of interest for a vertical hybrid coordinate.

- `NFPOS=2` with `CFPFMT='LELAM'` and `LELAM=.FALSE.` can produce initial conditions or coupling files for a LAM spectral model, starting from the global model, and define the horizontal area, the resolution, the extension zone and the truncation for a vertical hybrid coordinate.

- `NFPOS=2` with `CFPFMT='LELAM'` and `LELAM=.TRUE.` can produce initial conditions or nesting files for a LAM spectral model, starting from a LAM model of larger or equal area, and define the inner horizontal area, the resolution, the extension zone and the truncation for a vertical hybrid coordinate.

- `NFPOS=2` with `CFPFMT='LALON'` does not work because latitudes-longitudes grids are not supported by the model.

- `NFPOS=2` with `CFPFMT='GAUSS'` and `LELAM=.TRUE.` is not supported because the output horizontal area would not be included inside the input model one.

These special combination of options (`NFPOS=2` and `CFPFMT ≠ 'MODEL'`) will trigger :

- the horizontal interpolations to be performed before the vertical interpolation, whatever the post-processing levels are.

- a spectral fit of the target orography if necessary, before the vertical interpolations.

Chapter 5

Post-processing server

*FullP*OS can be configured to process consecutively several input files of the same geometry and content, like different forecast ranges or different members of an ensemble forecast.

This is a feature of the configuration `NCONF=903`, activated by the namelist key `NFPSERVER` described below, and is similar to a time loop, with post-processing steps controlled by the variables `NFRPOS` and `NPOSTS(:)`.
For each input file, the date is copied as such to the output file.
Should climatological files be used, then the files update is automatic in case the month has changed from one file to another.

Th server can run in parallel to the application producing its input files, and stay in stand-by if necessary, waiting for the data to be available (exactly like the limited area model can wait for its boundaries).

Remark : like in the forecasting model, an input file, named `ICMSH${CNMEXP}INIT`, is necessary to initialize the input geometry.

Limitation : though it is working like a time loop this server mode of the post-processing is not (yet) compatible with the model I/O server.

NFPSERVER :

> **Definition** : Server mode in the configuration `NCONF=903` :
>> 0 : the server mode is disabled
>> 1 : the server mode is active and treats a number of files equal to `NFRPOS`, numbered 0 to `NFRPOS-1`. Output files are stamped with these numbers, in replacement of the usual forecast time stamp.
>> -1 : same as `NFPSERVER=1`, but the initial file `ICMSH${CNMEXP}INIT` is also processed, and the corresponding output file is stamped `"INIT"`. This mode is suitable to the making of coupling files for dynamical adaptation, while the other one is more general.

> **Scope** : Integer between -1 and 1

> **Default value** : 0

> **Namelist location** : `NAMARG`

CSCRIPT_PPSERVER :

> **Definition** : absolute filename of the script controlling the availability of the necessary input files for the post-processing, when run in server mode.

Scope : String of maximum 120 characters. This variable has no effect if the corresponding file does not exist.

Default value : 'cnt3_wait' if NFPSERVER=0, blank string otherwise. Should this feature not be used and the server inactive, then it is recommended to deliberately set in namelist this variable as a blank string to prevent the application to access the file system and search for it.

Namelist location : NAMCT0

Example :

```
&NAMARG
     NCONF=903,
     NFPSERVER=1,
 /
&NAMCT0
    NFRPOS=3,
    NPOSTS(0)=0,
 /
```

will process 3 files, named ICMSH${CNMEXP}+N with N varying from 0 to 2 with the adequate number of digits used in the model.

Remark : the variable NPOSTS(:) can be used to process non-consecutive steps, for instance to represent a change in forecast ranges in hours. Example :

```
    NFRPOS=1,
    NPOSTS(0)=5,
    NPOSTS(1)=0,
    NPOSTS(2)=3,
    NPOSTS(3)=6,
    NPOSTS(4)=12,
    NPOSTS(5)=18,
```

Chapter 6

Multi-objects post-processing

The definition of the post-processing parameters reveals that the computation of more than one output domain is possible only if the output format is a latitudes-longitudes grid. However it is possible to create more than one domain on another kind of output grid, and even to mix output kinds of grids : this is achieved by the definition of multiple post-processors, each of them being a post-processing object with its private definition variables.

Given a post-processing object, its definition parameters are set by the usual namelist blocks, written in an object-specific namelist file. The traditional namelist file `fort.4` is still needed to define the model parameters, but the post-processing namelist blocks inside may be ignored. There is an exception however, for the namelist block `NAMFPC` which contains a few variables which either are global or have a double definition : one for the model and one for the post-processor.

NFPOBJ :

> **Definition** : number of post-processing objects
>
> **Scope** : Integer, strictly positive. Maximum value : 7
>
> **Default value** : 1
>
> **Namelist location** : `NAMFPOBJ`

NFPCONF :

> **Definition** : value of the parameter `NFPOS` for each post-processing object, defining the general configuration for each of them
>
> **Scope** : Integer array, maximum size : 7 . Possible values : 1 or 2
>
> **Default value** : `NFPOS`
>
> **Namelist location** : `NAMFPOBJ`

CNAMELIST :

> **Definition** : namelists absolute filename for each post-processing object. The namelists files should contain the following namelists blocks :
> `NAMFPC NAMFPD NAMFPG NAMFPF NAMAFN NAMFPIOS NAMFPSC2 NAMFPSC2_DEP`
> and possibly `NEMFPEZO` for LAM output domains with an extension zone.
>
> **Scope** : array of maximum 7 characters string, maximum characters : 256.
>
> **Default value** : `fort.4`
>
> **Namelist location** : `NAMFPOBJ`

NFRFPOS, NFPOSTS :

> **Definition** : Outputs monitor, specific for a post-processing object, working as follows :
> - if NFPOSTS(0) = 0 then the post-processing runs every NFRFPOS step (including step 0).
> - if NFPOSTS(0) > 0 then NFPOSTS(0) is the number of post-processing events and the post-processing runs on the steps NFPOSTS(1)*NFRFPOS, NFPOSTS(2)*NFRFPOS, ...NFPOSTS(NFPOSTS(0))*NFRFPOS.
> - if NFPOSTS(0) < 0 then –NFPOSTS(0) is the number of post-processing events and the post-processing runs on the hours :
> –NFPOSTS(1)*NFRFPOS, -NFPOSTS(2)*NFRFPOS, ...
> until -NFPOSTS(NFPOSTS(0))*NFRFPOS.

> **Scope** : Respectively positive integer, and integer array sized 0 to 960.

> **Default value** : respectively NFRPOS and NPOSTS(:).

> **Namelist location** : NAMFPC

NFPOSTSMIN :

> **Definition** : Array complementing NFPOSTS to define the minute for each post-processing outputs when the frequency of outputs is not defined as time steps :
> - NFPOSTSMIN(0) is the number of post-processing events. It should be equal to ABS(NFPOSTS(0))
> - The post-processing runs on the minute :
> NFPOSTSMIN(1) of the hour -NFPOSTS(1)*NFRFPOS,
> NFPOSTSMIN(2) of the hour -NFPOSTS(2)*NFRFPOS, ...
> until the minute NFPOSTSMIN(NFPOSTS(ABS(NFPOSTS(0)))
> of the hour -NFPOSTS(ABS(NFPOSTS(0)))*NFRFPOS.

> **Scope** : integer array sized 0 to 960.

> **Default value** : NPOSTSMIN(:)

> **Namelist location** : NAMFPC

Remark : when the variables NFRFPOS and NFPOSTS(:) of the different objects are defined, the variables NFRPOS and NPOSTS(:) of the model namelist NAMCT0 are still necessary because they represent the envelope of all the events defined by the individual post-processing objects.

In the context of multi-objects post-processing, the following namelists variables from the namelist block NAMFPC have a different definition in the model and in the post-processing objects, therefore these variables should be defined in the model namelist file :

NFPCLI :

> **Definition** : Should any post-processing object use monthly climatological values for the horizontal interpolations (NFPCLI=3, then this variable should be set to this same value because it triggers the reading of extra surface fields from the model input file.

> **Scope** : Integer between 0 and 3.

> **Default value** : 0

> **Namelist location** : NAMFPC *of the model namelists file*

Notice : In cycles newer than 48t1 this will not be needed anymore : the post-processing will activate itself the new necessary key, except in OOPS where the post-processor is built after the fields. In that latter case, the user will have to set `NPPVCLIX=3` in the namelist `NAMPHYDS` of the model.

NFPSWI :

Definition : Should any post-processing object interpolate Soil Wetness index, then this variable should be set to the maximum value among the post-processing namelists because it triggers the reading of extra surface fields from the model input file.

Scope : Integer between 0 and 2.

Default value : 0

Namelist location : `NAMFPC` *of the model namelists file*

Notice : In cycles newer than 48t1 this will not be needed anymore : the post-processing will activate itself the new necessary key, except in OOPS where the post-processor is built after the fields. In that latter case, the user will have to set `NPPVCLIX=4` in the namelist `NAMPHYDS` of the model.

LFPCAPEX :

Definition : Should any post-processing object use the PBL fields from the model instantaneous fluxes in the computation of CAPE, then this variable should be set to `.TRUE.` because it triggers the computation of theses fields in the model.

Scope : Boolean.

Default value : `.FALSE.`

Namelist location : `NAMFPC` *of the model namelists file*

Notice : In cycles newer than 48t1 this will not be needed anymore : the post-processing will activate itself the necessary key, except in OOPS where the post-processor is built after the fields. In that latter case, the user will have to set `LXCLS=.TRUE.` in the namelist `NAMXFU` of the model.

Also the namelists blocks `NAMCFU` and `NAMXFU` which define the needed physical fluxes have to be added in the model namelist file.
In cycles newer than 48t1 this will not be needed anymore : the post-processing will activate itself the necessary `CFU` and `XFU` keys, except in OOPS where the post-processor is built after the fields.

Limitation : post-processing multi-object is not (yet) compatible with the model I/O server.

Chapter 7

Troubleshootings and tips

7.1 Date issues

Before writing out data to a FA file, and if it exists already, the program controls the date inside the output file against the date in the model ; and it aborts in case of an inconsistency.

By default, the date computed in post-processing FA files is recomputed to consider only the effective date and not the forecast range (H00+06 and H06+00 would lead to the same date H06). But users can force the post-processing to write onto FA files the exact date picked up from the model.

L_READ_MODEL_DATE :

> **Definition** : If set to `.TRUE.`, the date written inside the FA post-processing files is the date picked up from the forecasting model.
> In the server mode of the configuration 903, this namelist key can be used to force the output date to be systematically a forecast at time 0, which is indeed what the model would set.
>
> **Scope** : Boolean
>
> **Default value** : `.FALSE.`
>
> **Namelist location** : `NAMFPC`

LFPMOIS :

> **Definition** : If `.TRUE.` the date of the starting file is used to determine the month for the monthly climatology data (used only if `NFPCLI` $\geq$ 3) during all the execution of the application. This option can be used for in-line post-processing[1] in order to avoid updating the climatology file on the fly, during the model integration (though it is possible to do so). As long as the custom is to set `NFPCLI=1` in the in-line post-processing for backend production, this key should rarely be helpful.
> Another utility for this key would be to disable the automatic climatological file update in the server mode of the configuration 903.
>
> **Scope** : Boolean.
>
> **Default value** : `.FALSE.`
>
> **Namelist location** : `NAMFPC`

---

[1]The post-processing is performed during the direct model integration

NFPCHKDAT :

> **Definition** : If set to 0, this option disables the abort on date inconsistency and let the user assume it. The use of this option is of course highly discouraged. In cycles newer than 48t1 this parameter will be able to disable also the month inconsistency on climatological files.
>
> **Scope** : Integer, between 0 and 1
>
> **Default value** : 1
>
> **Namelist location** : NAMFPC

7.2   Missing physical fluxes

In the model, instantaneous or cumulated fluxes are triggered by logical keys ; one key may trigger a group of fields. In the offline post-processing, the request of one field would trigger the reading of all the fields of its group from the file. This can be a problem if someone has added new fields under an existing key, and someone else wants to post-process an older file that does not contain these new fields : the program will abort, complaining that the new fields are missing from the file.
To solve this issue, the tip is to set the original fields names of these new fields to a blank string. Doing so, these fields will not be read :

YFA_*%CLNAME :

> **Definition** : FA field names in the model. If the field corresponds to an instantaneous or cumulated flux and its name is set to a blank string, then the field will not be read from file.
>
> **Scope** : String of 16 characters
>
> **Namelist location** : NAMFA

7.3   Location of the extension zone

When the biperiodicization of Boyd is used, the extension zone is the result of the interpolation of the input wider domain : there is no major difference in the algorithm used in the post-processing for the core area and the extension zone.
When the spline method is used, the extension zone is an extrapolation of the interpolated geographical output area, and the algorithm is such that the extension zone should temporarily be given a geographical location somewhere in the output domain. In order to preserve the load balancing of the computation, this virtual extension zone is located along the limits of the output domain. This location can be modified, however, because in certain cases points might be excessively close to the limits, and as a result the program would abort.

RCO_EZO :

> **Definition** : in the case of biperiodicization by splines method : number of rows to shift the virtual extension zone from the limits toward the center of the input domain. Any positive value will lead to a shift of 1 row toward the inside of the domain. If negative,

the rounded absolute value is the number of rows used to shift the virtual extension zone from the limits toward the center of the input domain[2].

Scope : real.

Default value : 80. (meaning : 1 row).

Namelist location : `NEMFPEZO`

7.4 Large grids or large number of vertical levels (FA files only)

FA files software needs the maximum number of latitudes, the maximum truncation and the maximum number of vertical levels to be pre-defined. Should the post-processing defines larger values, then the FA limits should be re-defined in namelist :

JPXTRO :

Definition : maximum truncation in FA software.

Scope : Integer

Default value : 1280

Namelist location : `NAMFAINIT`

JPXLAT :

Definition : maximum number of latitudes in FA software.

Scope : Integer

Default value : 2560

Namelist location : `NAMFAINIT`

JPXNIV :

Definition : maximum number of vertical levels in FA software.

Scope : Integer

Default value : 200

Namelist location : `NAMFAINIT`

7.5 Large number of FA files

FA files software needs the maximum number of simultaneously opened files or the maximum number of simultaneously manageable files frames to be pre-defined. Should the post-processing defines larger values, then the FA limits should be re-defined in namelist :

JPNXCA :

Definition : maximum number of files frames in FA software.

Scope : Integer

---

[2]the definition of this variable is awkward because it is the recycling of an older erroneous variable

Default value : 20

Namelist location : `NAMFAINIT`

JPNXFA :

Definition : maximum number of opened files in FA software.

Scope : Integer

Default value : 20

Namelist location : `NAMFAINIT`

7.6   Stream function and Velocity potential

Stream function and Velocity potential are usually computed together, to make a new historical file ARPEGE. Actually the code is written in such a way that it is not possible to compute one of them without the other. If only one of them should be produced, then both should be requested and eventually a selection namelist can be used to remove the un-wished field.

7.7   Appending fields to a file

Imagine you wish to post-process a given field on a thousand of pressure levels : the software will fail because the maximum number of output levels is limited to a reasonable value.

However you can easily overcome this limitation by slicing the list of post-processing levels : that way you would submit a bunch a jobs, targeting the same output file. Since the output file is not sequential but indexed-sequential, the file will not be overwritten at the beginning of each job : instead the fields will be appended to one another.

You can also use this trick to append fields to your own input file : to do that you just have to copy your input file to the output file before starting the post-processing job.

7.8   Derivatives on model levels

If you try to postprocess derivatives on η levels (like the potential vorticity on the model levels) and you do interpolate on the horizontal (for instance : from a file ARPEGE to a file ALADIN/AROME), the software will fail because derivatives will be missing : this is because the horizontal derivatives are available only in the model geometry.

A way to overcome this limitation is to first change the geometry of your input file to the geometry of your output file (using `NFPOS=2`), then to post-process on the new "model" grid (`CFPFMT='MODEL'`).

Unfortunately this does not work if the target geometry is a latitudes-longitudes grid. In this case the tip is first to make the field you wish to interpolate as a passive scalar field ; this can be achieved in two steps :

1. You should create a historical file with the supplementary fields you wish to interpolate ; this can be achieved either by a regular change of geometry in which the namelist should contain the supplementary fields, or by running a normal post-processing job in the model geometry (`CFPFMT='MODEL'`) and using the "appending fields" tip described above on page 80.

2. Then the additional fields should be declared in the model as extra "GFL" fields. For example, to interpolate the gridpoint field of vertical velocity on model levels, the namelist file should contain the following variables :

```
&NAMGFL
  NGFL_EXT=1,
  YEXT_NL(1)%LSP=.FALSE.,
  YEXT_NL(1)%LGP=.TRUE.,
  YEXT_NL(1)%NREQIN=1,
  YEXT_NL(1)%CNAME='VITESSE_VERT',
/
```

Furthermore, the traditional post-processing field of vertical velocity should be renamed, in order not to conflict with the extra GFL named `"VITESSE_VERT"` :

```
&NAMAFN
  TFP_VV%CLNAME='JUNK',
/
```

7.9 Upper air physical fields

3D physical fields are not (yet) post-processable as such. However they can be post-processed through the use of an extra GFL field with a gridpoint representation. The post-processing will automatically acknowledge its existence because a post-processing Structure exists for extra GFL fields (`TFP_EXT(:)`). Example :

```
&NAMGFL
  NGFL_EXT=1,
  YEXT_NL(1)%LSP=.FALSE.,
  YEXT_NL(1)%LGP=.TRUE.,
  YEXT_NL(1)%NREQIN=0,
  YEXT_NL(1)%CNAME='MY3DFLUX',
/
```

There is one exception, however : the Eddy Diffusive Rate (EDR).
For that field it is necessary to activate the key `LEDR=.TRUE.` in the namelist `NAMPHY`, in order to have the model field allocated. Furthermore, it is necessary to activate the key `LREQIN_VEXTRDI=.TRUE.` in the namelist `NAMPHYDS`, in order to read the field from file in case of offline post-processing.

In cycle 48t2 the model will abort if the field of EDR is requested but `LEDR=.FALSE.` ; while the key `LREQIN_VEXTRDI=.TRUE.` will be automatically set if needed.

7.10 Adiabatic post-processing

To run the post-processor in the adiabatic model, physics should be completely disabled, as well as cumulated and instantaneous fluxes in ARPEGE/ALADIN/AROME (ie : if .NOT.LECMWF) :

```
&NAMPHY
    LMPHYS=.FALSE.,
/END
&NAERAD
    LHGHG=.FALSE.,
    LSRTM=.FALSE.,
    NMCICA=0,
    NGHGRAD=0,
    NHINCSOL=0,
/END
```

In IFS, physics should be completely disabled too, but surface fields will be read, anyway :

```
&NAMPHY
    LEPHYS=.FALSE.,
    NALBEDOSCHEME=0,
/END
&NAERAD
    LHGHG=.FALSE.,
    LSRTM=.FALSE.,
    NMCICA=0,
    NGHGRAD=0,
    NHINCSOL=0,
    NAERMACC=0,
    LUSEPRE2017RAD=.TRUE.
/END
```

7.11 Free-use fields

*FullP*os provides the environment to post-process your personal fields once you have created them in the software. This may be done with a minimum of modifications in the software. The environment should be documented through the following namelists variables :

GFP_FSU%CLNAME :

Definition : Surface physical free-use fields names

Scope : array of 16 characters ; maximum size : 28 items.

Default value : Refer to appendix A.3 on page 92.

Namelist location : `NAMAFN`

GFP_FSU%IGRIB :

Definition : GRIB codes of Surface physical free-use fields

Scope : array of integers ; maximum size : 28 items.

Default value : Refer to appendix B.3 on page 101.

Namelist location : `NAMAFN`

GFP_FSU%IBITS :

Definition : Number of bits for packing surface physical free-use fields.

Scope : Integer array ; maximum size : 28 items.

Default value : Refer to appendix A.3 on page 92.

Namelist location : `NAMAFN`

TFP_FUA%CLNAME :

Definition : Dynamic upper air free-use fields names.

Scope : array of 16 characters ; ; maximum size : 70 items.

Default value : Refer to appendix A.1 on page 88.

Namelist location : `NAMAFN`

TFP_FUA%IGRIB :

Definition : GRIB codes of dynamic upper air free-use fields.

Scope : array of integer ; maximum size : 70 items.

Default value : Refer to appendix B.1 on page 100.

Namelist location : `NAMAFN`

TFP_FUA%LLGP :

Definition : Control of the horizontal representation for dynamic upper air free-use fields : `.TRUE.` for gridpoint representation ; `.FALSE.` for spectral representation.

Scope : Boolean array ; maximum size : 70 items.

Default value : Refer to appendix A.1 on page 88.

Namelist location : `NAMAFN`

TFP_FUA%IBITS :

>   **Definition** : Number of bits for packing dynamic upper air free-use fields.
>
>   **Scope** : Integer array ; maximum size : 70 items.
>
>   **Default value** : Refer to appendix A.1 on page 88.
>
>   **Namelist location** : `NAMAFN`

TFP_FSU%CLNAME :

>   **Definition** : Dynamic surface free-use fields names.
>
>   **Scope** : array of 16 characters ; ; maximum size : 28 items.
>
>   **Default value** : Refer to appendix A.2 on page 90.
>
>   **Namelist location** : `NAMAFN`

TFP_FSU%IGRIB :

>   **Definition** : GRIB codes of dynamic surface free-use fields.
>
>   **Scope** : array of integers ; maximum size : 28 items.
>
>   **Default value** : Refer to appendix B.2 on page 101.
>
>   **Namelist location** : `NAMAFN`

TFP_FSU%LLGP :

>   **Definition** : Control of the horizontal representation for dynamic surface free-use fields
>   `.TRUE.` for gridpoint representation ; `.FALSE.` for spectral representation.
>
>   **Scope** : Boolean array ; maximum size : 28 items.
>
>   **Default value** : Refer to appendix A.2 on page 90.
>
>   **Namelist location** : `NAMAFN`

TFP_FSU%IBITS :

>   **Definition** : Number of bits for packing dynamic surface free-use fields.
>
>   **Scope** : Integer array ; maximum size : 28 items.
>
>   **Default value** : Refer to appendix A.2 on page 90.
>
>   **Namelist location** : `NAMAFN`

Dynamic fields should then be computed in the subroutines `POS` (for interpolations on pressure levels, isentropic levels or PV levels) or `ENDPOS` (for interpolations on height or η levels). You can possibly control the result of the horizontal interpolations in the subroutine `FPCORDYN`. The fields will be treated as fitable non-derivatives : in other words they will be concerned by the keys `NFIT*`.

7.12 How to disable or reduce norms computation, or output files writing

NFPWRITE :

Definition : write (1 or 2) or not (0 or -1) output files, while keeping the computation. If set to 2 or -1 then output norms are disabled as well. This option can be useful for benchmarking, and possibly debugging. Note that if the model I/O server is active on post-processing, norms will be computed by the I/O server, but these norms will not be visible in the traditional listing. `NFPWRITE=1` triggers the computation and print of norms by the post-processing itself, independently of the I/O server. `NFPWRITE=2` disables the computation and print of norms by the post-processing itself, independently of the I/O server This option does not work yet with `NFPSURFEX=1`. The option `NFPWRITE=2` will be available in cycle 48t2.

Scope : integer between -1 and 2.

Default value : 1

Namelist location : `NAMFPIOS`

The frequency of norms computation can be just reduced, in order to save computational time, withe the following variables (available in cycle 48t2) :

NFRFPDI, NFPDITS :

Definition : Post-processing norms monitor, working as follows :
- if `NFPDITS(0) = 0` then the post-processing runs every `NFRFPDI` step (including step 0).
- if `NFPDITS(0) > 0` then `NPOSTS(0)` is the number of post-processing events and the post-processing runs on the steps `NFPDITS(1)*NFRFPDI`, `NFPDITS(2)*NFRFPDI`, ...`NFPDITS(NFPDITS(0))*NFRFPDI`.
- if `NFPDITS(0) < 0` then `-NFPDITS(0)` is the number of post-processing events and the post-processing runs on the hours `-NFPDITS(1)*NFRFPDI`, `-NFPDITS(2)*NFRFPDI`, ...`-NFPDITS(NFPDITS(0))*NFRFPDI`.

Scope : Respectively positive integer, and integer array sized 0 to 960.

Default value : `NFRFPDI=1` and `NFPDITS(:)=0` (systematic outputs)

Namelist location : `NAMFPIOS`

NFPDITSMIN :

Definition : Array complementing NFPDITS to define the minute for each post-processing outputs when the frequency of outputs is not defined as time steps :
- `NFPDITSMIN(0)` is the number of post-processing events. It should be equal to `ABS(NFPDITS(0))`
- The post-processing runs on the minute :
  `NFPDITSMIN(1)` of the hour `-NFPDITS(1)*NFRFPDI`,
  `NFPDITSMIN(2)` of the hour `-NFPDITS(2)*NFRFPDI`, ...
  until the minute `NFPDITSMIN(NFPDITS(ABS(NFPDITS(0)))`
  of the hour `-NFPDITS(ABS(NFPDITS(0)))*NFRFPDI`.

Scope : integer array sized 0 to 960.

Default value : `NFPDITSMIN(:)=0`

Namelist location : `NAMFPIOS`

7.13   Varpack

LFPCLSTOGMV :

Definition : if set to `.TRUE.` then PBL fields of T and Q overwrite the bottom level of the model T and Q. This option is used for Varpack in Météo-France, when the bottom model level correspond approximatively to a height of 2 meters.

Scope : Boolean.

Default value : `.FALSE.`

Namelist location : `NAMFPC`

7.14   Testing *FullP*os in OOPS

In the context of the project OOPS (Object Oriented Prediction System), *FullP*os is used to change *internally* model geometries in the incremental 4D-Var assimilation algorithm.

In this context, the change of resolution from high to low resolution uses the algorithm described in page 69, with specific source code interfaces. To go from low to high resolution, since the data at low resolution are actually increments and not plain fields, a double change of resolution is performed, on fields before incrementations and after incrementations.

These operations can be tested by a specific configuration in the Fortran traditional code : the configuration `NCONF=904`. This configuration works with two forecasting model objects and two post-processing objects for the lower and the higher resolution.

The environment variable `FOOMASTER_CONFIGURATION` can be used to test different parts of this simulation :

FOOMASTER_CONFIGURATION :

Definition : environment variable used to define the behaviour of the configuration `NCONF=904`. Possible values :

`TEST_CHANGEOFRESOL_PLAINFLDS` : to test a change of geometry on plain fields, toward another geometry and backward to the initial geometry. Forecast integration can be run on both models. A number of such "updates" can be tested with the namelist parameter `MUPTRA`.

`TEST_CHANGEOFRESOL_TRUEINCR` : to test the incremental change of geometry with null increments.

`TEST_CHANGEOFRESOL_NULLINCR` : full test of the change of geometry with realistic increments. One should be aware that the computation of plain physical fields from actual increments main cause issues during a diabatic forecast integration afterward (negative TKE, for instance).

7.15 Tailored-size of halos for horizontal interpolations

NFPSLWIDE :

Definition : width of the halo used for horizontal interpolation. It can be used to extend the size of the halo, for debugging purpose possible. But using it to extend the vicinity of data used for interpolations requires modifications sophisticated modifications in the code. Note that this variable will be renamed `NFPWIDE` in cycles newer than 48t1.

Scope : Integer, positive.

Default value : Self-determined for the current interpolation scheme (usually : `3` for quadratic interpolations).

Namelist location : `NAMFPSC2`

Appendix A

Fields identifiers for ARPEGE/ALADIN/AROME

A.1 Upper air dynamic fields

This section describes the name identifiers of the upper air dynamic fields available in cycle 48 for ARPEGE/ALADIN/AROME.

The descriptor `CLNAME` of the structures `TFP_*` in the namelist `NAMAFN` should be used to fill the array `CFP3DF` of the namelist `NAMFPC`.

```
  Description                : Structure        %CLNAME
Absolute Vorticity....... : TFP_ABS      ABS_VORTICIT
        Aerosol nr 01..... : TFP_AERO(01) AERO01
        Aerosol nr 02..... : TFP_AERO(02) AERO02
        Aerosol nr 03..... : TFP_AERO(03) AERO03
        Aerosol nr 04..... : TFP_AERO(04) AERO04
       CHEM var nr 01..... : TFP_CHEM(01) CHEM001
       CHEM var nr 02..... : TFP_CHEM(02) CHEM002
       CHEM var nr 03..... : TFP_CHEM(03) CHEM003
       CHEM var nr 04..... : TFP_CHEM(04) CHEM004
Cloud fraction.......... : TFP_CLF      CLOUD_FRACTI
Convective precip. flux.. : TFP_CPF      CV_PREC_FLUX
DD Mesh Fraction........ : TFP_DAL      DD_MESH_FRAC
Divergence.............. : TFP_DIV      DIVERGENCE
DD Vertical Velocity..... : TFP_DOM      DD_OMEGA
Eddy diffusivity rate.... : TFP_EDR      EDR
First variable EFB scheme : TFP_EFB1     EFB1
Secon variable EFB scheme : TFP_EFB2     EFB2
Third variable EFB scheme : TFP_EFB3     EFB3
Equilibrium Level        : TFP_EL       SURFEQUILIBRLEV
Etadot.................. : TFP_ETAD     ETADOT
Equiv. pot. temperature.. : TFP_ETH      THETA_EQUIVA
Passive scalar nr 01..... : TFP_EXT(01)  MY3DFLUX
Passive scalar nr 02..... : TFP_EXT(02)  EXTGFL.02
Passive scalar nr 03..... : TFP_EXT(03)  EXTGFL.03
        EZDIAG nr 01..... : TFP_EZDIA01) EZDIAG01
        EZDIAG nr 02..... : TFP_EZDIA02) EZDIAG02
```

```
        EZDIAG nr 03..... : TFP_EZDIA03) EZDIAG03
        EZDIAG nr 04..... : TFP_EZDIA04) EZDIAG04
Free Convection Level    : TFP_FCL        SURFFREECONVLEV
Flux Q source term turbul : TFP_FQTUR     Q SRC TERM TURB
Flux S source term turbul : TFP_FSTUR     S SRC TERM TURB
Free upper air field n 01 : TFP_FUA(01)   UPPER_AIR.01
Free upper air field n 02 : TFP_FUA(02)   UPPER_AIR.02
Free upper air field n 03 : TFP_FUA(03)   UPPER_AIR.03
        GHG nr 01..... : TFP_GHG(01)   GHG01
        GHG nr 02..... : TFP_GHG(02)   GHG02
        GHG nr 03..... : TFP_GHG(03)   GHG03
Atmospheric graupel...... : TFP_GR        GRAUPEL
Atmospheric hail........ : TFP_HL         HAIL
altitude of iso-t........ : TFP_HTB       ISOT_ALTIT
Relative humidity....... : TFP_HU         HUMI_RELATIV
Atmospheric solid water.. : TFP_I         SOLID_WATER
Convective Solid Water... : TFP_ICONV     QI_CONV
Isobaric equivalent tempe : TFP_IET       VIRT_P_TEMPE
Atmos total solid water.. : TFP_IRAD      RAD_SOLID_WATER
Stream function......... : TFP_KHI        FONC.COURANT
Atmospheric liquid water. : TFP_L         LIQUID_WATER
Lifting Condensation Leve : TFP_LCL       SURFLIFTCONDLEV
Convective Liquid Water.. : TFP_LCONV     QL_CONV
Atmos total liquid water. : TFP_LRAD      RAD_LIQUID_WATER
CH4 loss rate........... : TFP_LRCH4
Montgomery potential..... : TFP_MG        MONTGOMERY G
Prognostic mixing length. : TFP_MXL       MIXING_LENGTH
Ozone................... : TFP_O3MX       OZONE
Pressure................ : TFP_P          PRESSURE
Pressure Departure...... : TFP_PD         PRESS.DEPART
Mass change rate in phys. : TFP_PHYCTY
Velocity potential...... : TFP_PSI        POT.VITESSE
Pressure of iso-t....... : TFP_PTB        ISOT_PRESS
Potential Vorticity..... : TFP_PV         POT_VORTICIT
Specific humidity....... : TFP_Q          HUMI.SPECIFI
Convective Rain......... : TFP_RCONV      QR_CONV
Humid density........... : TFP_RHO        HUMID_DENSIT
RK scheme temper tend ... : TFP_RKTH      RK_TEMPTEND
RK scheme condens tend .. : TFP_RKTQC     RK_QCTEND
RK scheme vapor  tend ... : TFP_RKTQV     RK_QVTEND
Atmospheric rain........ : TFP_RR         RAIN
Convective Snow......... : TFP_SCONV      QS_CONV
Shearing Deformation..... : TFP_SHD       SHEAR_DEFORM
Shear source term turbul. : TFP_SHTUR     SHEAR TERM TURB
Atmospheric snow........ : TFP_SN         SNOW
Stratiform precip. flux.. : TFP_SPF       ST_PREC_FLUX
Simulated reflect. in mmh : TFP_SRE       SIM_REFLECTI
Simulated reflect. in dBz : TFP_SREDB     REFLEC_DBZ
Stretching Deformation... : TFP_STD       STRET_DEFORM
```

```
Temperature.............. : TFP_T      TEMPERATURE
Potential temperature.... : TFP_TH     TEMPE_POTENT
Wet bulb pot. temperature : TFP_THPW   THETA_PRIM_W
Virtual Theta............ : TFP_THV    THETA_VIRTUA
Turbulent kinetic energy. : TFP_TKE    TKE
Wet bulb temperature..... : TFP_TPW    TPRIM_W
Total turbulent energy... : TFP_TTE    TOTAL_TUR_ENERGY
U-momentum of wind....... : TFP_U      VENT_ZONAL
UD Mesh Fraction......... : TFP_UAL    UD_MESH_FRAC
UD pseudohist entrainment : TFP_UEN    UD_ENTRAINMENT
Cnv pseudohist cloud frac : TFP_UNEBH  PSHI_CONV_CLOUD
UD Vertical Velocity..... : TFP_UOM    UD_OMEGA
V-momentum of wind....... : TFP_V      VENT_MERIDIE
Pseudo Vertic. Divergence : TFP_VD     VERTIC.DIVER
Vorticity................ : TFP_VOR    VORTICITY
Ver velocity omega=DPi/Dt : TFP_VV     VITESSE_VERT
Vert velocity w=Dz/Dt.... : TFP_VW     VERT.VELOCIT
Wind velocity............ : TFP_WND    WIND_VELOCIT
Geopotential............. : TFP_Z      GEOPOTENTIEL
```

Notice :

- vertical velocity "omega" is expressed in Pa/s

- true vertical velocity "w" is expressed in m/s.

A.2   2D dynamic fields

This section describes the name identifiers of the 2D dynamic fields available in cycle 48 for ARPEGE/ALADIN/AROME.
The descriptor `CLNAME` of the structures `TFP_*` in the namelist `NAMAFN` should be used to fill the array `CFP2DF` of the namelist `NAMFPC`.

```
 Description              : Structure      %CLNAME
Analysed surface MOCON... : TFP_ASMC    SURFANAMOCON.POS
CAPE..................... : TFP_CAPE    SURFCAPE.POS.F00
CIEN.................... : TFP_CIEN    SURFCIEN.POS.F00
Filtred ln(Ps),NCUFNR=1.. : TFP_CUF1    CUF1PRESSURE
Filtred ln(Ps),NCUFNR=2   : TFP_CUF2    CUF2PRESSURE
Filtred ln(Ps),NCUFNR=3.. : TFP_CUF3    CUF3PRESSURE
Filtred ln(Ps),NCUFNR=4.. : TFP_CUF4    CUF4PRESSURE
Filtred ln(Ps),NCUFNR=5.. : TFP_CUF5    CUF5PRESSURE
Module of wind cls....... : TFP_FCLS    CLSWIND_VELO.POS
Module of gusts......... : TFP_FGST    CLSRAFALES.POS
Surface geopotential..... : TFP_FIS     SPECSURFGEOPOTEN
Tropo. Folding Indicator. : TFP_FOL     TROPO_FOLD_INDIC
Free surface field nr 01. : TFP_FSU(01) SURF2D.01
Free surface field nr 02. : TFP_FSU(02) SURF2D.02
Free surface field nr 03. : TFP_FSU(03) SURF2D.03
Map factor............... : TFP_GM      MAP_FACTOR
```

```
GOES11 IMAGER CH 1....... : TFP_GOES11C1 C001_GOES_11_IMA
GOES11 IMAGER CH 2....... : TFP_GOES11C2 C002_GOES_11_IMA
GOES11 IMAGER CH 3....... : TFP_GOES11C3 C003_GOES_11_IMA
GOES11 IMAGER CH 4....... : TFP_GOES11C4 C004_GOES_11_IMA
GOES12 IMAGER CH 1....... : TFP_GOES12C1 C001_GOES_12_IMA
GOES12 IMAGER CH 2....... : TFP_GOES12C2 C002_GOES_12_IMA
GOES12 IMAGER CH 3....... : TFP_GOES12C3 C003_GOES_12_IMA
GOES12 IMAGER CH 4....... : TFP_GOES12C4 C004_GOES_12_IMA
Height of the PBL........ : TFP_HCLP     CLPMHAUT.POS
altitude of iso-tprimw=0  : TFP_HTPW     SURFISOTPW0.MALT
altitude of iso-tprimw=1  : TFP_HTPW1    SURFISOTPW1.MALT
altitude of iso-tpw=1P5.. : TFP_HTPW2    SURFISOTPW2.MALT
Mini. rel. moist. in cls. : TFP_HUN      CLSMINI.HUMI.REL
Maxi. rel. moist. in cls. : TFP_HUX      CLSMAXI.HUMI.REL
Log. of Surface pressure. : TFP_LNSP     SURFPRESSION
MOCON.................... : TFP_MOCO     CLPMOCON.POS
MSAT7 MVIRI CH 1......... : TFP_MSAT7C1  C001_METEOSAT_07
MSAT7 MVIRI CH 2......... : TFP_MSAT7C2  C002_METEOSAT_07
MSAT8 SEVIRI CH 1........ : TFP_MSAT8C1  C001_METEOSAT_08
MSAT8 SEVIRI CH 2........ : TFP_MSAT8C2  C002_METEOSAT_08
MSAT8 SEVIRI CH 3........ : TFP_MSAT8C3  C003_METEOSAT_08
MSAT8 SEVIRI CH 4........ : TFP_MSAT8C4  C004_METEOSAT_08
MSAT8 SEVIRI CH 5........ : TFP_MSAT8C5  C005_METEOSAT_08
MSAT8 SEVIRI CH 6........ : TFP_MSAT8C6  C006_METEOSAT_08
MSAT8 SEVIRI CH 7........ : TFP_MSAT8C7  C007_METEOSAT_08
MSAT8 SEVIRI CH 8........ : TFP_MSAT8C8  C008_METEOSAT_08
MSAT9 SEVIRI CH 1........ : TFP_MSAT9C1  C001_METEOSAT_09
MSAT9 SEVIRI CH 2........ : TFP_MSAT9C2  C002_METEOSAT_09
MSAT9 SEVIRI CH 3........ : TFP_MSAT9C3  C003_METEOSAT_09
MSAT9 SEVIRI CH 4........ : TFP_MSAT9C4  C004_METEOSAT_09
MSAT9 SEVIRI CH 5........ : TFP_MSAT9C5  C005_METEOSAT_09
MSAT9 SEVIRI CH 6........ : TFP_MSAT9C6  C006_METEOSAT_09
MSAT9 SEVIRI CH 7........ : TFP_MSAT9C7  C007_METEOSAT_09
MSAT9 SEVIRI CH 8........ : TFP_MSAT9C8  C008_METEOSAT_09
Mask extra domain........ : TFP_MSK      GEOMASK.FPOS
Mean sea level pressure.. : TFP_MSL      MSLPRESSURE
MSL NH pressure.......... : TFP_MSLNH    MSL_NHPRESSURE
MTSAT 1 IMAGER CH 1...... : TFP_MTSAT1C1 C001_MTSAT_01_IM
MTSAT 1 IMAGER CH 2...... : TFP_MTSAT1C2 C002_MTSAT_01_IM
MTSAT 1 IMAGER CH 3...... : TFP_MTSAT1C3 C003_MTSAT_01_IM
MTSAT 1 IMAGER CH 4...... : TFP_MTSAT1C4 C004_MTSAT_01_IM
ICAO Tropopause pressure. : TFP_PCAO     ICAOTROP.PRESSUR
ICAO jet pressure........ : TFP_PJET     JETPRESSURE
Q cls.................... : TFP_QCLS     CLSHU.SPECIF.POS
QNH pressure............. : TFP_QNH      QNHPRESSURE
HU cls................... : TFP_RCLS     CLSHU.RELATI.POS
Forecasted surface MOCON. : TFP_SMC      SURFMOCON.POS
Surface pressure......... : TFP_SP       AGAIN.SURF.PRESS
Surface NH pressure...... : TFP_SPNH     SUR_NHPRESSURE
```

```
Maxi. simu. reflect (dBZ) : TFP_SREDBX    REFLECT_DBZ.MAX
Maxi. simu. reflect(mm/h) : TFP_SREX      SURFREFLECT.MAX
Storm relative helicity.. : TFP_SRH       STORMRELHELICITY
Storm motion, u component : TFP_STRMMU     STORMMOTIONU
Storm motion, v component : TFP_STRMMU     STORMMOTIONU
ICAO Tropo. temperature.. : TFP_TCAO      ICAOTROP.TEMPERA
T cls.................... : TFP_TCLS      CLSTEMPERATU.POS
Temperature of convection : TFP_TCVS      SURFTCVS.POS.F00
Mini. temperature in cls. : TFP_TN        CLSMINI.TEMPERAT
Pressure of echotop...... : TFP_TOPR      ECHOTOP
Total water vapour....... : TFP_TWV       SURFTOT.WAT.VAPO
Maxi. temperature in cls. : TFP_TX        CLSMAXI.TEMPERAT
U cls.................... : TFP_UCLS      CLSVENT_ZONA.POS
U gusts.................. : TFP_UGST      CLSURAFALES.POS
U-momentum of ICAO jet... : TFP_UJET      JETVENT_ZONAL
V cls.................... : TFP_VCLS      CLSVENT_MERI.POS
Ventilation Index........ : TFP_VEIN      CLPVEIND.POS
V gusts.................. : TFP_VGST      CLSVRAFALES.POS
V-momentum of ICAO jet... : TFP_VJET      JETVENT_MERIDIEN
Surface MOCON for VARPACK : TFP_VSMC      VARPACKSURFMOCON
Surface Vertical Velocity : TFP_WWS       SURFVERT.VELOCIT
```

A.3 Physical fields

This section describes the name identifiers of the physical fields available in cycle 48 for ARPEGE/ALADIN/AROME.
The descriptor `CLNAME` of the structures `GFP_*` in the namelist `NAMAFN` should be used to fill the array `CFPPHY` of the namelist `NAMFPC`.

Note that this list is excessively exhaustive : certain fields may not be accessible.

```
 Description                : Structure       %CLNAME
100M.WIND SPEED ......... : GFP_100SI     100M.WIND.SPEED
100M.UWIND      ........ : GFP_100U      100M.UWIND
100M.VWIND      ........ : GFP_100V      100M.VWIND
10M.NEUTRAL UWIND     .. : GFP_10NU      10M.NEUTRL UWIND
10M.NEUTRAL VWIND     .. : GFP_10NV      10M.NEUTRL VWIND
200M.WIND SPEED ......... : GFP_200SI     200M.WIND.SPEED
200M.UWIND      ........ : GFP_200U      200M.UWIND
200M.VWIND      ......... : GFP_200V      200M.VWIND
Dummy hail field (AROME). : GFP_ACCGREL   SURFACCGRELE
Anisotropy of topography. : GFP_ACOT      SURFVAR.GEOP.ANI
Desert aerosols.......... : GFP_ADES      SURFAEROS.DESERT
Albedo................... : GFP_AL        SURFALBEDO
Continental aerosols..... : GFP_ALAN      SURFAEROS.LAND
Surf. albedo total....... : GFP_ALBHIS    SURFALBEDO HISTO
Surf. albedo for bare gro : GFP_ALS       SURFALBEDO.SOLNU
Surface snow albedo...... : GFP_ALSN      SURFALBEDO NEIGE
Surf. albedo for vegetati : GFP_ALV       SURFALBEDO.VEG
Percentage of clay in soi : GFP_ARG       SURFPROP.ARGILE
```

```
Marine aerosols......... : GFP_ASEA      SURFAEROS.SEA
Carbone aerosols........ : GFP_ASOO      SURFAEROS.SOOT
Sulfate aerosols........ : GFP_ASUL      SURFAEROS.SULFAT
Volcano aerosols........ : GFP_AVOL      SURFAEROS.VOLCAN
Surf. albedo for non snow : GFP_BAAL      SURFALBEDO.COMPL
Roughness length (*g).... : GFP_BSR       SURFZOREL.FOIS.G
CONV.AVAIL.POTENTIAL ENER : GFP_CAPE      CONV.AV.POT.ENER
MAX CAPE LAST 6H ........ : GFP_CAPE6     MAX CAPE LAST 6H
CAPE-SHEAR      ........ : GFP_CAPES     CAPE-SHEAR
MAX CAPE-SHEAR LAST 6H .. : GFP_CAPS6     MAX CAPESHEAR 6H
 Soil depth.............. : GFP_D2         SURFEPAIS.SOL
Maximum soil depth....... : GFP_D2MX      SURFEPAI.SOL.MAX
Duct Base Height........ : GFP_DCTB      Duct Base Height
Mean Refractivity Gradien : GFP_DNDZA     Mean Refrac Grad
Min. Refractivity Gradien : GFP_DNDZN     Min Refrac Grad
Topography main direction : GFP_DPAT      SURFVAR.GEOP.DIR
Deep soil temperature.... : GFP_DST       PROFTEMPERATURE
Deep soil wetness........ : GFP_DSW       PROFRESERV.EAU
Ocean depth of 20degC iso : GFP_EC20D     20degC depth
Emissivity.............. : GFP_EMIS      SURFEMISSIVITE
Calcite Fraction 1 (small : GFP_FCA1      CalciteFraction1
Calcite Fraction 2 (large : GFP_FCA2      CalciteFraction2
Frozen deep soil wetness. : GFP_FDSW      PROFRESERV.GLACE
Frozen surface soil wetne : GFP_FSSW      SURFRESERV.GLACE
Free field nr 01........ : GFP_FSU(01)   SURFFREE.FIELD01
Free field nr 02........ : GFP_FSU(02)   SURFFREE.FIELD02
Free field nr 03........ : GFP_FSU(03)   SURFFREE.FIELD03
OUTPUT gp orography (*g). : GFP_GFIS      SURFGEOPOTENTIEL
Resist. to evapotranspir. : GFP_HV        SURFRES.EVAPOTRA
Interception content..... : GFP_IC        SURFRESERV.INTER
Sea ice thickness........ : GFP_ICTH      Ice thickness
Interpolated dynamic surf : GFP_IDZO      INTSURFZO.FOIS.G
Increment to mini rel. mo : GFP_INCHN     SURFINCREMENT.HN
Increment to maxi rel. mo : GFP_INCHX     SURFINCREMENT.HX
Increment to mini tempera : GFP_INCTN     SURFINCREMENT.TN
Increment to maxi tempera : GFP_INCTX     SURFINCREMENT.TX
Interpolated thermal surf : GFP_ITZO      INTSURFGZO.THERM
Index of vegetation...... : GFP_IVEG      SURFIND.VEG.DOMI
Leaf area index......... : GFP_LAI       SURFIND.FOLIAIRE
percentage of land....... : GFP_LAN       SURFPROP.TERRE
1h avg. CTG lightning den : GFP_LICGA1    CG.LIGHTN.AVG1H
3h avg. CTG lightning den : GFP_LICGA3    CG.LIGHTN.AVG 3H
6h avg. CTG lightning den : GFP_LICGA6    CG.LIGHTN.AVG 6H
Inst. CTG lightning densi : GFP_LICGI     CG.LIGHTN.INST
1h avg. total lightning d : GFP_LITOTA1   TOT.LIGHTN.AVG1H
3h avg. total lightning d : GFP_LITOTA3   TOT.LIGHTN.AVG3H
6h avg. total lightning d : GFP_LITOTA6   TOT.LIGHTN.AVG6H
Inst. total lightning den : GFP_LITOTI    TOT.LIGHTN.INST
Land/sea mask........... : GFP_LSM       SURFIND.TERREMER
```

```
Ocean mixed layer depth-. : GFP_MLD      Mixed Layer Dep
Maximum of CLWC ........ : GFP_MXCLWC   CLD_WX_60M
Maximum of CLWC ........ : GFP_MXCLWC2  CLD_WX
First ozone profile (A).. : GFP_O3A      SURFA.OF.OZONE
Second ozone profile (B). : GFP_O3B      SURFB.OF.OZONE
Third ozone profile (C).. : GFP_O3C      SURFC.OF.OZONE
Anisotropy vector/U-momen : GFP_PADOU    SURF.U.ANISO.DIR
Anisotropy vector/V-momen : GFP_PADOV    SURF.V.ANISO.DIR
Analysed RMS of PHI (CANA : GFP_PCAAG    SURFETA.GEOPOTEN
Forecasted RMS of PHI (CA : GFP_PCAPG    SURFETP.GEOPOTEN
Surface relative moisture : GFP_PSRHU    SURFHUMI.RELATIV
Proportion of urbanisatio : GFP_PURB     SURFPROP.URBANIS
Maximum proportion of veg : GFP_PVGMX    SURFPROP.VEG.MAX
INTERPOLATED Ts......... : GFP_RDST     INTSURFTEMPERATU
Relax. deep soil wetness. : GFP_RDSW     RELAPROP.RMAX.EA
Stomatal minimum resistan : GFP_RSMIN    SURFRESI.STO.MIN
SNOW DENSITY     ........ : GFP_RSN      SNOW DENSITY
Percentage of sand in soi : GFP_SAB      SURFPROP.SABLE
Surf.clear-sky direct SW  : GFP_SCDIR    SUR.CLR-SKY DIRD
Snow depth.............. : GFP_SD       SURFRESERV.NEIGE
SD FILTERED OROG ........ : GFP_SDFOR    SD FILTERED OROG
Std. dev. of orography (* : GFP_SDOG     SURFET.GEOPOTENT
Surf.tot sky direct beam  : GFP_SDSRP    SF.TOT.SKY DIRDP
Surf.total sky direct SW  : GFP_SFDIR    SUR.TOT.SKY DIRD
INTERPOLATED gp orography : GFP_SFIS     INTSURFGEOPOTENT
Surface snow density..... : GFP_SNDE     SURFDENSIT.NEIGE
SURFACE PRESSURE........ : GFP_SP       SURFACE PRESSURE
Surface PARadiation...... : GFP_SPAR     PHOTO.ACTIVE.RAD
Surface clear-sky PARadia : GFP_SPARC    C-S PHO.ACT. RAD
Surface roughness (*g)... : GFP_SR       SURFZO.FOIS.G
Ocean sea surface height. : GFP_SSH      Sea Surf Height
Ocean sea surface salinit : GFP_SSS      Sea Surf Salini
SEA SURF. TEMP. ......... : GFP_SST      SEASURFTEMPERATU
Surface soil wetness..... : GFP_SSW      SURFRESERV.EAU
Surface temperature...... : GFP_ST       SURFTEMPERATURE
TOA incident solar radiat : GFP_STINC    TOA INC.SOL. RAD
SUNSHI. DURATION........ : GFP_SUND     SUNSHI. DURATION
Surface UV-B radiation... : GFP_SUVB     UV-B RADIATION
Trapping Layer Base Heigh : GFP_TPLB     Trap Layer Base
Trapping Layer Top Height : GFP_TPLT     Trap Layer Top
percentage of vegetation. : GFP_VEG      SURFPROP.VEGETAT
Vertically-integr. mass d : GFP_VIMD     VertIntegMassDiv
Visibility due to water/i : GFP_VISICLD  CLSVISIN_60
Visibility due to water/i : GFP_VISICLD2 CLSVISIN
Visibility due to Precipi : GFP_VISIHYD  CLSVISIHYDN60
Visibility due to Precipi : GFP_VISIHYD2 CLSVISIHYDN
Volcano altitude........ : GFP_VOLCALTI Volcano Altitude
Extra field n 01........ : GFP_VX2(01)  SURFEXTRAFIELD01
Extra field n 02........ : GFP_VX2(02)  SURFEXTRAFIELD02
```

```
Extra field n 03........ : GFP_VX2(03)  SURFEXTRAFIELD03
Heat roughness length (*g : GFP_ZOH     SURFGZ0.THERM
Vegetation roughness leng : GFP_ZOV     SURFZOVEG.FOIS.G
FRICTION VELOCITY      .. : GFP_ZUST    FRICT. VELOCITY
```

A.4   Cumulated fluxes

This section describes the name identifiers of the cumulated fluxes fields available in cycle 48 for ARPEGE/ALADIN/AROME.
The descriptor `CLNAME` of the structures `GFP_*` in the namelist `NAMAFN` should be used to fill the array `CFPCFU` of the namelist `NAMFPC`.

```
 Description              : Structure        %CLNAME
Boundary Layer Dissipatio : GFP_CBLD     SURFDISSIP SURF
Convective Cloud Cover... : GFP_CCCC     ATMONEBUL.CONVEC
flux de chaleur dans le s : GFP_CCHS     SURFCHAL. DS SOL
Convective precipitation. : GFP_CCP      SURFPREC.EAU.CON
Convective Snow Fall..... : GFP_CCSF     SURFPREC.NEI.CON
Convective Graupel Fall.. : GFP_CCSG     SURFPREC.GRA.CON
Convective Hail Fall..... : GFP_CCSH     SURFPREC.GRE.CON
Contrib. of Convection to : GFP_CCVQ     SURFCFU.Q.CONVEC
Contrib. of Convection to : GFP_CCVS     SURFCFU.CT.CONVE
Contrib. of Convection to : GFP_CCVU     SURFTENS.CONV.ZO
Contrib. of Convection to : GFP_CCVV     SURFTENS.CONV.ME
Surface direct normal ira : GFP_CDNI     SURFDIR NORM IRR
Deep soil water content r : GFP_CDRU     PROFRUISSELLEMEN
Clim. rel. deep soil wetn : GFP_CDSW     PROFPROP.RMAX.EA
Duration of total precipi : GFP_CDUTP    SURFTIME.PREC.TO
Water Evaporation........ : GFP_CE       SURFFLU.MEVAP.EA
flux d eau dans le sol... : GFP_CEAS     SURFEAU DANS SOL
Evapotranspiration....... : GFP_CETP     SURFEVAPOTRANSPI
Cumulative lightning dens : GFP_CFLASH   SURFDIAG.FLASH
melt snow................ : GFP_CFON     SURFFONTE NEIGE
Surface global normal ira : GFP_CGNI     SURFGLB NORM IRR
High Cloud Cover........ : GFP_CHCC     ATMONEBUL.HAUTE
Solid specific moisture.. : GFP_CICE     ATMOHUMI SOLIDE
Interception water conten : GFP_CIRU     SURFRUISS. INTER
Cloudy brightness tempera : GFP_CLBT     Cloud BrightTemp
Low Cloud Cover......... : GFP_CLCC     ATMONEBUL.BASSE
Latent Heat Evaporation.. : GFP_CLHE     SURFFLU.LAT.MEVA
Latent Heat Sublimation.. : GFP_CLHS     SURFFLU.LAT.MSUB
Total Latent Heat (Water  : GFP_CLHT     SURFFLU.LAT.MTOT
Liquid specific moisture. : GFP_CLI      ATMOHUMI LIQUIDE
Large Scale Graupel fall  : GFP_CLSG     SURFPREC.GRA.GEC
Large Scale Hail fall.... : GFP_CLSH     SURFPREC.GRE.GEC
Large Scale Precipitation : GFP_CLSP     SURFPREC.EAU.GEC
Large Scale Snow fall.... : GFP_CLSS     SURFPREC.NEI.GEC
Medium Cloud Cover....... : GFP_CMCC     ATMONEBUL.MOYENN
Total precipitable water. : GFP_CQTO     ATMOHUMI TOTALE
```

```
Snow Sublimation........ : GFP_CS        SURFFLU.MSUBL.NE
Clear-sky brightness temp : GFP_CSBT     Clear BrightTemp
Surface Latent Heat Flux. : GFP_CSLH     SURFCHAL LATENTE
Surface moon radiation... : GFP_CSMR     SURFRAYT.LUNE.DE
Snow mass............... : GFP_CSNS      SURFRESERV NEIGE
Clear sky shortwave radia : GFP_CSOC     SURFRAYT SOL CL
Surface down solar flux.. : GFP_CSOD     SURFRAYT SOLA DE
Surface parallel solar fl : GFP_CSOP     SURFRAYT DIR SUR
Surf. water content run-o : GFP_CSRU     SURFRUISSELLEMEN
Surface Sensible Heat Flu : GFP_CSSH     SURFFLU.CHA.SENS
Surface solar radiation.. : GFP_CSSR     SURFFLU.RAY.SOLA
Clim. rel. surf soil wetn : GFP_CSSW     SURFPROP.RMAX.EA
Surface Thermal radiation : GFP_CSTR     SURFFLU.RAY.THER
Water + Snow Evaporation. : GFP_CT       SURFFLU.MTOTA.NE
Total Cloud cover....... : GFP_CTCC      ATMONEBUL.TOTALE
Clear sky longwave radiat : GFP_CTHC     SURFRAYT THER CL
Surface down thermic flux : GFP_CTHD     SURFRAYT THER DE
Top mesospheric enthalpy. : GFP_CTME     TOPMESO ENTH
Total Ozone............. : GFP_CTO3      ATMOOZONE TOTALE
Top parallel solar flux.. : GFP_CTOP     TOPRAYT DIR SOM
Transpiration........... : GFP_CTP       SURFTRANSPIRATIO
Top clear sky shortwave r : GFP_CTSOC    SOMMRAYT SOL CL
Tendency of Surface press : GFP_CTSP     SURFPRESSION SOL
Top Solar radiation...... : GFP_CTSR     SOMMFLU.RAY.SOLA
Top clear sky longwave ra : GFP_CTTHC    SOMMRAYT THER CL
Top Thermal radiation.... : GFP_CTTR     SOMMFLU.RAY.THER
Contrib. of Turbulence to : GFP_CTUQ     SURFCFU.Q.TURBUL
Contrib. of Turbulence to : GFP_CTUS     SURFCFU.CT.TURBU
U-Gravity-Wave Stress.... : GFP_CUGW     SURFTENS.DMOG.ZO
U-stress................ : GFP_CUSS      SURFTENS.TURB.ZO
U-Total Stress.......... : GFP_CUTO      SURFTENS.TOTA.ZO
V-Gravity-Wave Stress.... : GFP_CVGW     SURFTENS.DMOG.ME
V-stress................ : GFP_CVSS      SURFTENS.TURB.ME
V-Total Stress.......... : GFP_CVTO      SURFTENS.TOTA.ME
Soil Moisture........... : GFP_CWS       SURFCONTENU EAU
```

Notice : precipitations are expressed in kg/m^2 (equivalent to mm)

A.5 Instantaneous fluxes

This section describes the name identifiers of the instantaneous fluxes fields available in cycle 48 for ARPEGE/ALADIN/AROME.
The descriptor CLNAME of the structures GFP_* in the namelist NAMAFN should be used to fill the array CFPXFU of the namelist NAMFPC.

```
 Description              : Structure        %CLNAME
wind intensity at PBL hei : GFP_X10FF    CLSWIND.VELOCITY
U-neutral wind at PBL hei : GFP_X10NU    CLSVENTNEUTRE.U
V-neutral wind at PBL hei : GFP_X10NV    CLSVENTNEUTRE.V
U-component of wind at PB : GFP_X10U     CLSVENT.ZONAL
```

```
V-component of wind at PB : GFP_X10V     CLSVENT.MERIDIEN
Relative Humidity at PBL  : GFP_X2RH     CLSHUMI.RELATIVE
Specific Humidity at PBL  : GFP_X2SH     CLSHUMI.SPECIFIQ
Temperature at PBL height : GFP_X2T      CLSTEMPERATURE
Wet bulb temperature at 2 : GFP_X2TPW    CLSTPRIM_W
CAPE from the model...... : GFP_XCAPE    SURFCAPE.MOD.XFU
Convective Cloud Cover... : GFP_XCCC     SURFNEBUL.CONVEC
Height of the PBL........ : GFP_XCLPH    CLPMHAUT.MOD.XFU
Convective precipitation. : GFP_XCP      SURFPREC.EAU.CON
Convective Snow Fall..... : GFP_XCSF     SOOONEIGE CONVEC
Convective Graupel Fall.. : GFP_XCSG     SOOOGRAUP CONVEC
Convective Hail Fall..... : GFP_XCSH     SOOOGRELE CONVEC
Pressure of top of convec : GFP_XCTOP    CLPTOPCONV.MOD.X
Contribution of Convectio : GFP_XCVQ     SOOOFL.Q  CONVEC
Contribution of Convectio : GFP_XCVS     SOOOFL.CT CONVEC
Contribution of Convectio : GFP_XCVU     SOOOFL.U  CONVEC
Contribution of Convectio : GFP_XCVV     SOOOFL.V  CONVEC
Contribution of GWD to U. : GFP_XGDU     SOOOFL.U ONDG.OR
Contribution of GWD to V. : GFP_XGDV     SOOOFL.V ONDG.OR
Gusts from of the model.. : GFP_XGUST    CLSRAFAL.MOD.XFU
High Cloud Cover........  : GFP_XHCC     SURFNEBUL.HAUTE
Low Cloud Cover.........  : GFP_XLCC     SURFNEBUL.BASSE
Large Scale Graupel fall. : GFP_XLSG     SOOOGRAUP STRATI
Large Scale Hail fall.... : GFP_XLSH     SOOOGRELE STRATI
Large Scale Precipitation : GFP_XLSP     SOOOPLUIE STRATI
Large Scale Snow fall.... : GFP_XLSS     SOOONEIGE STRATI
Medium Cloud Cover.......  : GFP_XMCC     SURFNEBUL.MOYENN
MOCON from the model..... : GFP_XMOCO    CLPMOCON.MOD.XFU
Mean radiant temperature. : GFP_XMRT     CLSMEAN.RAD.TEMP
Min. rel. moisture at PBL : GFP_XN2HU    CLSMINI.HUMI.REL
Minimum temperature at PB : GFP_XN2T     CLSMINI.TEMPERAT
Precipitation Type.......  : GFP_XPTYPE   CLSPTYPE_60M
Precipitation Type.......  : GFP_XPTYPE2  CLSPTYPE
Severe Precipitation Type : GFP_XPTYPESE CLSPTYPESEV
Severe Precipitation Type : GFP_XPTYPESE CLSPTYPESEV_60M
Surface solar radiation.. : GFP_XSSR     SOOORAYT.SOLAIRE
Surface Thermal radiation : GFP_XSTR     SOOORAYT.TERREST
Total Cloud cover........  : GFP_XTCC     SURFNEBUL.TOTALE
Thetaprimwprim surface fl : GFP_XTHW     THETAPWP_FLUX
Top Solar radiation...... : GFP_XTSR     SOMMRAYT.SOLAIRE
Top Thermal radiation.... : GFP_XTTR     SOMMRAYT.TERREST
Contribution of Turbulenc : GFP_XTUQ     SOOOFL.Q  TURBUL
Contribution of Turbulenc : GFP_XTUS     SOOOFL.CT TURBUL
Contribution of Turbulenc : GFP_XTUU     SOOOFL.U  TURBUL
Contribution of Turbulenc : GFP_XTUV     SOOOFL.V  TURBUL
U-momentum of gusts from  : GFP_XUGST    CLSU.RAF60M.XFU
U-momentum of gusts2 from : GFP_XUGST2   CLSU.RAF2.MOD.XF
Ventilation Index........  : GFP_XVEIN    CLPVEIND.MOD.XFU
V-momentum of gusts from  : GFP_XVGST    CLSV.RAF60M.XFU
```

```
V-momentum of gusts2 from : GFP_XVGST2   CLSV.RAF2.MOD.XF
Max. rel. moisture at PBL : GFP_XX2HU    CLSMAXI.HUMI.REL
Maximum temperature at PB : GFP_XX2T     CLSMAXI.TEMPERAT
Hail Diagnostic (AROME).. : GFP_XXDIAGH  SURFDIAGHAIL
```

Appendix B

Fields identifiers for IFS

B.1   Upper air dynamic fields

This section describes the ECMWF GRIB codes of the upper air dynamic fields available in cycle 48 for ARPEGE/ALADIN/AROME.

The descriptor `IGRIB` of the structures `TFP_*` in the namelist `NAMAFN` should be used to fill the arrays `MFP3DF*` of the namelist `NAMFPC`.

```
  Description                 : Structure     %IGRIB
Cloud fraction.......... : TFP_CLF          248
Divergence.............. : TFP_DIV          155
Etadot.................. : TFP_ETAD          77
Free upper air field n 01 : TFP_FUA(01)      82
Free upper air field n 02 : TFP_FUA(02)      83
Free upper air field n 03 : TFP_FUA(03)      84
Relative humidity........ : TFP_HU           157
Atmospheric solid water.. : TFP_I            247
Stream function.......... : TFP_KHI            1
Atmospheric liquid water. : TFP_L            246
Montgomery potential..... : TFP_MG            53
Pressure................ : TFP_P             54
Pressure Departure....... : TFP_PD           118
Velocity potential....... : TFP_PSI            2
Potential Vorticity...... : TFP_PV            60
Specific humidity........ : TFP_Q            133
Atmospheric rain......... : TFP_RR            75
Atmospheric snow......... : TFP_SN            76
Temperature............. : TFP_T            130
Potential temperature.... : TFP_TH             3
U-momentum of wind....... : TFP_U            131
V-momentum of wind....... : TFP_V            132
Pseudo Vertic. Divergence : TFP_VD           119
Vorticity............... : TFP_VOR          138
Ver velocity omega=DPi/Dt : TFP_VV           135
Vert velocity w=Dz/Dt.... : TFP_VW           120
Geopotential............ : TFP_Z            129
```

B.2   2D dynamic fields

This section describes the ECMWF GRIB codes of the 2D dynamic fields available in cycle 48 for ARPEGE/ALADIN/AROME.

The descriptor `IGRIB` of the structures `TFP_*` in the namelist `NAMAFN` should be used to fill the array `MFP2DF` of the namelist `NAMFPC`.

```
   Description               : Structure    %IGRIB
 Surface geopotential..... : TFP_FIS         129
 Tropo. Folding Indicator. : TFP_FOL         125
 Free surface field nr 01. : TFP_FSU(01)     124
 Free surface field nr 02. : TFP_FSU(02)     123
 Free surface field nr 03. : TFP_FSU(03)     122
 Map factor............... : TFP_GM          126
 Log. of Surface pressure. : TFP_LNSP        152
 Mean sea level pressure.. : TFP_MSL         151
 Surface pressure......... : TFP_SP          134
 Surface Vertical Velocity : TFP_WWS          80
```

B.3   Physical fields

This section describes the ECMWF GRIB codes of the physical fields available in cycle 48 for ARPEGE/ALADIN/AROME.

The descriptor `IGRIB` of the structures `GFP_*` in the namelist `NAMAFN` should be used to fill the array `MFPPHY` of the namelist `NAMFPC`.

```
   Description               : Structure    %IGRIB
 ZERO DEG.LEVEL  ......... : GFP_0DEGL    228024
 100M.WIND SPEED ......... : GFP_100SI    228249
 100M.UWIND      ........ : GFP_100U     228246
 100M.VWIND      ........ : GFP_100V     228247
 WIND GUST 10 M  ......... : GFP_10FG         49
 WIND GUST 10 M SINCE LAST : GFP_10FG3    228028
 WIND GUST 10 M SINCE LAST : GFP_10FG6       123
 10M.NEUTRAL UWIND      .. : GFP_10NU     228131
 10M.NEUTRAL VWIND      .. : GFP_10NV     228132
 10M.WIND SPEED  ......... : GFP_10SI        207
 10M.UWIND       ......... : GFP_10U         165
 10M.VWIND       ......... : GFP_10V         166
 200M.WIND SPEED ......... : GFP_200SI    228241
 200M.UWIND      ......... : GFP_200U     228239
 200M.VWIND      ......... : GFP_200V     228240
 2M.DEWPOINT     ......... : GFP_2D          168
 2M.TEMPERATURE  ......... : GFP_2T          167
 Particulate matter le 1 u : GFP_AEPM1    210072
 Particulate matter le 10u : GFP_AEPM10   210074
 Particulate matter le 2.5 : GFP_AEPM25   210073
 Dust emission potential.. : GFP_AERDEP   210052
 Lifting Threshold Speed.. : GFP_AERLTS   210053
 AERO diag Opt wvl nr 01   : GFP_AERO_WVL210207
```

```
Soil Clay Content........ : GFP_AERSCC  210054
Albedo................... : GFP_AL         174
ALBEDO         ......... : GFP_ALB        243
MODIS Albedo N-IR diffuse : GFP_ALNID       18
MODIS Albedo N-IR paralle : GFP_ALNIG  210191
MODIS Albedo N-IR paralle : GFP_ALNII  210189
MODIS Albedo N-IR paralle : GFP_ALNIP       17
MODIS Albedo N-IR paralle : GFP_ALNIV  210190
MODIS Albedo UVis diffuse : GFP_ALUVD       16
MODIS Albedo UVis paralle : GFP_ALUVG  210188
MODIS Albedo UVis paralle : GFP_ALUVI  210186
MODIS Albedo UVis paralle : GFP_ALUVP       15
MODIS Albedo UVis paralle : GFP_ALUVV  210187
ANGLE.SUB.SOROG ......... : GFP_ANOR       162
SNOW ALBEDO    ......... : GFP_ASN         32
Black Carbon biogenic flu : GFP_BCBF   210031
Black Carbon fossil fuel  : GFP_BCFF   210032
Black Carbon GFED flux... : GFP_BCGF   210040
PBL.DISSIP.    ......... : GFP_BLD        145
BOUND.LAY.HEIGHT........ : GFP_BLH        159
BUDGET VALUES   ........ : GFP_BV         128
CONV.AVAIL.POTENTIAL ENER : GFP_CAPE        59
MAX CAPE LAST 6H ........ : GFP_CAPE6  228035
CAPE-SHEAR      ......... : GFP_CAPES  228044
MAX CAPE-SHEAR LAST 6H .. : GFP_CAPS6  228036
CEILING CLOUD BASE....... : GFP_CBASA  260109
CLOUD BASE LEVEL........ : GFP_CBASE  228023
CONV.CC        ......... : GFP_CCC        185
Clim. rel. deep soil wetn : GFP_CDSW       214
GPP flux adjustment coeff : GFP_CGPP   228078
CH4 .surf. flux.......... : GFP_CH4AG  210070
CH4 .fire. emis.......... : GFP_CH4F   210082
CHARNOCK.PARAM  ......... : GFP_CHAR       148
SEA ICE COVER   ......... : GFP_CI          31
CONV. INHIBITION ........ : GFP_CIN    228001
Cloudy brightness tempera : GFP_CLBT   260510
Lake cover............... : GFP_CLK         26
CO2 .anth. emis.......... : GFP_CO2APF 210069
CO2 .fire. emis.......... : GFP_CO2FIRE 210080
CO2 .bios. flux.......... : GFP_CO2NBF 210068
CO2 .ocea. flux.......... : GFP_CO2OF  210067
CONV.PRECIP.    ......... : GFP_CP         143
REC flux adjustment coeff : GFP_CREC   228079
CONVECTIVE RAINFALL RATE  : GFP_CRR    228218
Clear-sky brightness temp : GFP_CSBT   260511
CONV.SNOWFALL   ......... : GFP_CSF        239
CONVECTIVE SNOWFALL RATE  : GFP_CSFR   228220
Clim. rel. surf soil wetn : GFP_CSSW       215
CLOUD TOP LEVEL CONVECTIO : GFP_CTOPC  228046
```

```
HIGH VEG. COVER ........ : GFP_CVH          28
LOW VEG. COVER  ........ : GFP_CVL          27
Duct Base Height........ : GFP_DCTB     228017
Lake depth.............. : GFP_DL       228007
Oceanic DMS............. : GFP_DMSO     210043
Mean Refractivity Gradien : GFP_DNDZA   228016
Min. Refractivity Gradien : GFP_DNDZN   228015
Dust Source Function..... : GFP_DSF     216046
Deep soil temperature.... : GFP_DST        219
Deep soil wetness........ : GFP_DSW        217
EVAPORATION      ........ : GFP_E          182
Ocean depth of 20degC iso : GFP_EC20D   151163
Emissivity.............. : GFP_EMIS       124
EVA. SNOW       ........ : GFP_ES          44
EVA. SNOW       ........ : GFP_ES          44
U-STRESS        ........ : GFP_EWSS       180
U-STRESS        ........ : GFP_EWSS       180
Calcite Fraction 1 (small : GFP_FCA1    216043
Calcite Fraction 2 (large : GFP_FCA2    216044
FREEZINGRAIN     ........ : GFP_FZRA    228216
OUTPUT gp orography (*g). : GFP_GFIS       129
GROSS PRIMARY PRODUCTION  : GFP_GPP     228081
GRAV.WAVE.DISSIP......... : GFP_GWD        197
HIGH.CC         ........ : GFP_HCC        188
WIND GUST 10 M (INSTANTAN : GFP_I10FG   228029
Sea ice thickness....... : GFP_ICTH    174098
INST.S.MOI.FLUX ........ : GFP_IE         232
INST.X-SURF.ST. ........ : GFP_IEWSS      229
INST.X-SURF.ST. ........ : GFP_IEWSS      229
INST.GROSS PRIMARY PRODUC : GFP_IGPP    228084
LSC PREC. FRACT. INSTANTA : GFP_ILSPF   228217
INST.NET ECOSYSTEM EXCHAN : GFP_INEE    228083
Biomass burning injection : GFP_INJF    210119
INST.Y-SURF.ST. ........ : GFP_INSSS      230
INST.ECOSYSTEM RESPIRATIO : GFP_IREC    228085
ANISO.SUB.SOROG ........ : GFP_ISOR       161
INST.S.HEAT.FLUX........ : GFP_ISSHF      231
ICE SURF.TEMP. 1........ : GFP_ISTL1       35
ICE SURF.TEMP. 2........ : GFP_ISTL2       36
ICE SURF.TEMP. 3........ : GFP_ISTL3       37
ICE SURF.TEMP. 4........ : GFP_ISTL4       38
CONV. K-INDEX    ........ : GFP_KINDX   260121
HIGH VEG. LAI   ........ : GFP_LAIH        67
LOW VEG. LAI    ........ : GFP_LAIL        66
Lake bottom layer tempera : GFP_LBLT    228010
LOW.CC          ........ : GFP_LCC        186
LAT.GRAV.WAVE.ST........ : GFP_LGWS       195
Lake ice depth.......... : GFP_LICD    228014
1h avg. CTG lightning den : GFP_LICGA1  228053
```

```
3h avg. CTG lightning den  : GFP_LICGA3   228059
6h avg. CTG lightning den  : GFP_LICGA6   228060
Inst. CTG lightning densi  : GFP_LICGI    228052
Lake ice temperature.....  : GFP_LICT     228013
1h avg. total lightning d  : GFP_LITOTA1  228051
3h avg. total lightning d  : GFP_LITOTA3  228057
6h avg. total lightning d  : GFP_LITOTA6  228058
Inst. total lightning den  : GFP_LITOTI   228050
Lake mix layer depth.....  : GFP_LMLD     228009
Lake mix layer temperatur  : GFP_LMLT     228008
LARGE.SCALE.SNOW.........  : GFP_LSF         240
Lake shape factor.......   : GFP_LSHF     228012
Land/sea mask...........   : GFP_LSM         172
LARGESCAPRECIP. .........  : GFP_LSP         142
LSC PREC. FRACT. ACCUMULA  : GFP_LSPF         50
LOG.SURF.ROUGH  ........   : GFP_LSRH        234
LARGE SCALE RAINFALL RATE  : GFP_LSRR     228219
LARGE SCALE SNOWFALL RATE  : GFP_LSSFR    228221
Lake total layer temperat  : GFP_LTLT     228011
LOG.S.ROUGH.HEAT........   : GFP_LZOH        245
MEDIUM.CC       ........   : GFP_MCC         187
MER.GRAV.WAVE.ST........   : GFP_MGWS        196
Ocean mixed layer depth-.  : GFP_MLD      151148
MIN.TEMP.       ........   : GFP_MN2T        202
MIN.TEMP. SINCE LAST 3 HO  : GFP_MN2T3    228027
MIN.TEMP. SINCE LAST 6 HO  : GFP_MN2T6       122
MIN.TOT.PRECIP. .........  : GFP_MNTPR    228227
MIN.TOT.PRECIP.SINCE LAST  : GFP_MNTPR6   228225
MSL             ........   : GFP_MSLD        151
MAX.TEMP.       ........   : GFP_MX2T        201
MAX.TEMP. SINCE LAST 3 HO  : GFP_MX2T3    228026
MAX.TEMP. SINCE LAST 6 HO  : GFP_MX2T6       121
MAX.TOT.PRECIP. .........  : GFP_MXTPR    228226
MAX.TOT.PRECIP.SINCE LAST  : GFP_MXTPR3   228222
MAX.TOT.PRECIP.SINCE LAST  : GFP_MXTPR6   228224
NET ECOSYSTEM EXCHANGE OF  : GFP_NEE      228080
V-STRESS        ........   : GFP_NSSS        181
Optical depth ammonium ae  : GFP_ODAM     210251
Optical depth black C aer  : GFP_ODBC     210211
Optical depth dust aeroso  : GFP_ODDU     210209
Optical depth nitrate aer  : GFP_ODNI     210250
Optical depth organic M a  : GFP_ODOM     210210
Optical depth secondary o  : GFP_ODSOA    216047
Optical depth sea salt ae  : GFP_ODSS     210208
Optical depth sulphate ae  : GFP_ODSU     210212
Optical depth tot. aer. a  : GFP_ODTOACC  215089
Optical depth volc.fly as  : GFP_ODVFA    210244
Optical depth volc.sulfat  : GFP_ODVSU    210243
Organic matter biogenic f  : GFP_OMBF     210033
```

```
Organic matter fossil fue : GFP_OMFF    210034
Organic matter GFED flux. : GFP_OMGF    210041
POTENTIAL EVAPORATION  .. : GFP_PEV     228251
PRECIPITATION TYPE  ..... : GFP_PTYPE   260015
INTERPOLATED Ts.......... : GFP_RDST       218
Relax. deep soil wetness. : GFP_RDSW       216
ECOSYSTEM RESPIRATION OF  : GFP_REC     228082
RUNOFF          ........ : GFP_RO         205
SNOW DENSITY    ........ : GFP_RSN         33
Ocean salnity avg 300m... : GFP_SAL3    151175
Surf.clear-sky direct SW  : GFP_SCDIR   228022
Snow depth............... : GFP_SD         141
SD FILTERED OROG ........ : GFP_SDFOR       74
Std. dev. of orography (* : GFP_SDOG       160
Surf.tot sky direct beam  : GFP_SDSRP       47
SNOWFALL        ........ : GFP_SF         144
Surf.total sky direct SW  : GFP_SFDIR   228021
SKINTEMPERATURE ........ : GFP_SKT        235
S.L.HEAT.FLUX.  ........ : GFP_SLHF       147
SLOPE.SUB.SOROG ........ : GFP_SLOR       163
SLOPE.SUB.SOROG ........ : GFP_SLOR       163
SNOW MELT       ........ : GFP_SMLT        45
SO2 dry deposition veloci : GFP_SO2DD   216006
Sulphate High-level emiss : GFP_SO2H    210036
Sulphate Low-level emissi : GFP_SO2L    210035
Secondary organic matter. : GFP_SOA     210039
Secondary organic matter  : GFP_SOACO   216007
Sulphate GFED flux....... : GFP_SOGF    210042
Soil type................ : GFP_SOTY        43
SURFACE PRESSURE......... : GFP_SP         134
Surface PARadiation...... : GFP_SPAR        58
Surface clear-sky PARadia : GFP_SPARC       20
Surface roughness (*g)... : GFP_SR         173
SKINRESERV.EAU  ........ : GFP_SRC        198
SURFACE RUNOFF  ........ : GFP_SRO          8
Ocean sea surface height. : GFP_SSH     151145
S.S.HEAT.FLUX.  ........ : GFP_SSHF       146
SURF SOLAR CLEAR......... : GFP_SSRC       210
S.SOLAR.RAD.DOWN......... : GFP_SSRD       169
S.SOLAR.RAD.DOWN CLEAR... : GFP_SSRDC   228129
SUB-SURFACE RUNOFF....... : GFP_SSRO         9
Ocean sea surface salinit : GFP_SSS     151130
SEA SURF. TEMP. ........ : GFP_SST         34
TOA incident solar radiat : GFP_STINC      212
LEV1TEMPERATURE ........ : GFP_STL1       139
LEV2TEMPERATURE ........ : GFP_STL2       170
LEV3TEMPERATURE ........ : GFP_STL3       183
LEV4TEMPERATURE ........ : GFP_STL4       236
S.THERMAL.RAD.  ........ : GFP_STR        177
```

```
SURF THERM CLEAR......... : GFP_STRC        211
S.THERM.RAD.DOWN......... : GFP_STRD        175
S.THERM.RAD.DOWN CLEAR... : GFP_STRDC    228130
SUNSHI. DURATION......... : GFP_SUND        189
Surface UV-B radiation... : GFP_SUVB         57
LEV1RESERV.EAU   ........ : GFP_SWL1         39
LEV2RESERV.EAU   ........ : GFP_SWL2         40
LEV3RESERV.EAU   ........ : GFP_SWL3         41
LEV4RESERV.EAU   ........ : GFP_SWL4         42
TOTAL.CC         ........ : GFP_TCC         164
Total column GHG var nr 0 : GFP_TCGHG    210064
Total column GHG var nr 0 : GFP_TCGHG    210065
Total column GHG var nr 0 : GFP_TCGHG    210066
TOT.COL.ICE.WAT ........ : GFP_TCIW         79
TOT.COL.LIQ.WAT ........ : GFP_TCLW         78
TOT.COL.OZON     ........ : GFP_TCO3        206
TOT.COL.RAIN.WAT ........ : GFP_TCRW     228089
TOT.COL.SUPERCOOLED.LIQ.W : GFP_TCSLW    228088
TOT.COL.SNOW.WAT ........ : GFP_TCSW     228090
TOT.COL.WATER    ........ : GFP_TCW         136
TOT.COL.WATVAPOU......... : GFP_TCWV        137
Ocean temperature avg 300 : GFP_TEM3     151164
TOTAL.PRECIP.    ........ : GFP_TP          228
Trapping Layer Base Heigh : GFP_TPLB     228018
Trapping Layer Top Height : GFP_TPLT     228019
TOTAL PRECIPITATION RATE  : GFP_TPR      260048
TEMP.SNOWLAYER   ........ : GFP_TSN         238
T.SOLAR.RAD.     ........ : GFP_TSR         178
TOP SOLAR  CLEAR......... : GFP_TSRC        208
CONV. TT-INDEX   ........ : GFP_TTIND    260123
T.THERMAL.RAD.   ........ : GFP_TTR         179
TOP THERMALCLEAR......... : GFP_TTRC        209
HIG VEG. TYPE    ........ : GFP_TVH          30
LOW VEG. TYPE    ........ : GFP_TVL          29
OCEAN U-CURRENT ........ : GFP_UCUR     151131
Urban fraction.......... : GFP_URBF     216122
UV Biologically Effective : GFP_UVBED    214002
UV Biologically Effective : GFP_UVBEDCS 214003
OCEAN V-CURRENT ........ : GFP_VCUR     151132
percentage of vegetation. : GFP_VEG         199
Vertically-integr. mass d : GFP_VIMD        213
HORIZ.VISIBILITY......... : GFP_VISIH      3020
Eastward water vapour flu : GFP_VIWVE    162071
Northward water vapour fl : GFP_VIWVN    162072
Volcanic Continuous emiss : GFP_VOLC     210037
Volcano altitude......... : GFP_VOLCALTI216045
Volcanic Explosive emissi : GFP_VOLE     210038
Extra field n 01......... : GFP_VX2(01)      82
Extra field n 02......... : GFP_VX2(02)      83
```

```
Extra field n 03......... : GFP_VX2(03)      84
SURF.ROUGHNESS   ......... : GFP_ZOF         244
ZERO DEG.LEVEL WETBULB-T. : GFP_ZTWB0    228047
ONE DEG.LEVEL WETBULB-T.  : GFP_ZTWB1    228048
FRICTION VELOCITY      .. : GFP_ZUST     228003
```

Appendix C

Example of selection file for ARPEGE/ALADIN/AROME

To get the following fields :

- Model orography on domains FRANCE and EUROC25 at time h00

- Surface pressure on domain EUROC25 at times h00 and h03

- Geopotential at 500 hPa on domains FRANCE and EUROC25 at time h00

- Geopotential at 850 hPa on domains FRANCE and EUROC25 at time h03

- Temperature at 850 hPa on domain FRANCE at time h00

- Temperature at 500 hPa on domain EUROC25 at time h00 and h03

- Potential vorticity at 300 K on domain FRANCE at time h00

You would first have the following parameters in the namelist file :

```
&NAMCTO
   CNPPATH='.',
/END
&NAMFPC
   CFP2DF='SPECSURFGEOPOTEN','SURFPRESSION',
   CFP3DF='GEOPOTENTIEL','TEMPERATURE','POT_VORTICIT',
   RFP3P(1)=500.,
   RFP3P(2)=850.,
   RFP3T(1)=300.,
   CFPDOM='FRANCE','EUROC25',
/END
```

Then you would add in your script the following two files :

```
/bin/cat <EOF>> xxt00000000                      /bin/cat <EOF>> xxt00000300
&NAMFPPHY                                         &NAMFPPHY
/END                                              /END
&NAMFPDY2                                         &NAMFPDY2
   CL2DF(1)='SPECSURFGEOPOTEN',                      CL2DF(1)='SURFPRESSION',
   CLD2DF(1)='FRANCE:EUROC25',                       CLD2DF(1)='EUROC25',
   CL2DF(2)='SURFPRESSION',                       /END
   CLD2DF(2)='EUROC25',                           &NAMFPDYP
/END                                                 CL3DF(1)='GEOPOTENTIEL',
&NAMFPDYP                                            ILD3DF(1,1)=2,
   CL3DF(1)='GEOPOTENTIEL',                          CLD3DF(1,1)='FRANCE:EUROC25',
   ILD3DF(1,1)=1,                                    CL3DF(2)='TEMPERATURE',
   CLD3DF(1,1)='FRANCE:EUROC25',                     ILD3DF(1,2)=1,
   CL3DF(2)='TEMPERATURE',                           CLD3DF(1,2)='EUROC25',
   ILD3DF(1,2)=1,2,                               /END
   CLD3DF(1,2)='EUROC25',                         &NAMFPDYH
   CLD3DF(2,2)='FRANCE',                          /END
/END                                              &NAMFPDYV
&NAMFPDYH                                         /END
/END                                              &NAMFPDYT
&NAMFPDYV                                         /END
   CL3DF(1)='POT\_VORTICIT',                      &NAMFPDYS
   ILD3DF(1,1)=1,                                 /END
   CLD3DF(1,1)='FRANCE',                          &NAMFPDYI
/END                                              /END
&NAMFPDYT                                         &NAMFPDYF
/END                                              /END
&NAMFPDYS                                         EOF
/END
&NAMFPDYI
/END
&NAMFPDYF
/END
EOF
```

Appendix D

How to make climatology files for ARPEGE/ALADIN/AROME

Climatology files are made with the configuration 923 of ARPEGE for a gaussian grid, or the configuration E923 for ALADIN/AROME for a LAM grid or a latitudes-longitudes grid. Additionnally, for Surfex surface fields the application PGD should be run to make the so-called PGD climatological file.

Among the tuning namelists variables of the configuration E923, one should keep in mind that :

- Latitudes-longitudes grids do not have extension zones (`NDGL=NDGUX` and `NDLON=NDLUX` in the namelist `NAMDIM`)

- Latitudes-longitudes grids are plane (`LRPLANE=.FALSE.` in the namelist `NAMCTO`)

- For purely gridpoint outputs, no spectral fit should be applied to the surface geopotential (`LKEYF=.FALSE.` in the namelist `NAMCLA`).

Appendix E

Formulations of the spectral filters

There are two formulations used to smooth the fields.

The first one — nicknamed *thx* because it uses the hyperbolic tangent function — is actually a low-pass filter and is used in ARPEGE/IFS only to smooth the fields which are horizontal derivatives, or which are build upon horizontal derivatives, espacially when the model is stretched. It looks like a smoothed step function :

$$f(n) = \frac{1 - \tanh(e^{-k}(n - n_0))}{2}$$

where n is a given wavenumber in the *unstretched* spectral space, k is the intensity of the filter and n_0 is the truncation threshold. : this function roughly equals 1 if n is less than n_0, and roughly equals 0 if it is bigger.

The second one is au gaussian function. In ARPEGE/IFS it writes :

$$f(n) = e^{\frac{-k}{2}(n/N)^2}$$

where n is a given wavenumber, k is the intensity of the filter and N represents the model triangular truncation.

In ALADIN/AROME the gausssian filter writes :

$$f(n, m) = e^{\frac{-k}{2}((n/N)^2 + (m/M)^2)}$$

where (n, m) is a given pair of wavenumbers, k is the intensity of the filter and (N, M) represent the model elliptic truncation ; while the low-pass filter writes :

$$f(n, m) = e^{\frac{-k}{2}((n/min(N,M,n_0))^2 + (m/min(N,M,n_0))^2)}$$

where n_0 is the truncation threshold.

In ALADIN/AROME this gaussian filter is used to filter any field (horizontal derivatives or not).