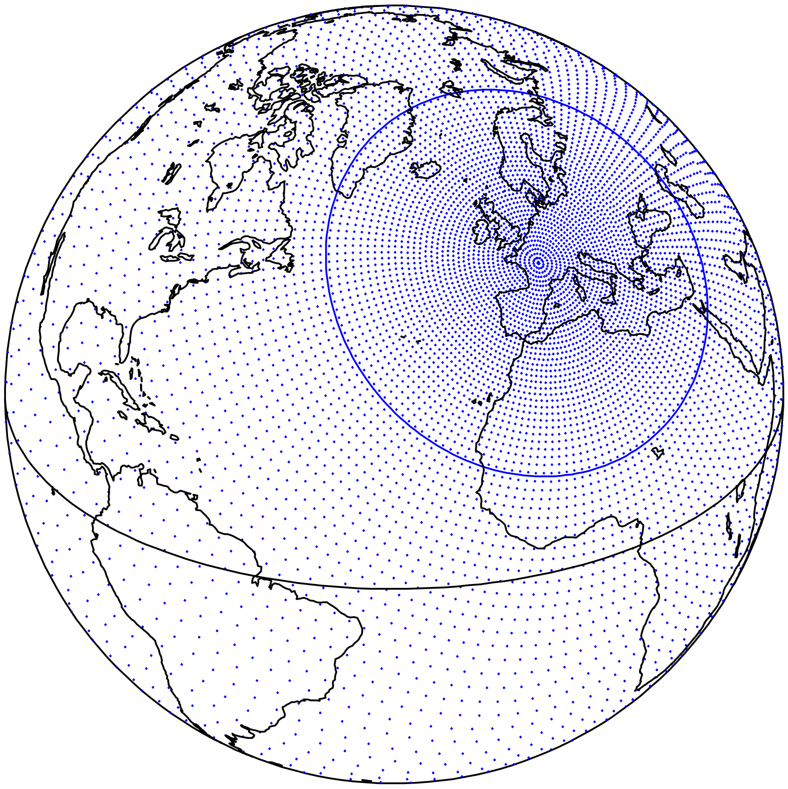
FullPOS users guide for Arpege/Aladin cycle 25T1



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Chapter 1

Introduction

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

FullPos has two main parts : the vertical interpolations, then the horizontal interpolations. In between, a spectral treatment is sometimes possible for the dynamic fields.

1.1 Organisation of this manual

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

It is assumed that the user has some familiarity with the configuration 001 of ARPEGE/IFS or ALADIN and understands the basic features of post-processing operations.

Much of the information presented in this document is also 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.

FullPos has so many features that it is difficult to validate all the possible namelists configurations.

If you have wishes for further developments inside *FullPos* , then please write a short report as well, that could be discussed.

1.3 Summary of features

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

- 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 or model level

- Multiple latitudes X longitudes output subdomains, or one gaussian grid with any definition, or one grid of kind 'ALADIN', with any definition
- Multiple possible optimisations of the memory or the CPU time used, through specific I/O schemes, vectorisation depth, distribution and various other segmentations.
- Possible spectral treatment for all the fields of a given post-processing level type
- Customization of the names of the post-processed fields
- Support for computing a few other fields without diving deeply into the code of *FullPos*
- Ability to perform post-processing in-line (ie : during the model integration) or off-line (out of the model integration)
- Ability to make ARPEGE or ALADIN history files, starting from a file ARPEGE or a file ALADIN (processes "927", "E927" and "EE927")

1.4 Acknowledgements

Thanks to Alain Joly who invented first the "French POS" concept which became *FullPos* , and to Jean-François Geleyn who has adopted my point of view about this internal new post-processing. Credit and thanks to Jean Pailleux who convinced ECMWF to let METEO-FRANCE implement this software in ARPEGE/IFS ; to Mats Hamrud for his advice on vertical scannings, his help for long distance debugging and the re-usable code he has written on I/O scheme, spectral transforms and horizontal scanning ; to Vincent Cassé for these long talks about interpolations and how the so-called "semi-lagrangian buffers" work ; to Jean-Marc Audoin and Eric Escalière who helped me to write a part of the code ; to Patrick Le Moigne and Jean-Daniel Gril who spent time to let me try to understand the geometry of ALADIN. Congratulations and tanks to Gabor Radnoti who managed in the huge task to implement *FullPos* inside ALADIN ; to Jaouad Boutahar and Mehdi Elabed for their debugging in *FullPos* . Many thanks to Jean-Noël Thépaut who believed in the use of *FullPos* for the incremental variational analysis. Thank to you all who will use *FullPos* and be happy of it (. . . and maybe find out residual bugs ?)

Special thanks to the workstation "Nout", to Edit_file and the mouse on NOS-Ve with which the code is typed, and to the user friendly Crisp editor under UNIX environment, with which this manual has been typed.

Chapter 2

Basic usage

2.1 Getting started

2.1.1 Installing the software

FullPos is embedded in the software ARPEGE/IFS/ALADIN. It needs the auxilary library for the I/Os and some low-level calculations, and the external spectral transforms packages TFL and TAL (the last one is needed for running *FullPos* ALADIN only).

2.1.2 Preparing the namelists file

The namelists file should correspond to the ARPEGE/IFS/ALADIN cycle you are running.
FullPos is using a few specific namelists which are : `NAMAFN`, `NAMFPC`, `NAMFPD`, `NAMFPG`, `NAMFPF`, `NAMFPIOS`, `NAMFPSC2`, `NAMFPEZO` and `NAMCAPE`.
All these namelists are specific to *FullPos* , except `NAMAFN` which is a little bit more general.
FullPos is also using model variables from the namelists `NAMCT0`, `NAMDIM`, `NAMDYN`, `NAMPAR0`, `NAMPAR1`, `NAMOPH`, `NAMFA` and `NAMCT1`.
Furthermore it is indirectly interfaced with the model via the namelists `NAMPHY`, `NAMDPHY`, `NAMINI`, `NAMCFU` and `NAMXFU`.

2.1.3 Running the software

To run the software anyhow, you have to control that the next basic namelist variables are properly set :

NCONF :

Definition : General configuration of the ARPEGE/IFS/ALADIN software. This parameter is also accessible as a command line option : `-c`

Scope : Integer which *must* be 1 to enable the post-processing.

Default value : in namelist the default value is 1 ; if the command line option is used there is no default value.

Namelist location : `NAMCT0`

CNMEXP :

Definition : Name of the experiment. This parameter is also accessible as a command line option : `-e`

Scope : string of 4 characters.

Default value : in namelist the default value is `'0123'` ; if the command line option is used there is no default value.

Namelist location : `NAMCT0`

LECMWF :

Definition : Control of setup version. (Set `.TRUE.` for ECMWF setup and `.FALSE.` for METEO-FRANCE setup). This parameter is also accessible as a command line option : `-v`

Scope : in namelist : boolean ; in command line : character string which can be either `'ecmwf'` (for `LECMWF=.TRUE.`) or `'meteo'` (for `LECMWF=.FALSE.`).

Default value : in namelist the default value is `.TRUE.` ; if the command line option is used there is no default v alue.

Namelist location : `NAMCT0`

LELAM :

Definition : Control of the limited area vs. global version of the model. (Set `.TRUE.` for ALADIN and `.FALSE.` for ARPEGE/IFS). This parameter is also accessible as a command line option : `-m`

Scope : in namelist : boolean ; in command line : character string which can be either `'arpifs'` (for `LELAM=.FALSE.`) or `'aladin'` (for`LELAM=.TRUE.`).

Default value : in namelist the default value is `.FALSE.` ; if the command line option is used the default value is `'arpifs'`.

Namelist location : `NAMCT0`

LFPOS :

Definition : Main control of *FullPos* software ; set `LFPOS=.TRUE.` to activate it.

Scope : Boolean.

Default value : `.FALSE.`

Namelist location : `NAMCT0`

N1POS :

Definition : Post-processing outputs control switch. Set `N1POS=1` to switch on, and `N1POS=0` to switch off.

Scope : Integer between 0 and 1.

Default value : 1

Namelist location : `NAMCT1`

NFRPOS, NPOSTS :

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

- if `NPOSTS(0) = 0` then the post-processing runs every `NFRPOS` time steps (including time 0).
- if `NPOSTS(0) > 0` then `NPOSTS(0)` is the number of post-processing events and the post-processing runs on the time 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 240.

Default value : If `LECMWF=.FALSE.` and `NCONF=1` and the command line is used then `NFRPOS=1` and `NPOSTS` is set for output at hours 0, 6, 12, 18, 24, 30, 36, 48, 60 and 72. Else `NFRPOS=NSTOP` and `NPOSTS(:)=0` (outputs at first and last time step).

Namelist location : `NAMCT0`

If you do not specify anything else, then *FullPos* will run, but you will not get any output file since you did not ask for any output field !

Imagine now that you add in the namelist `NAMFPC` the following variables :
`CFP3DF='GEOPOTENTIEL','TEMPERATURE',`
`RFP3F=50000.,85000.,`
then you will get a post-processing file which will contain the geopotential and the temperature at 500 hPa and 850 hPa on the model grid (stretched gaussian grid in the case of ARPEGE, geographical "C+I" grid in the case of ALADIN. The output file will be a file ARPEGE/ALADIN named `PF${CNMEXP}000+`*nnnn*, where `${CNMEXP}` is the name of the experiment (`CNMEXP(1:4)`), and *nnnn* the forecast range.

2.2 Leading namelists and variables

The namelists variables and the set-up have been built in order to use the namelists default values as far as possible, and to respect a hierarchy.
This section will describe the purpose of the main post-processing namelists and will detail the basic variables in these namelists.

2.2.1 NAMFPC

This is the main namelist for the post-processing. It contains the list of the fields to post-process, the format of the output subdomain(s) (spectral coefficients, gaussian grid, LAM grid or LAT X LON grids), and various options of post-processing.

CFPFMT :

Definition : format of the output files.

Scope : character variable which can be either `'MODEL'`, `'GAUSS'`, `'LELAM'` or `'LALON'` respectively for spectral coefficients, a global model grid, a LAM grid a set of LAT X LON grids.

Default value : `'GAUSS'` in ARPEGE/IFS ; `'LELAM'` in ALADIN.

CFPDOM :

Definition : names of the subdomains.

Scope : array of 10 characters ; if `CFPFMT` is `'MODEL'`, `'GAUSS'` or `'LELAM'` then you can make only one output domain ; otherwise you can make up to 15 subdomains.

Default value : `CFPDOM(1)='000'` ; `CFPDOM(`i`)=' '` for i greater than 1. This means that by default, you ask for only one output (sub-)domain.

CFP3DF :

Definition : ARPEGE names of the 3D dynamics fields.

Scope : array of 12 characters, maximum size : 98 items. The reference list of these fields is written in appendix A.1 on page 51.

Default value : blank strings (no 3D dynamics fields to post-process).

CFP2DF :

Definition : ARPEGE names of the 2D dynamics fields.

Scope : array of 16 characters, maximum size : 78 items. The reference list of these fields is written in appendix A.1.1 on page 53.

Default value : blank strings (no 2D dynamics fields to post-process).

CFPPHY :

Definition : ARPEGE names of the surface grid-point fields from physical parameterisations.

Scope : array of 16 characters, maximum size : 328 items. The reference list of these fields is written in appendix A.1.2 on page 54.

Default value : blank strings (no surface fields to post-process).

CFPCFU :

Definition : ARPEGE names of the cumulated fluxes.

Scope : array of 16 characters, maximum size : 63 items. The reference list of these fields is written in appendix A.1.3 on page 55.

Default value : blank strings (no cumulated fluxes to post-process).

CFPXFU :

Definition : ARPEGE names of the instantaneous fluxes.

Scope : array of 16 characters, maximum size : 63 items. The reference list of these fields is written in appendix A.1.4 on page 57.

Default value : blank strings (no instantaneous fluxes to post-process).

RFP3P :

Definition : post-processing pressure levels.

Scope : array of real values, maximum size : 31 items. Unit : Pascal.

Default value : None.

RFP3H :

Definition : post-processing height levels above orography.

Scope : array of real values, maximum size : 127 items. Unit : meter.

Default value : None.

RFP3TH :

Definition : post-processing potential temperature levels.

Scope : array of real values, maximum size : 15 items. Unit : Kelvin.

Default value : None.

RFP3PV :

Definition : post-processing potential vorticity levels.

Scope : array of real values, maximum size : 15 items. Unit : Potential Vorticity Unit.

Default value : None.

NRFP3S :

Definition : post-processing *eta* levels.

Scope : array of real values, maximum size : 200 items. Unit : adimensional.

Default value : None.

Notice :

- If you ask for fluxes you do not need to specify anything particuliar in the namelists `NAMCFU` or `NAMXFU` : these namelists will be automatically modified by *FullPos* in order to get the required fluxes.
- If you ask for spectral coefficients then the upper air grid-point fields, the surface grid point fields and the fluxes will be written on the model gaussian grid.

2.2.2 NAMFPD

This namelist defines the boundaries and the horizontal dimensions of each output subdomain. Many default values are available through a clever use of the previous namelist NAMFPC.

Note that if you ask for the model horizontal geometry (`CFPFMT='MODEL'`), all these parameters will be reset by the program ; so you should not try to choose them yourself.

NLAT, NLON :

Definition : respectively number of latitudes and longitudes for each output (sub-)domain (corresponding respectively to the variables `NDGLG` and `NDLON` of a model grid).

Scope : arrays of integers.

Default value : It depends of the variables `CFPFMT` and `LELAM` as shown in the table 2.1 on page 12.

RLATC, RLONC :

Definition : respectively latitude and longitude of the center of each output (sub-)domain (if `CFPFMT='GAUSS'` then these variables are useless).

Scope : arrays of reals ; unit : degrees.

Default value : It depends from the variable `CFPFMT`.
If `CFPFMT='LALON'` then refer to the table 2.2 on page 12 ;
elseif `CFPFMT='LELAM'` then refer to the table 2.3 on page 13.

RDELY, RDELX :

Definition : respectively the mesh size in latitude and longitude for each output (sub-)domain (if `CFPFMT='GAUSS'` then these variables are useless).

Scope : arrays of reals ; 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 12 ;
elseif `CFPFMT='LELAM'` then refer to the table 2.3 on page 13.

NFPGUX, NFPLUX :

Definition : respectively number of geographical latitude rows and longitude rows for each output (sub-)domain (these variables are usefull only if `CFPFMT='LELAM'` : they correspond to the definition of the so-called "C+I" area while `NLAT` and `NLON` are corresponding to the area "C+I+E").

Scope : arrays of integers.

Default value : It depends from the variable `CFPDOM`. Refer to the table 2.3 on page 13.

2.2.3 NAMFPG

This namelist defines the geometry of the output subdomain(s). It is used mostly when the output geometry is a gaussian grid or a LAM grid. Default geometry is the model geometry.

Note that if you ask for the model horizontal geometry (`CFPFMT='MODEL'`), all these parameters will be reset by the program ; so you should not try to choose them yourself.

Table 2.1: Default values for `NLAT` and `NLON` according to `CFPFMT` and `LELAM`

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

Table 2.2: Default values for LAT X LON subdomains according to 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
'OCINDIEN'	67	89	-16.5	66.	1.5	1.5
'REUNION05'	61	141	-20.	65.	0.5	0.5
else - case ARPEGE	0	0	0.	0.	0.	0.
else - case ALADIN	`NDGUXG`	`NDLUXG`	computed	computed	computed	computed

Table 2.3: Default values for LAM subdomains according to the value of `CFPDOM`

CFPDOM	NLAT	NLON	RLATC	RLONC
'BELG'	61	61	50.44595488554766	4.90727841961041
'SLOV'	37	37	46.05017943078632	13.52668207859151
'MARO'	149	149	31.56059442218072	-7.00000000285346
'OPMA'	97	97	31.56059442218072	-7.00000000285346
'LACE'	181	205	46.24470063381371	16.99999999944358
'ROUM'	61	61	44.77301981937139	25.00000000483406
'FRAN'	189	189	45.31788242335041	1.27754303826285
else - case ARPEGE	169	169	46.46884540633992	2.57831063089259
else - case ALADIN	`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
'LACE'	181	205	14734.91380550296	14734.913810093
'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	`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
'LACE'	17.0	46.24470064
'ROUM'	25.0	44.77301983
'FRAN'	25.0	44.77301983
else - case ARPEGE	2.57831001	46.46884918
else - case ALADIN	`ELON0`	`ELAT0`

NFPMAX :

Definition : A truncation order which definition depends on the variable `CFPFMT` :

- If `CFPFMT='GAUSS'` it is the truncation order of the output grid.
- If `CFPFMT='LELAM'` it is the *meridional* truncation order of the output grid.
- If `CFPFMT='LALON'` it is the truncation used to filter in spectral space the post-processed fields.

Scope : array of integers. Maximum size 15 items.

Default value :

- If `CFPFMT='GAUSS'` then `NFPMAX` is computed like for a quadratic grid :
  so that `3*NFPMAX(:)+1` $\geq$ `NLON(:)`
- If `CFPFMT='LELAM'` then `NFPMAX` is computed like for a quadratic grid :
  so that `3*NFPMAX(:)+1` $\geq$ `NLAT(:)`
- If `CFPFMT='LALON'` `NFPMAX` is computed like for a quadratic grid :
  so that `3*NFPMAX(:)+1` $\geq$ `min(NLAT(:),NLON(:))`

NMFPMAX :

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

Scope : integer.

Default value : If ; else if `CFPFMT='LELAM'` then `NMFPMAX` is computed like for a quadratic grid : so that `3*NMFPMAX+1` $\geq$ `NLON(1)`

FPMUCEN, FPLOCEN :

Definition : respectively Sine of the latitude, and longitude of either the pole of interest if `CFPFMT='GAUSS'`, or the location of the observed cyclone (for bogussing purpose — refer to section 4.4 on page 44 —) if `CFPFMT='LELAM'`. This variable is useless if `CFPFMT='LALON'`.

Scope : reals ; unit : adimentional for `FPMUCEN`, and radians for `FPLOCEN`

Default value : in ARPEGE/IFS : respectively `RMUCEN` and `RLOCEN`. In ALADIN : respectively `sin(ELAT0)` and `ELON0`.

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`

NFPRGRI :

Definition : number of active points on each parallel of a gaussian grid. Used only if `CFPFMT='GAUSS'`. Reduced grids can be computed thanks to the procedure *surgery*[1].

Scope : Integer array to be filled from subscript 1 to `NLAT(i)/2` (Northern hemisphere only) : subscript 1 corresponds to row the nearest to the pole ; subscript `NLAT(i)/2` corresponds to the row the nearest to the equator. Both hemisphere are assumed to be symetric.

Default value : `NFPRGRI(1:(NLAT(1)+1)/2)=NRGRI(1:(NDGLG+1)/2)` if `NLAT(1)=NDGLG` ; else `NFPRGRI(1:NLAT(1))=NLON(1)`.

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.

NFPTTYP :

Definition : Transformation type (used to rotate or deform model fields). This variable is useless if `CFPFMT='LALON'`.

- if `NFPTTYP=1` then the pole of interest is at the North pole of the geographical Earth.
- if `NFPTTYP=2` and `CFPFMT='GAUSS'` in ARPEGE/IFS then the pole of interest is anywhere else on the geographical Earth.
- if `NFPTTYP=2` and `CFPFMT='LELAM'` in ALADIN : the cyclone is moved to the location of the observed cyclone (for bogussing purpose — refer to section 4.4 on page 44 —).

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

Default value : In ARPEGE/IFS and if `CFPFMT='GAUSS'` : `NFPTTYP=NSTTYP`. In all other cases `NFPTTYP=1`.

FPNLGINC :

Definition : non-linear grid increment. Used only if `CFPFMT='GAUSS'` to compute the value : `(NLON(1)-1)/NFPMAX(1)`.

Scope : Real value between 2. (linear grid) and 3. (quadratic grid)

Default value : `FPNLGINC=1.`

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 : It depends from the variable `CFPDOM`. Refer to the table 2.3 on page 13.

[1] http://intra.cnrm.meteo.fr/gmod/modeles/procedures/surgery.html

NFPLEV :

Definition : number of vertical levels.

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

Default value : `NFPLEV=NFLEVG`

FPVALH, FPVBH :

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

Scope : real arrays. 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). Else the program will attempt to recompute `FPVALH` and `FPVBH` to fit with `NFPLEV`, using vertical levels that may have been used in operations in the past.

FPVP00 :

Definition : Reference pressure.

Scope : real value. Unit : Pascal.

Default value : `FPVP00=VP00`.

2.3 Output files handling

2.3.1 File structure

Output files are ARPEGE/ALADIN files.

- If you ask for a gaussian grid in output (`CFPFMT='GAUSS'`) you will get a file ARPEGE.
- If you ask for a LAM grid (`CFPFMT='LELAM'`) you will get a file ALADIN.
- If you ask for LAT X LON grids (`CFPFMT='LALON'`) you will get files ALADIN with the only particularity that the output geometry is not projected.
- If you ask for the model geometry (`CFPFMT='MODEL'`) you can get either spectral or gridpoint data.

Notice : to plot LAM or LAT X LON grids you can use the graphic procedure *chagal*[2].

2.3.2 File name

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]http://www.cnrm.meteo.fr/aladin/concept/Chagal0.html

2.3.3 File content

To read a field in an output file, you have to specify through the subroutine `FACILE` the name of the field you wish to get.

For a "surface" field, this name is the ARPEGE field name that has been defined in the namelist `NAMFPC` ; it is a string of 16 characters.

For an upper air field, this name is also the ARPEGE field name that has been defined in the namelist `NAMFPC` (string of 12 characters), but furthermore, you must specify the kind of post-processing level ("prefix" of the field) and the value of this level. There are 5 possibilities, according to the level type as shown in the table 2.4 on page 17.

Table 2.4: Prefix, unit and number of letters to write upper air 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
Eta	`S`	-	3

Example : temperature at 2 PVU is `V020TEMPERATURE`

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 Spectral fit on dynamic fields

If you wish to post-process surface dynamic fields or upper air dynamic fields on pressure levels, potential temperature levels or potential vorticity levels, it is possible to perform a spectral fit between the vertical interpolations and the horizontal interpolations. The spectral fit will remove the nemerical noise which has been generated by the vertical interpolation and which is beyond the model truncation.

LFITP :

> **Definition** : Spectral fit of post-processed fields on pressure levels.
>
> **Scope** : Boolean.
>
> **Default value** : `.TRUE.`
>
> **Namelist location** : `NAMFPC`

LFITT :

> **Definition** : Spectral fit of post-processed fields on potential temperature levels.
>
> **Scope** : Boolean.
>
> **Default value** : `.FALSE.`
>
> **Namelist location** : `NAMFPC`

LFITV :

> **Definition** : Spectral fit of post-processed fields on potential vorticity levels.
>
> **Scope** : Boolean.
>
> **Default value** : `.FALSE.`
>
> **Namelist location** : `NAMFPC`

LFIT2D :

> **Definition** : Spectral fit of 2D post-processed fields.
>
> **Scope** : Boolean.
>
> **Default value** : `.TRUE.`
>
> **Namelist location** : `NAMFPC`

Notice :

- If you wish to post-process upper air dynamic fields on height levels or hybrid levels, it is not possible to apply such spectral fit because the horizontal interpolations are performed *before* the vertical interpolation in order to respect the displacement of the planetary boundary layer.
- If you post-process dynamic fields which are not represented by spectral coefficients in the model, then these fields will not be spectrally fitted, even if the corresponding key `LFIT`xx is `.TRUE.` In the same way, if you post-process a specific dynamic field which is represented by spectral coefficients in the model, then this field will be spectrally fitted whenever the corresponding key `LFIT`xx is `.TRUE.`. However it is possible to change the native representation of a field : refer to section 3.3.1 on page 30.

3.1.2 Tuning of the spectral filters

Several fields can be smoothed via tunable filters activated in spectral space (refer to appendix A.4 on page 61 for the formulation of these filters). These parameters are contained in the specific namelist `NAMFPF`.

LFPBED, RFPBED :

> **Definition** : Respectively switch and intensity of the filter on the so-called "derivative" fields, that is : horizontal derivatives or those which are build after horizontal derivatives (absolute and relative vorticites, divergence, vertical velocity, stretching and shearing deformations, potential vorticity and all fields interpolated on potential vorticity levels).
>
> **Scope** : Respectively boolean and real. Unit : adimensional
>
> **Default value** : `LFPBED=.TRUE.` ; `RFPBED`≈3.08[1] in ARPEGE/IFS, `RFPBED`=6. in ALADIN.

NFMAX :

> **Definition** : Truncation threshold of each (sub-)domain for the filter on the so-called "derivative" fields (used only in ARPEGE/IFS if the model is stretched).
>
> **Scope** : Integer array. Maximum size : 15 items.
>
> **Default value** : If `CFPFMT='GAUSS'` then `NFMAX(1)=NFPMAX(1)*FPSTRET`.
> Else if `CFPFMT='MODEL'` then `NFMAX(1)=NFPMAX(1)*FPSTRET` *which means that the fields will never be filtered.*
> Else `NFPMAX` is computed like for a quadratic grid :
> so that `3*NFMAX(:)+1` $\geq$ `min(NLAT(:),NLON(:))`

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

LFPBEG, RFPBEG :

Definition : Respectively switch and intensity of the filter on geopotential.

Scope : Respectively boolean and real. Unit : adimensional

Default value : `LFPBEG=.TRUE.` ; `RFPBEG`=4. in ARPEGE/IFS, `RFPBEG`=6. in ALADIN.

LFPBET, RFPBET :

Definition : Respectively switch and intensity of the filter on temperature.

Scope : Respectively boolean and real. Unit : adimensional

Default value : `LFPBET=.TRUE.` ; `RFPBET`=4. in ARPEGE/IFS, `RFPBET`=6. in ALADIN.

LFPBEP, RFPBEP :

Definition : Respectively switch and intensity of the filter on medium sea level pressure.

Scope : Respectively boolean and real. Unit : adimensional

Default value : `LFPBEP=.TRUE.` ; `RFPBEP`=4. in ARPEGE/IFS, `RFPBEP`=6. in ALADIN.

LFPBEH, RFPBEH :

Definition : Respectively switch and intensity of the filter on relative humidity.

Scope : Respectively boolean and real. Unit : adimensional

Default value : `LFPBEH=.TRUE.` ; `RFPBEH`=4. in ARPEGE/IFS, `RFPBEH`=6. in ALADIN.

Notice :

- Only one filter can be appled to a given field ; consequently, in case of ambiguity in the choice of filter (example : geopotential on an iso-PV surface), only the "derivative" filter is applied.
- Filters are applied even if the post-processed fields should be represented in spectral coefficients.

3.1.3 Climatology

In horizontal interpolations the usage of auxilary climatology data improves the accuracy of the upper air fields when interpolated on surface-dependent levels, and of several surface fields. Appendix A.3 on page 60 explains how to make such files.

NFPCLI :

Definition : Usage level for climatology data :

- if `NFPCLI`=0 climatology data are not used.
- if `NFPCLI`=1 the horizontal interpolations use the surface geopotential and the land-sea mask of a target climatology file. In this case the climatology file name in the local script should be : "`const.clim.CFPDOM`*(i)*" where i is the (sub-)domain subscript.
- if `NFPCLI`=3 the horizontal interpolations use a larger set of climatology surface fields, including constant and monthly values. In this case two climatology files are used : one with the source geometry and one with the target geometry. 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.

The table 3.1 on page 21 lists the climatology fields read in function of the namelist keys.

Scope : Integer which value can be only 0, 1 or 3.

Default value : `NFPCLI`=0

Namelist location : `NAMFPC`

Table 3.1: Climatology fields read in function of the namelist keys.

Field	Namelist keys
surface geopotential	NFPCLI $\geq$ 1
land-sea mask	NFPCLI $\geq$ 1 and (LMPHYS or LEPHYS)
surface temperature	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
relative surface wetness	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
deep soil temperature	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
relative deep soil wetness	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
snow depth	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
albedo	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
emissivity	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
standard deviation of surface geopotential	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
percentage of vegetation	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
roughness lenth	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
anisotropy coefficient of topography	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
direction of the main axis of topography	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
type of vegetation	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
minimum stomatal resistance	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
percentage of clay	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
percentage of sand	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
root depth	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
leaf area density	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
thermal roughness length	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS)
surface snow albedo	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS) and LVGSN
surface snow density	NFPCLI $\geq$ 3 and (LMPHYS or LEPHYS) and LVGSN

RFPCORR :

Definition : critical difference of surface geopotential between the model and the source climatology in order to correct surface temperature through the standard vertical profile.

Scope : Real. Unit : J/kg

Default value : 300.*g

Namelist location : `NAMFPC`

RFPCSAB :

Definition : Critical difference of sand percentage between the model and the 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 depth between the model and the source climatology in order to compute the relative soil moisture.

Scope : Real. Unit : m.

Default value : 0.001 m.

Namelist location : `NAMFPC`

LFPMOIS :

Definition : Month selected while using climatology data (used only if `NFPCLI` *ge* 3) :

- if `LFPMOIS= .FALSE.` then the month is the one of the model (forecast).
- if `LFPMOIS=.TRUE.` then the month is the one of the input initial file. This option should lead to less accurate fields but it enables in-line post-processing[2].

Scope : Boolean.

Default value : `.FALSE.`

Namelist location : `NAMFPC`

3.1.4 Optional pronostic fields

The model is able to run with optional pronostic fields. These fields would be interpolated by the post-processing if they are declared as *present* in the model. But if they are not, then the post-processing would create and fullfill them as it can.

NFPASS :

Definition : Number of spectral passive scalars in the model.

Scope : Integer between 0 and 5

Default value : 0

Namelist location : `NAMDIM`

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

LNHDYN :

Definition : Control of the non-hydrostatic model ; if `LNHDYN=.TRUE.` then pressure departure and vertical divergence fields are read in and thus interpolated. Else pressure departure and vertical divergence are created. Pressure departure field is then fullfilled with zero, while vertical divergence is diagnosed.

Scope : Boolean. To run the model with this option you need the ALADIN software.

Default value : `.FALSE.`

Namelist location : `NAMCT0`

LSPQ, LGPQ :

Definition : Respectively spectral and gridpoint atmospheric specific humidity represented as pronostic variable in the model.

Scope : Boolean. Possible values : any pair of booleans except `(.TRUE.,.TRUE.)`

Default value : if `LECMWF=.TRUE.` then `(LSPQ,LGPQ)=(.FALSE.,.TRUE.)`.
Else `(LSPQ,LGPQ)=(.TRUE.,.FALSE.)`.

Namelist location : `NAMDIM`

LSPL, LGPL :

Definition : Respectively spectral and gridpoint atmospheric liquid water represented as pronostic variable in the model.

Scope : Boolean. Possible values : any pair of booleans except `(.TRUE.,.TRUE.)`

Default value : if `LECMWF=.TRUE.` then `(LSPL,LGPL)=(.FALSE.,.TRUE.)`.
Else `(LSPL,LGPL)=(.FALSE.,.FALSE.)`.

Namelist location : `NAMDIM`

LSPI, LGPI :

Definition : Respectively spectral and gridpoint atmospheric solid water (ice) represented as pronostic variable in the model.

Scope : Boolean. Possible values : any pair of booleans except `(.TRUE.,.TRUE.)`

Default value : if `LECMWF=.TRUE.` then `(LSPI,LGPI)=(.FALSE.,.TRUE.)`.
Else `(LSPI,LGPI)=(.FALSE.,.FALSE.)`.

Namelist location : `NAMDIM`

LSPA, LGPA :

Definition : Respectively spectral and gridpoint cloud fraction represented as pronostic variable in the model.

Scope : Boolean. Possible values : any pair of booleans except `(.TRUE.,.TRUE.)`

Default value : if `LECMWF=.TRUE.` then `(LSPA,LGPA)=(.FALSE.,.TRUE.)`.
Else `(LSPA,LGPA)=(.FALSE.,.FALSE.)`.

Namelist location : `NAMDIM`

LSPO3, LGPO3 :

Definition : Respectively spectral and gridpoint ozone mixing ratio represented as pronostic variable in the model.

Scope : Boolean. Possible values : any pair of booleans except (.TRUE.,.TRUE.)

Default value : (.FALSE.,.FALSE.).

Namelist location : NAMDIM

3.1.5 Adiabatic post-processing

To run the post-processing in the adiabatic model, you should carefully remove the physical fields from the model, by setting the following variables in namelists :

```
/NAMPHY
   LSOLV=.FALSE.,
   LFGEL=.FALSE.,
   LFGELS=.FALSE.,
   LMPHYS=.FALSE.,
   LNEBN=.FALSE.,
/END
/NAMDPHY
   NVSO=0,
   NVCLIV=0,
   NVRS=0,
   NVSF=0,
   NVSG=0,
   NCSV=0,
   NVCLIN=0,
   NVCLIP=0,
/END
```

3.1.6 Horizontal interpolations

It is possible to control the kind of horizontal interpolations, for dynamic fields on one side, and for physical fields and fluxes on the other side :

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

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, even when any ISBA field is requested.

3.1.7 The problem of lakes and islands

When the output resolution is so that a single gridpoint lake or island is created, the horizontal interpolations taking into account the land/sea nature will not work properly since no neighbouring points will be of the same nature as the target point ; hence all the neighbouring points will be used in the interpolation process. This can lead to irrealistic temperatures or water contents. To avoid this, an alternative option has been developped :

LFPLAKE :

Definition : Special treatment for lake and islands ; when it is set to `.TRUE.` the surface and deep soil temperatures and water contents will be modified as follows :

- values on isolated lakes or islands gridpoint created by the interpolations will be overwritten by the climatology data
- values on any lake gridpoint, *as identified by the climatology*, will be overwritten by the climatology data (to improve the existing quality of the climatology data over lakes, when it is possible)

Scope : Boolean.

Default value : `.FALSE.`

Namelist location : `NAMFPC`

Notice: the positive impact of the feature still need be proved.

3.1.8 Computation of CAPE

The computation of the Convective Available Potential Energy (CAPE) is widely tunable :

NFPCAPE :

Definition : Kind of computation :

- `NFPCAPE=1` : computation starts from the lowest model level
- `NFPCAPE=2` : computation starts from the most unstable model level
- `NFPCAPE=3` : computation starts from the recomputed temperature and relative moisture at 2 meters
- `NFPCAPE=4` : computation starts from the analysed temperature and relative moisture at 2 meters

Scope : Integer which value can be only 1,2 3 or 4.

Default value : 2

Namelist location : `NAMFPC`

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 : Depth of layer above the ground in which most unstable parcel is searched for (used with `NFPCAPE=2` only).

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`

3.1.9 Miscellaneous

LFPQ :

Definition : To control the interpolation of relative versus specific humidity on height or *eta* levels. Relative humidity is considered to have better conservative properties through interpolations than mixing ratio, even if it is not a conservative quantity. If `LFPQ=.FALSE.` the relative humidity is interpolated then the specific humidity is deducted. If `LFPQ=.TRUE.` the specific humidity is interpolated then the relative humidity is deducted.

Scope : Boolean.

Default value : `.FALSE.` (this is the recommended value).

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=.TRUE.` then `RFPVCAP`=8900. Pa ; else `RFPVCAP`=15000. Pa

Namelist location : `NAMFPC`

NDLNPR :

Definition : Discretization of $\delta(\ln p)$. Set `NDLNPR`=1 to adopt the proper discretization to conform the non-hydrostatic model or whenever you post-process on "non-hydrostatic" field (pressure departure, vertical divergence or true vertical velocity). orticity levels.

Scope : Integer which value can be only 0 or 1.

Default value : 1

Namelist location : `NAMDYN`

3.2 Optimizing the performance

NPROMA :

Definition : working length of the model data rows. Refer to appendix A.5.2 on page 64 for more information.

Scope : positive or negative integer but not zero nor a power of 2, and limited (in absolute value) to the biggest helpful value (ie : the number of model gridpoints in the current processor). When it is negative the absolute value is used ; when it is positive the program will try to increase it in the limit of 10 % in an attempt to improve even more the optimization.

Default value : if `LECMWF=.TRUE.` then `NPROMA`=2047, else `NPROMA`=67.

Namelist location : `NAMDIM`

NFPROMAG :

Definition : working length of the post-processing data rows. Refer to appendix A.5.2 on page 64 for more information.

Scope : positive integer but not zero nor a power of 2, and limited to the biggest helpful value (ie : the number of post-processing gridpoints in the current processor).

Default value : internally computed as the mean of the helpful values gathered among all processors.

Namelist location : `NAMFPSC2`

NFPROMEL :

Definition : working length of the post-processed extension zone data rows. Refer to appendix A.5.2 on page 64 for more information.

Scope : positive integer but not zero nor a power of 2, and limited to the biggest helpful value (ie : the number of gridpoints in the post-processed extension zone of the current processor).

Default value : internally computed as the biggest helpful value.

Namelist location : `NAMFPEZO`

NPROC :

Definition : Number of processors used for the distribution per nodes.

Scope : Integer between 1 and the maximum number of processors of the machine.

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

Namelist location : `NAMPAR0`

LMPOFF :

Definition : Control of message passing libraries. Set `LMPOFF=.TRUE.` to avoid entering message passing subroutines when `NPROC=1`.

Scope : Boolean.

Default value : `.FALSE.`

Namelist location : `NAMPAR0`

NPRTRW, NPRTRV :

Definition : Numbers of processors used respectively for the waves distribution and the vertical distribution in spectral space.

Scope : Integers greater than zero and so that `NPRTRW*NPRTRV=NPROC`. For the time being the vertical distribution is not working, so (`NPRTRW,NPRTRV`) must be (`NPROC,1`).

Default value : 0 (So these parameters *must* be set explicitely !)

Namelist location : `NAMPAR0`

NPRGPNS, NPRGPEW :

Definition : Numbers of processors used respectively for the North-South and East-West gridpoint distributions.

Scope : Integers greater than zero and so that `NPRGPNS*NPRGPEW=NPROC`.
For the time being the East-West distribution is not working in ARPEGE/ALADIN, so (`NPRGPNS,NPRGPEW`) must be (`NPROC,1`).

Default value : 0 (So these parameters *must* be set explicitely !)

Namelist location : `NAMPAR0`

NSTRIN, NSTROUT :

Definition : Numbers of processors used respectively for unpacking input data from file and for packing output data to file.

Scope : Integers between 1 and `NPROC`. The best performance in ARPEGE/ALADIN is obtained with `NSTRIN=NPROC` and `NSTROUT`$\approx$`NPROC`/2.

Default value : if `LECMWF=.TRUE.` then (`NSTRIN,NSTROUT`)=(`1,0`).
Else (`NSTRIN,NSTROUT`)=(`NPROC,1`).

Namelist location : `NAMPAR1`

NSTREFP :

Definition : Number of processors used for the distribution of the post-processed extension zone (for LAM outputs only).

Scope : Integer between 1 and `NPROC`.

Default value : 1

Namelist location : `NAMFPEZO`

LSPLIT :

Definition : Control of latitude row splitting. set `LSPLIT=.TRUE.` to improve the balance of distribution.

Scope : Boolean. This option does not work in ALADIN (`LSPLIT` must be `.FALSE.`).

Default value : `.TRUE.`

Namelist location : `NAMPAR1`

NFPXFLD :

Definition : Chunk size of global fields while gathering the post-processed distributed fields before writing out to output files. Refer to appendix A.5.1 on page 64 for more information.

Scope : Integer greater than zero and limited to the biggest helpful value (ie : the number of post-processed fields).

Default value : internally computed as the biggest helpful value.

Namelist location : `NAMFPIOS`

3.3 Output fields conditioning

3.3.1 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 generic identificator (there is one variable per dynamic field).

Default value : Refer to appendix A.1 on page 51 for upper air fields, and to appendix A.1.1 on page 53 for 2D fields.

Namelist location : `NAMAFN`

LFITS :

Definition : Spectral fit of post-processed fields on eta levels. This key is active *only* if `CFPFMT='MODEL'` (ie : spectral coefficients in output). Setting `LFITS=.FALSE.` enables to write out all upper air dynamic fields in gridpoints.

Scope : Boolean. This key is getting obsolescent.
Better use the individual keys `TFP_{*}%LLGP`.

Default value : `.TRUE.`

Namelist location : `NAMFPC`

3.3.2 Encoding data in output file

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`

NB{*} :

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

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

Default value : Refer to appendix A.1.2 on page 54. 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 generic identificator (there is one variable per dynamic field)

Default value : Refer to appendix A.1 on page 51 for upper air fields, and to appendix A.1.1 on page 53 for 2D fields. Notice : surface geopotential should not be packed in the model in order to keep consistency between spectral and gridpoint orography.

Namelist location : `NAMAFN`

NFPGRIB :

Definition : GRIB level for fields encoding in the post-processing ARPEGE/ALADIN files :

- NFPGRIB=0 : no packing at all. This value has priority over the numbers of bits for packing.
- NFPGRIB=1 : standard GRIB encoding.
- NFPGRIB=2 : a modified GRIB encoding for ARPEGE/ALADIN files.

Refer to the documentation on the ARPEGE/ALADIN files for more information (available in french[3] or in english[4]).

Scope : Integer between 0 and 2.

Default value : 2

Namelist location : `NAMFPC`

[3]http://intra.cnrm.meteo.fr/gmod/modeles/Tech/fa/synopsis.html
[4]http://intra.cnrm.meteo.fr/gmod/modeles/Tech/fa/manual.html

3.3.3 Customized complexions

NCADFORM :

Definition : Auto-documentation format for the ALADIN files : set `NCADFORM=0` for the EGGX new style format and `NCADFORM=1` for the EGGX old style format.

Scope : Integer which value can be only 0 or 1.

Default value : 0

Namelist location : `NAMOPH`

LFPRH100 :

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

Scope : Boolean.

Default value : `LFPRH100=LECMWF`

Namelist location : `NAMFPC`

LFPLOSP :

Definition : Representation of surface pressure : set `LFPLOSP=.TRUE.` to fill surface pressure with its logarithm.

Scope : Boolean.

Default value : if `LECMWF=.TRUE.` then `LFPLOSP=.FALSE.` ; else `LFPLOSP=.FALSE.` except for the so-called configurations ((e)e)927 (See chapter 4 on page 39).

Namelist location : `NAMFPC`

3.4 Selective namelists

In normal use, at each post-processing time step all the post-processing fields are written out at all post-processing levels and for all output (sub-)domains. However it is possible to specify a more selective list of fields to write out, by choosing for each field the exact list of post-processing levels, and for each post-processing level of each field the exact list of (sub-)domains.

This is achieved by filling a specific namelist file currently named the *selection file*. In the local script the selection file should write : "`xxt`*DDDD*HH*MM*" where *DDDD*, HH and *MM* specify respectively the day (on 4 digits), the hour (on 2 digits) and the minute (on 2 digits) of the forecast. Furthermore in the local script the working directory should contain a file named `dirlst` listing the content of the working directory (as generated by the command `%ls`.
The selection files should contain the following namelist blocks :

1. `NAMFPPHY`
2. `NAMFPDY2`
3. `NAMFPDYP`
4. `NAMFPDYH`
5. `NAMFPDYV`
6. `NAMFPDYT`
7. `NAMFPDYS`

Finally the following variables should be documented :

CNPPATH :

Definition : directory where the selection files stand.

Scope : string of 120 characters.

Default value : blank string (no selection files)

Namelist location : `NAMCTO` in the namelist file.

CLPHY :

Definition : selected physical fields names.

Scope : array of 16 characters, maximum size : 328 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 *(10 + 1))-1) characters. Maximum size : 328 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 : 63 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 *(10 + 1))-1) characters. Maximum size : 63 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 : 63 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 *(10 + 1))-1) characters. Maximum size : 63 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 : 78 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 *(10 + 1))-1) characters. Maximum size : 78 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 : 98 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 and `NAMFPDYS` for *eta* 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 : 98 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 and `NAMFPDYS` for *eta* 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 *(10 + 1))-1) characters. Maximum size : (200 , 78) 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 and `NAMFPDYS` for *eta* levels. All in the selection file.

Appendix A.2 on page 58 shows an example of selection file.

3.5 Miscellaneous

3.5.1 Customization of names

CN{*} :

Definition : ARPEGE/ALADIN field names for each surface fields or fluxes.

Scope : String of 16 characters. "{*}" represents the field generic identificator (there is one variable per field).

Default value : Refer to appendix A.1.2 on page 54.

Namelist location : `NAMAFN`

TFP_{*}%CLNAME :

Definition : ARPEGE/ALADIN field names for dynamic fields.

Scope : String of 16 characters. "{*}" represents the field generic identificator (there is one variable per field). However the string length is limited to 12 characters for upper air fields.

Default value : Refer to appendix A.1 on page 51 for upper air fields, and to appendix A.1.1 on page 53 for 2D fields.

Namelist location : `NAMAFN`

CFPDIR :

Definition : Prefix of the output files names.

Scope : String of 180 characters. for instance you can set a UNIX path.

Default value : `'PF'`

Namelist location : `NAMFPC`

LINC :

Definition : Control of the time stamp of the output files names : `.TRUE.` to write the stamp in hours, `.FALSE.` to write it in time steps.

Scope : Boolean.

Default value : `.FALSE.`

Namelist location : `NAMOPH`

3.5.2 Traceback

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`

NPRINTLEV :

Definition : verboose option for the listing.

Scope : Integer between 0 (minimum prints) and 2 (maximum prints).

Default value : 0

Namelist location : `NAMCTO`

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 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

The family of configurations 927

4.1 What it is

The "configuration 927" is the way how to use *FullPos* to change the geometry and/or the resolution of a history spectral file. Actually, it is not a true configuration of the software ARPEGE/IFS/ALADIN, since the parameter `NCONF` should remain equal to 1 ; let us rather call it a configuration of the post-processing. In such configuration the horizontal interpolations are performed systematically before the vertical interpolations, and the dynamic variables are (usually) written out as spectral coefficients in the target spectral geometry[1].
As shown in the fancy picture 4.1 on page 40,

- Configuration "927" is to make a file ARPEGE, starting from a file ARPEGE (mostly used to change the resolution, the stretching and the pole of stretching in the 4D-Var suite),
- Configuration "E927" is to make a file ALADIN, starting from a file ARPEGE (for coupling ALADIN to ARPEGE),
- Configuration "EE927" is to make a file ALADIN, starting from a file ALADIN (for ALADIN nesting)

4.2 How it works

The configurations 927 are working only off-line[2].

Such "configurations" are activated through a specific key :

LFPSPEC :

Definition : Control of the configuration 927. Set `LFPSPEC=.TRUE.` to activate the process.

Scope : Boolean.

Default value : `.FALSE.`

Namelist location : `NAMFPC`

[1]It is the change of spectral geometry which makes this configuration so special in the context of the software state

[2]Out of the direct model integration

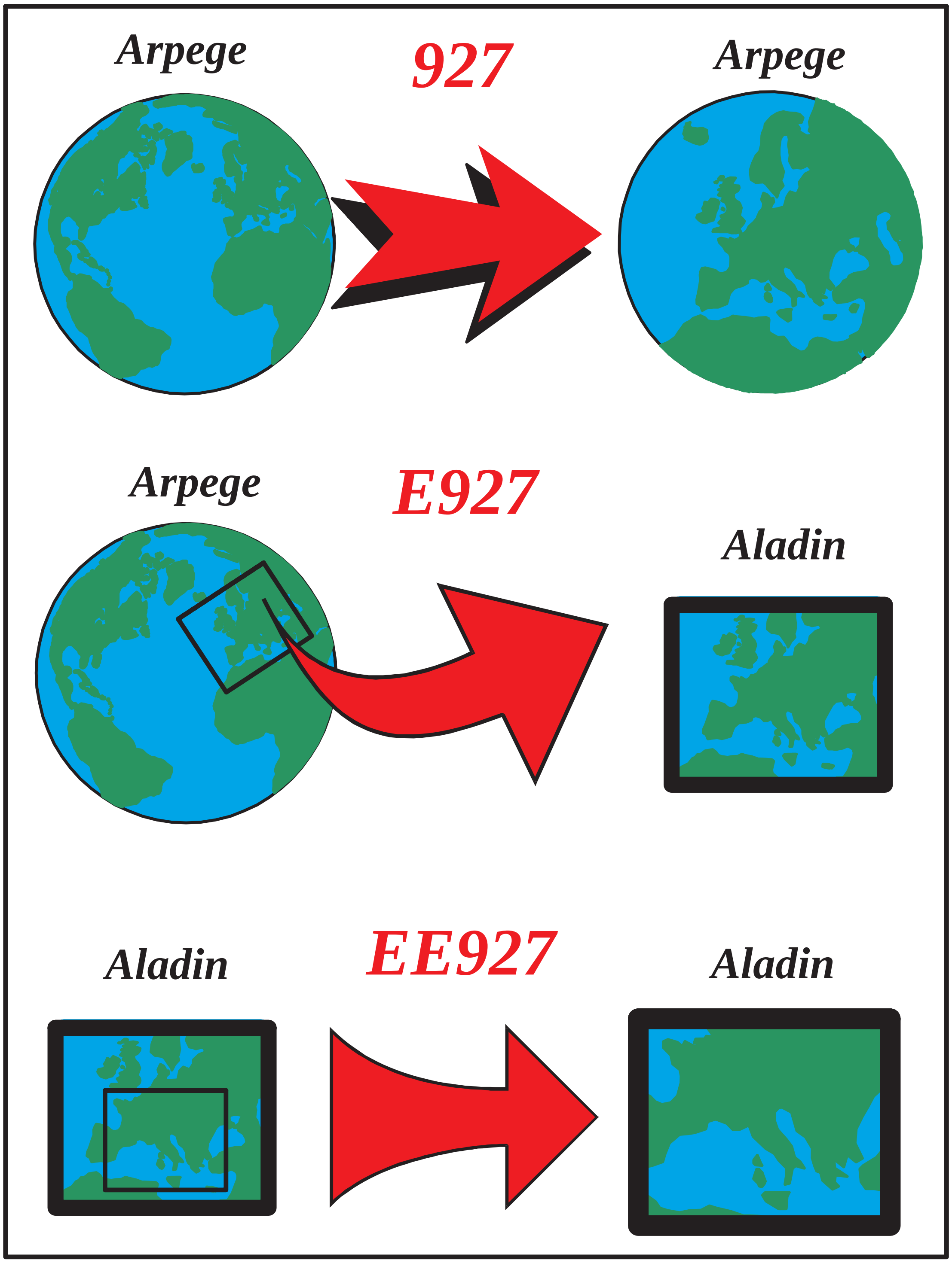

Figure 4.1: The configuration 927, E927 and EE927

Notice :

- To run the configuration 927 (arpege to arpege) you have to run the *model* ARPEGE.
- To run the configuration E927 (arpege to aladin) you have to run the *model* ARPEGE (setting `LELAM=.FALSE.` or `-m arpifs` in command line) with the *software* ALADIN
- To run the configuration EE927 (aladin to aladin) you have to run the *model* ALADIN

Warning ! The configurations 927 create a working file named 'ncf927'. If your script contains executions of configurations 927 inside a loop, then this file should be deleted before the beginning of each iteration.

4.3 Namelists parameters

The recommended namelists parameters to set for the configuration 927 are the following :

```
/NAMCT0
   LFPOS=.T.,
   NPRINTLEV=1, (verboosity)
   NOPGMR=0, LSIDG=.F., (memory savings)
   NSPPR=0, (CPU savings)
/END
&NAMCT1
   N1HIS=0, (no history file in output)
   LRFILAF=.F., (I/O savings)
/END
/NAMINI
   NEINI=0, (no initialization on input data)
/END
&NAMFA
  NSTRON=-1, NBITPG=16, (proper file encoding)
/END
/NAMAFN (Let this namelist empty)
/END
/NAMFPC
   LTRACEFP=.TRUE.,
   LFPSPEC=.T.,
   CFPFMT='GAUSS',
   NFPCLI=3,
   LFPMOIS=.FALSE.,
   CFP3DF(1)='TEMPERATURE',
   CFP3DF(2)='FONC.COURANT',
   CFP3DF(3)='POT.VITESSE',
   CFP3DF(4)='HUMI.SPECIFIQUE',
   CFP2DF(1)='SURFPRESSION',
   CFP2DF(2)='SPECSURFGEOPOTENTIEL',
   CFPPHY(1)='SURFTEMPERATURE',
   CFPPHY(2)='PROFTEMPERATURE ',
   CFPPHY(3)='PROFRESERV.EAU  ',
   CFPPHY(4)='SURFRESERV.NEIGE',
   CFPPHY(5)='SURFRESERV.EAU  ',
```

```
   CFPPHY(6)='SURFZ0.FOIS.G   ',
   CFPPHY(7)='SURFALBEDO      ',
   CFPPHY(8)='SURFEMISSIVITE  ',
   CFPPHY(9)='SURFET.GEOPOTENT',
   CFPPHY(10)='SURFIND.TERREMER',
   CFPPHY(11)='SURFPROP.VEGETAT',
   CFPPHY(12)='SURFVAR.GEOP.ANI',
   CFPPHY(13)='SURFVAR.GEOP.DIR',
   CFPPHY(14)='SURFIND.VEG.DOMI',
   CFPPHY(15)='SURFRESI.STO.MIN',
   CFPPHY(16)='SURFPROP.ARGILE',
   CFPPHY(17)='SURFPROP.SABLE',
   CFPPHY(18)='SURFEPAIS.SOL',
   CFPPHY(19)='SURFIND.FOLIAIRE',
   CFPPHY(20)='SURFRES.EVAPOTRA',
   CFPPHY(21)='SURFGZ0.THERM',
   CFPPHY(22)='SURFRESERV.INTER',
   CFPPHY(23)='PROFRESERV.GLACE',
   CFPPHY(24)='SURFRESERV.GLACE',
   NRFP3S=1,2,3,4,5,6,7,8,9,10,11,12, ... (fill it up to NFPLEV)
/END
/NAMFPD
   NLAT= (fill it yourself)
   NLON= (fill it yourself)
/END
/NAMFPG
   FPMUCEN= (fill it yourself)
   FPLOCEN= (fill it yourself)
   NFPHTYP= (fill it yourself)
   NFPRGRI= (fill it yourself if NFPHTYP=2)
   FPSTRET= (fill it yourself)
   NFPTTYP= (fill it yourself)
   NFPMAX= (fill it yourself)
   NFPLEV= (fill it yourself)
   FPVALH= (fill it yourself)
   FPVBH= (fill it yourself)
/END
```

The recommended namelists parameters to set for the configuration E927 or EE927 are the following :

```
/NAMCT0
   LFPOS=.T.,
   NPRINTLEV=1, (verboosity)
   NOPGMR=0, LSIDG=.F., (memory savings)
   NSPPR=0, (CPU savings)
/END
&NAMCT1
   N1HIS=0, (no history file in output)
   LRFILAF=.F., (I/O savings)
```

```
/END
/NAMINI
   NEINI=0, (no initialization on input data)
/END
&NAMFA
  NSTRON=-1, NBITPG=18, (proper file encoding)
/END
/NAMAFN
   TFP_U%CLNAME='WIND.U.PHYS',
   TFP_V%CLNAME='WIND.V.PHYS',
/END
/NAMFPC
   LTRACEFP=.TRUE.,
   LFPSPEC=.T.,
   CFPFMT='GAUSS',
   NFPCLI=3,
   LFPMOIS=.FALSE.,
   CFP3DF(1)='TEMPERATURE',
   CFP3DF(2)='FONC.COURANT',
   CFP3DF(3)='POT.VITESSE',
   CFP3DF(4)='HUMI.SPECIFIQUE',
   CFP2DF(1)='SURFPRESSION',
   CFP2DF(2)='SPECSURFGEOPOTENTIEL',
   CFPPHY(1)='SURFTEMPERATURE',
   CFPPHY(2)='PROFTEMPERATURE ',
   CFPPHY(3)='PROFRESERV.EAU  ',
   CFPPHY(4)='SURFRESERV.NEIGE',
   CFPPHY(5)='SURFRESERV.EAU  ',
   CFPPHY(6)='SURFZ0.FOIS.G   ',
   CFPPHY(7)='SURFALBEDO      ',
   CFPPHY(8)='SURFEMISSIVITE  ',
   CFPPHY(9)='SURFET.GEOPOTENT',
   CFPPHY(10)='SURFIND.TERREMER',
   CFPPHY(11)='SURFPROP.VEGETAT',
   CFPPHY(12)='SURFVAR.GEOP.ANI',
   CFPPHY(13)='SURFVAR.GEOP.DIR',
   CFPPHY(14)='SURFIND.VEG.DOMI',
   CFPPHY(15)='SURFRESI.STO.MIN',
   CFPPHY(16)='SURFPROP.ARGILE',
   CFPPHY(17)='SURFPROP.SABLE',
   CFPPHY(18)='SURFEPAIS.SOL',
   CFPPHY(19)='SURFIND.FOLIAIRE',
   CFPPHY(20)='SURFRES.EVAPOTRA',
   CFPPHY(21)='SURFGZ0.THERM',
   CFPPHY(22)='SURFRESERV.INTER',
   CFPPHY(23)='PROFRESERV.GLACE',
   CFPPHY(24)='SURFRESERV.GLACE',
   NRFP3S=1,2,3,4,5,6,7,8,9,10,11,12, ... (fill it up to NFPLEV)
/END
```

```
/NAMFPD
   NLAT= (fill it yourself)
   NLON= (fill it yourself)
   RLATC= (fill it yourself)
   RLONC= (fill it yourself)
   RDELX= (fill it yourself)
   RDELY= (fill it yourself)
   NFPLUX= (fill it yourself)
   NFPGUX= (fill it yourself)
/END
/NAMFPG
   FPLONO= (fill it yourself)
   FPLATO= (fill it yourself)
   NFPMAX= (fill it yourself)
   NMFPMAX= (fill it yourself)
   NFPLEV= (fill it yourself)
   FPVALH= (fill it yourself)
   FPVBH= (fill it yourself)
/END
```

Furthermore, if you intend to make a non-hydrostatic history file, you should add the following parameters :

```
/NAMCTO
   LNHDYN= (.TRUE. or .FALSE. depending whether your input file is hydrostatic or not)
/END
/NAMDYN
   NDLNPR=1,
/END
/NAMFPC
   CFP3DF(5)='PRESS.DEPART',
   CFP3DF(6)='VERTIC.DIVER',
/END
```

4.4 Bogussing

A procedure has been developped in order to try and improve the forecast of tropical cyclone in ARPEGEALADIN : it is called "bogussing", or "configuration 927E". This configuration is working in 3 steps :

1. Bogussing of ALADIN : a configuration EE927 is run in adiabatic mode with translation activated to move the model cyclone (actually the minimum of surface pressure in the model) to the observed location (refer to `NFPTTYP`, `FPMUCEN` and `FPLOCEN`). In order not to translate the orography, one should first lower the orography to zero, then translate, and finally re-set the original orography.

2. ARPEGE background : this is a file ARPEGE which should contain the fields of a given ARPEGE history file, all in gridpoint representation. Furthermore the surface pressure should be the true one, not its logarithm. This file aims to be used for the third step :

3. Bogussing of ARPEGE : this configuration is a kind of "reverse configuration E927" : starting from the ARPEGE background file and the ALADIN bogussed file, a new ARPEGE file is build, containing the local translation of fields in the vicinity of the tropical cyclone.

To run this configuration 927E (aladin to arpege) you have to run the model ALADIN (setting `LELAM=.TRUE.` or `-m aladin` in command line) with the namelist of a configuration 927 in adiabatic mode and with the incremental process as described below :

NFPINCR :

Definition : Control of incremental post-processing. Set `NFPINCR`=1 to activate the incremental process.

Scope : Integer which value can be only 0 or 1.

Default value : 0

Namelist location : `NAMFPC`

You will have also to provide 3 input files :

ELSCF${CNMEXP(1:4)}ALBC : the ALADIN file before bogussing

ICMSH${CNMEXP(1:4)}INIT : the ALADIN bogussed file

BGPX${CNMEXP(1:4)}${CFPDOM} : the ARPEGE background file

Remark : this "incremental" process can be considered like the "tangent linear post-processing of the poor", as it does not really works on incrents ...

Chapter 5

Expert usage

Once you have a good knowledge of *FullPos* , you can tune various parameters of namelists as you wish, combine scripts, and even modify the code.
This section will shortly describe some examples of clever use of the software.

5.1 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, targetting 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.

5.2 Derivatives on model levels

If you try to postprocess derivatives on *eta* 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), 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 the configurations 927), then to post-process on the new "model" grid (`CFPFMT='MODEL'` and `LFITS=.FALSE.`).

Unfortunately this does not work if the target geometry is LAT X LON ! In this case you have to trick the software so that the field you wish to interpolate will be considered as a passive scalar field ; this can be achieved in two steps :

1. You should create a history file with the supplementary fields you wish to interpolate ; this can be achieved either by running a configuration of the kind "927" in which namelist you will request the supplementary fields, or by running a normal post-processing job in the model geometry (`CFPFMT='MODEL'`) and using the "appending fields" trick (refer to the previous section).

2. If they are spectral you can post-process your supplementary fields as model passive scalar fields (setting `NFPASS` and the field descriptors `TFP_SCVA()`). Else you can still trick the software by activating the pronostic field for gridpoint cloud fraction (setting `(LGPA=.TRUE.)`) and feeding the cloud fraction with one of your supplementary field through a proper setting of TFP_CLF%CLNAME. Notice : this is possible only because there is — by "chance" ! — no control of the interpolations overshoot for cloud fraction (In principle the interpolated cloud fraction should be controlled in order to remain between 0. and 1.).

5.3 3D physical fluxes

Fluxes are not yet post-processable as 3D fields. However you can post-process them in off-line mode[1] by activating the pronostic field for gridpoint cloud fraction (setting `(LGPA=.TRUE.)`) and feeding the cloud fraction with one of them through a proper setting of TFP_CLF%CLNAME. Notice : this is possible only because there is — by "chance" ! — no control of the interpolations overshoot for cloud fraction (In principle the interpolated cloud fraction should be controlled in order to remain between 0. and 1.).

5.4 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 :

CNPFSU :

Definition : Generic for surface physical free-use fields.

Scope : array of 16 characters ; maximum size : 15 items.

Default value : Refer to appendix A.1.2 on page 54.

Namelist location : `NAMAFN`

NBFSU :

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

Scope : Integer array ; maximum size : 15 items.

Default value : Refer to appendix A.1.2 on page 54.

Namelist location : `NAMAFN`

TFP_FUA%CLNAME :

Definition : Dynamic upper air free-use fields names.

Scope : array of 16 characters ; ; maximum size : 30 items.

Default value : Refer to appendix A.1 on page 51.

Namelist location : `NAMAFN`

TFP_FUA%IBITS :

Definition : Number of bits for packing dynamic upper air free-use fields.

[1] Out of the direct model integration

Scope : Integer array ; maximum size : 30 items.

Default value : Refer to appendix A.1 on page 51.

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 : 30 items.

Default value : Refer to appendix A.1 on page 51.

Namelist location : `NAMAFN`

TFP_FSU%CLNAME :

Definition : Dynamic surface free-use fields names.

Scope : array of 16 characters ; ; maximum size : 15 items.

Default value : Refer to appendix A.1.1 on page 53.

Namelist location : `NAMAFN`

TFP_FSU%IBITS :

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

Scope : Integer array ; maximum size : 15 items.

Default value : Refer to appendix A.1.1 on page 53.

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 : 15 items.

Default value : Refer to appendix A.1.1 on page 53.

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 *eta* 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 `LFITP`, `LFITV`, `LFITT`, `LFITS`and `LFIT2D`.

Appendix A

Appendixes

A.1 Upper air dynamic fields descriptors

This section details the content of a part of the namelist`NAMAFN` which contains the descriptors of the upper air dynamic fields. The descriptor `%CLNAME` serves to fill the array `CFP3DF` in the namelist `NAMFPC`.

Field	:	TYPE NAME	%CLNAME	%IBITS	%LLGP
Absolute Vorticity........	:	TFP_ABS	ABS_VORTICIT	24	F
Atmospheric liquid water..	:	TFP_W	LIQUID_WATER	24	T
Atmospheric solid water...	:	TFP_S	SOLID_WATER	24	T
Cloud fraction............	:	TFP_CLF	CLOUD_FRACTI	24	T
Divergence................	:	TFP_DIV	DIVERGENCE	24	F
Equiv. pot. temperature...	:	TFP_ETH	THETA_EQUIVA	24	F
Free upper air field n 01.	:	TFP_FUA(01)	UPPER_AIR.01	24	F
Free upper air field n 02.	:	TFP_FUA(02)	UPPER_AIR.02	24	F
Free upper air field n 03.	:	TFP_FUA(03)	UPPER_AIR.03	24	F
		(truncated list - 30 variables)			
Geopotential..............	:	TFP_Z	GEOPOTENTIEL	24	F
Montgomery potential......	:	TFP_MG	MONTGOMERY G	24	F
Ozone.....................	:	TFP_O3MX	OZONE	24	F
Passive scalar nr 01......	:	TFP_SCVA(01)	#001.SCALAR	24	F
Passive scalar nr 02......	:	TFP_SCVA(02)	#002.SCALAR	24	F
Passive scalar nr 03......	:	TFP_SCVA(03)	#003.SCALAR	24	F
		(truncated list - 5 variables)			
Potential temperature.....	:	TFP_TH	TEMPE_POTENT	24	F
Potential Vorticity.......	:	TFP_PV	POT_VORTICIT	24	F
Pressure Departure........	:	TFP_PD	PRESS.DEPART	24	F
Pressure..................	:	TFP_P	PRESSURE	24	F
Pseudo Vertic. Divergence.	:	TFP_VD	VERTIC.DIVER	24	F
Relative humidity.........	:	TFP_HU	HUMI_RELATIV	24	F
Shearing Deformation......	:	TFP_SHD	SHEAR_DEFORM	24	F
Specific humidity.........	:	TFP_Q	HUMI.SPECIFI	24	F
Stream function...........	:	TFP_KHI	FONC.COURANT	24	F
Stretching Deformation....	:	TFP_STD	STRET_DEFORM	24	F
Temperature...............	:	TFP_T	TEMPERATURE	24	F
True Vertical NH Velocity.	:	TFP_VW	VERT.VELOCIT	24	F

```
U-momentum of wind........ :     TFP_U    VENT_ZONAL         24     F
Velocity potential........ :     TFP_PSI  POT.VITESSE        24     F
Vertical velocity......... :     TFP_VV   VITESSE_VERT       24     F
Vorticity................. :     TFP_VOR  VORTICITY          24     F
V-momentum of wind........ :     TFP_V    VENT_MERIDIE       24     F
Wet bulb pot. temperature. :     TFP_THPW THETA_PRIM_W       24     F
Wind velocity............. :     TFP_WND  WIND_VELOCIT       24     F
```

Notice :

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

A.1.1 2D dynamic fields descriptors

This section details the content of a part of the namelistNAMAFN which contains the descriptors of the 2D dynamic fields. The descriptor %CLNAME serves to fill the array CFP2DF in the namelist NAMFPC.

```
   Field                    :    TYPE NAME    %CLNAME      %IBITS %LLGP
Altitude of iso-t=0 ...... :     TFP_HT0B SURFISOT0.MALTIT   24      T
Altitude of iso-tprimw=0 . :     TFP_HTPW SURFISOTPW0.MALT   24      T
CAPE...................... :     TFP_CAPE SURFCAPE.POS.F00   24      T
CIEN...................... :     TFP_CIEN SURFCIEN.POS.F00   24      T
Free surface field nr 01.. :  TFP_FSU(01) SURF2D.01          24      F
Free surface field nr 02.. :  TFP_FSU(02) SURF2D.02          24      F
Free surface field nr 03.. :  TFP_FSU(03) SURF2D.03          24      F
                             (truncated list - 15 variables)
HU cls.................... :     TFP_RCLS CLSHU.RELATI.POS   24      T
ICAO jet pressure......... :     TFP_PJET JETPRESSURE        24      T
ICAO Tropopause pressure.. :     TFP_PCAO ICAOTROP.PRESSUR   24      T
ICAO Tropo. temperature... :     TFP_TCAP ICAOTROP.TEMPERA   24      T
Log. of Surface pressure.. :     TFP_LNSP LOG.SURF.PRESS     24      F
Map factor................ :     TFP_GM   MAP_FACTOR         24      T
Maxi. rel. moist. in cls.. :     TFP_HUX  CLSHUREL.MAX.POS   24      T
Maxi. temperature in cls.. :     TFP_TX   CLSTEMPE.MAX.POS   24      T
Mean sea level pressure... :     TFP_MSL  MSLPRESSURE        24      F
Mini. rel. moist. in cls.. :     TFP_HUN  CLSHUREL.MIN.POS   24      T
Mini. temperature in cls.. :     TFP_TN   CLSTEMPE.MIN.POS   24      T
Module of gusts........... :     TFP_FGST CLSRAFALES.POS     24      T
Module of wind cls........ :     TFP_FCLS CLSWIND_VELO.POS   24      T
Pressure of iso-t=0 ...... :     TFP_PT0B SURFISOT0.PRESSU   24      T
Q cls..................... :     TFP_QCLS CLSHU.SPECIF.POS   24      T
Surface geopotential...... :     TFP_FIS  SPECSURFGEOPOTEN   64      F
Surface pressure.......... :     TFP_SP   SURFPRESSION       24      F
Surface Vertical Velocity. :     TFP_WWS  SURFVERT.VELOCIT   24      F
T cls..................... :     TFP_TCLS CLSTEMPERATU.POS   24      T
Total water vapour........ :     TFP_TWV  SURFTOT.WAT.VAPO   24      T
Tropo. Folding Indicator.. :     TFP_FOL  TROPO_FOLD_INDIC   24      T
U cls..................... :     TFP_UCLS CLSVENT_ZONA.POS   24      T
U gusts................... :     TFP_UGST CLSURAFALES.POS    24      T
U-momentum of ICAO jet.... :     TFP_UJET JETVENT_ZONAL      24      T
V cls..................... :     TFP_VCLS CLSVENT_MERI.POS   24      T
V gusts................... :     TFP_VGST CLSVRAFALES.POS    24      T
V-momentum of ICAO jet.... :     TFP_VJET JETVENT_MERIDIEN   24      T
```

A.1.2 Surface physical fields descriptors

This section details the content of a part of the namelistNAMAFN which contains the descriptors of the surface physical fields. The descriptor %CLNAME serves to fill the array CFPPHY in the namelist NAMFPC.

```
Albedo .............................. CNAL   = SURFALBEDO         NBAL   = 24
Analysed RMS of geopotential ........ CNPCAAG= SURFETA.GEOPOTEN   NBPCAAG= 24
Anisotropy coeff. of topography ..... CNACOT = SURFVAR.GEOP.ANI   NBACOT = 24
Clim. relative deep soil wetness .... CNCDSW = PROFPROP.RMAX.EA   NBCDSW = 24
Clim. relative surface soil wetness .. CNCSSW = SURFPROP.RMAX.EA   NBCSSW = 24
Deep soil temperature ............... CNDST  = PROFTEMPERATURE    NBDST  = 24
Deep soil wetness ................... CNDSW  = PROFRESERV.EAU     NBDSW  = 24
Direction of main axis of topography . CNDPAT = SURFVAR.GEOP.DIR   NBDPAT = 24
Emissivity .......................... CNEMIS = SURFEMISSIVITE     NBEMIS = 24
Forecasted RMS of geopotential ....... CNPCAPG= SURFETP.GEOPOTEN   NBPCAPG= 24
Frozen deep soil wetness ............ CNFDSW = PROFRESERV.GLACE   NBFDSW = 24
Frozen superficial soil wetness ...... CNFSSW = SURFRESERV.GLACE   NBFSSW = 24
Index of vegetation ................. CNIVEG = SURFIND.VEG.DOMI   NBIVEG = 24
Interception content ................ CNIC   = SURFRESERV.INTER   NBIC   = 24
INTERPOLATED surface temperature ..... CNRDST = INTSURFTEMPERATU   NBRDST = 24
Land/sea mask ....................... CNLSM  = SURFIND.TERREMER   NBLSM  = 24
Leaf area index ..................... CNLAI  = SURFIND.FOLIAIRE   NBLAI  = 24
OUTPUT Grid-point geopotential ....... CNGFIS = SURFGEOPOTENTIEL   NBGFIS = 64
Percentage of clay within soil ....... CNARG  = SURFPROP.ARGILE    NBARG  = 24
Percentage of land .................. CNLAN  = SURFPROP.TERRE     NBLAN  = 24
Percentage of sand within soil ....... CNSAB  = SURFPROP.SABLE     NBSAB  = 24
Percentage of vegetation ............ CNVEG  = SURFPROP.VEGETAT   NBVEG  = 24
Relaxation deep soil wetness ......... CNRDSW = RELAPROP.RMAX.EA   NBRDSW = 24
Resistance to evapotranspiration ..... CNHV   = SURFRES.EVAPOTRA   NBHV   = 24
Roughness length of bare surface
(times g)............................ CNBSR  = SURFZOREL.FOIS.G   NBBSR  = 24
Snow albedo ......................... CNALSN = SURFALBEDO NEIGE   NBALSN = 24
Surface snow density ................ CNSNDE = SURFDENSIT.NEIGE   NBSNDE = 24
Snow depth .......................... CNSD   = SURFRESERV.NEIGE   NBSD   = 24
Soil depth .......................... CND2   = SURFEPAIS.SOL      NBD2   = 24
Standart deviation of orography
(times g) ........................... CNSDOG = SURFET.GEOPOTENT   NBSDOG = 24
Stomatal minimum resistance .......... CNRSMIN= SURFRESI.STO.MIN   NBRSMIN= 24
Surface albedo for non snowed areas .. CNBAAL = SURFALBEDO.COMPL   NBBAAL = 24
Surface relative moisture ............ CNPSRHU= SURFHUMI.RELATIV   NBPSRHU= 24
Surface roughness (times g) .......... CNSR   = SURFZO.FOIS.G      NBSR   = 24
Surface soil wetness ................ CNSSW  = SURFRESERV.EAU     NBSSW  = 24
Surface temperature ................. CNST   = SURFTEMPERATURE    NBST   = 24
Thermal roughness length (times g) ... CNZOH  = SURFGZO.THERM      NBZOH  = 24
U-momentum of vector anisotropy ...... CNPADOU= SURF.U.ANISO.DIR   NBPADOU= 24
V-momentum of vector anisotropy ...... CNPADOV= SURF.V.ANISO.DIR   NBPADOV= 24
Free field #01 ...................... CNPFSU = SURFFREE.FIELD01   NBFSU  = 24
Free field #02 ...................... CNPFSU = SURFFREE.FIELD02   NBFSU  = 24
                              (truncated list - 15 variables)
```

A.1.3 Cumulated fluxes descriptors

This section details the content of a part of the namelist`NAMAFN` which contains the descriptors of the cumulated fluxes. The descriptor `%CLNAME` serves to fill the array `CFPCFU` in the namelist `NAMFPC`.

```
Boundary Layer Dissipation .......... CNCBLD = SURFDISSIP SURF    NBCBLD = 24
Clear sky longwave radiative flux .... CNCTHC = SURFRAYT THER CL   NBCTHC = 24
Clear sky shortwave radiative flux ... CNCSOC = SURFRAYT SOL CL    NBCSOC = 24
Contribution of Convection to Cp.T ... CNCCVS = SURFCFU.CT.CONVE   NBCCVS = 24
Contribution of Convection to Q ...... CNCCVQ = SURFCFU.Q.CONVEC   NBCCVQ = 24
Contribution of Convection to U ...... CNCCVU = SURFTENS.CONV.ZO   NBCCVU = 24
Contribution of Convection to V ...... CNCCVV = SURFTENS.CONV.ME   NBCCVV = 24
Contribution of Turbulence to Cp.T ... CNCTUS = SURFCFU.CT.TURBU   NBCTUS = 24
Contribution of Turbulence to Q ...... CNCTUQ = SURFCFU.Q.TURBUL   NBCTUQ = 24
Convective Cloud Cover ............... CNCCCC = ATMONEBUL.CONVEC   NBCCCC = 24
Convective precipitation ............ CNCCP  = SURFPREC.EAU.CON   NBCCP  = 24
Convective Snow Fall ................ CNCCSF = SURFPREC.NEI.CON   NBCCSF = 24
Deep soil water content run-off ...... CNCDRU = PROFRUISSELLEMEN   NBCDRU = 24
Duration of total precipitations ..... CNCDUTP= SURFTIME.PREC.TO   NBCDUTP= 24
Evapotranspiration .................. CNCETP = SURFEVAPOTRANSPI   NBCETP = 24
Flux d eau dans le sol ............... CNCEAS = SURFEAU DANS SOL   NBCEAS = 24
Flux de chaleur dans le sol .......... CNCCHS = SURFCHAL. DS SOL   NBCCHS = 24
High Cloud Cover .................... CNCHCC = ATMONEBUL.HAUTE    NBCHCC = 24
Interception water content run-off.... CNCIRU = SURFRUISS. INTER   NBCIRU = 24
Large Scale Precipitation ........... CNCLSP = SURFPREC.EAU.GEC   NBCLSP = 24
Large Scale Snow fall ............... CNCLSS = SURFPREC.NEI.GEC   NBCLSS = 24
Latent Heat Evaporation ............. CNCLHE = SURFFLU.LAT.MEVA   NBCLHE = 24
Latent Heat Sublimation ............. CNCLHS = SURFFLU.LAT.MSUB   NBCLHS = 24
Liquid specific moisture ............ CNCLI  = ATMOHUMI LIQUIDE   NBCLI  = 24
Low Cloud Cover ..................... CNCLCC = ATMONEBUL.BASSE    NBCLCC = 24
Medium Cloud Cover .................. CNCMCC = ATMONEBUL.MOYENN   NBCMCC = 24
Melt snow ........................... CNCFON = SURFFONTE NEIGE    NBCFON = 24
Snow mass ........................... CNCSNS = SURFRESERV NEIGE   NBCSNS = 24
Snow Sublimation .................... CNCS   = SURFFLU.MSUBL.NE   NBCS   = 24
Soil Moisture ....................... CNCWS  = SURFCONTENU EAU    NBCWS  = 24
Solid specific moisture ............. CNCICE = ATMOHUMI SOLIDE    NBCICE = 24
Surface down solar flux ............. CNCSOD = SURFRAYT DIFF DE   NBCSOD = 24
Surface down thermic flux ........... CNCTHD = SURFRAYT THER DE   NBCTHD = 24
Surface downward moon radiation ...... CNCSMR = SURFRAYT.LUNE.DE   NBCSMR = 24
Surface Latent Heat Flux ............ CNCSLH = SURFCHAL LATENTE   NBCSLH = 24
Surface parallel solar flux .......... CNCSOP = SURFRAYT DIR SUR   NBCSOP = 24
Surface Sensible Heat Flux .......... CNCSSH = SURFFLU.CHA.SENS   NBCSSH = 24
Surface solar radiation ............. CNCSSR = SURFFLU.RAY.SOLA   NBCSSR = 24
Surface Thermal radiation ........... CNCSTR = SURFFLU.RAY.THER   NBCSTR = 24
Surface water content run-off......... CNCSRU = SURFRUISSELLEMEN   NBCSRU = 24
Tendency of Surface pressure ......... CNCTSP = SURFPRESSION SOL   NBCTSP = 24
Top clear sky longwave radiative flux  CNCTTHC= SOMMRAYT THER CL   NBCTTHC= 24
Top clear sky shortwave radiative flux CNCTSOC= SOMMRAYT SOL CL    NBCTSOC= 24
Top mesospheric enthalpy ............ CNCTME = TOPMESO ENTH       NBCTME = 24
```

```
Top parallel solar flux ............. CNCTOP = TOPRAYT DIR SOM    NBCTOP = 24
Top Solar radiation ................. CNCTSR = SOMMFLU.RAY.SOLA   NBCTSR = 24
Top Thermal radiation ............... CNCTTR = SOMMFLU.RAY.THER   NBCTTR = 24
Total Cloud cover ................... CNCTCC = ATMONEBUL.TOTALE   NBCTCC = 24
Total Ozone ......................... CNCTO3 = ATMOOZONE TOTALE   NBCTO3 = 24
Total precipitable water ............ CNCQTO = ATMOHUMI TOTALE    NBCQTO = 24
Transpiration ....................... CNCTP  = SURFTRANSPIRATIO   NBCTP  = 24
U-momentum of Gravity-Wave Drag stress CNCUGW = SURFTENS.DMOG.ZO   NBCUGW = 24
U-momentum of Turbulence stress ...... CNCUSS = SURFTENS.TURB.ZO   NBCUSS = 24
V-momentum of Gravity-Wave Drag stress CNCVGW = SURFTENS.DMOG.ME   NBCVGW = 24
V-momentum of Turbulence stress ...... CNCVSS = SURFTENS.TURB.ME   NBCVSS = 24
Water Evaporation ................... CNCE   = SURFFLU.MEVAP.EA   NBCE   = 24
```

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

A.1.4 Instantaneous fluxes descriptors

This section details the content of a part of the namelist`NAMAFN` which contains the descriptors of the instantaneous fluxes. The descriptor `%CLNAME` serves to fill the array `CFPXFU` in the namelist `NAMFPC`.

```
CAPE out of the model ................ CNXCAPE= SURFCAPE.MOD.XFU   NBXCAPE= 24
Contribution of Convection to Cp.T ... CNXCVS = S000FL.CT CONVEC   NBXCVS = 24
Contribution of Convection to Q ...... CNXCVQ = S000FL.Q  CONVEC   NBXCVQ = 24
Contribution of Convection to U ...... CNXCVU = S000FL.U  CONVEC   NBXCVU = 24
Contribution of Convection to V ...... CNXCVV = S000FL.V  CONVEC   NBXCVV = 24
Contribution of Gravity Wave Drag to U CNXGDU = S000FL.U ONDG.OR   NBXGDU = 24
Contribution of Gravity Wave Drag to V CNXGDV = S000FL.V ONDG.OR   NBXGDV = 24
Contribution of Turbulence to Cp.T ... CNXTUS = S000FL.CT TURBUL   NBXTUS = 24
Contribution of Turbulence to Q ...... CNXTUQ = S000FL.Q  TURBUL   NBXTUQ = 24
Contribution of Turbulence to U ...... CNXTUU = S000FL.U  TURBUL   NBXTUU = 24
Contribution of Turbulence to V ...... CNXTUV = S000FL.V  TURBUL   NBXTUV = 24
Convective Cloud Cover ............... CNXCCC = SURFNEBUL.CONVEC   NBXCCC = 24
Convective precipitation ............. CNXCP  = S000PLUIE CONVEC   NBXCP  = 24
Convective Snow Fall ................. CNXCSF = S000NEIGE CONVEC   NBXCSF = 24
Gusts out of the model ............... CNXGUST= CLSRAFAL.MOD.XFU   NBXGUST= 24
Height of the PBL out of the model
(times g) ............................ CNXPBLG= CLPGEOPO.MOD.XFU   NBXPBLG= 24
High Cloud Cover ..................... CNXHCC = SURFNEBUL.HAUTE    NBXHCC = 24
Large Scale Precipitation ............ CNXLSP = S000PLUIE STRATI   NBXLSP = 24
Large Scale Snow fall ................ CNXLSS = S000NEIGE STRATI   NBXLSS = 24
Low Cloud Cover ...................... CNXLCC = SURFNEBUL.BASSE    NBXLCC = 24
Maximum relative moisture at 2 meters  CNXX2HU= CLSMAXI.HUMI.REL   NBXX2HU= 24
Maximum temperature at 2 meters ...... CNXX2T = CLSMAXI.TEMPERAT   NBXX2T = 24
Medium Cloud Cover ................... CNXMCC = SURFNEBUL.MOYENN   NBXMCC = 24
Minimum relative moisture at 2 meters  CNXN2HU= CLSMINI.HUMI.REL   NBXN2HU= 24
Minimum temperature at 2 meters ...... CNXN2T = CLSMINI.TEMPERAT   NBXN2T = 24
MOCON out of the model ............... CNXMOCO= CLPMOCON.MOD.XFU   NBXMOCO= 24
Relative Humidity at 2 meters ........ CNX2RH = CLSHUMI.RELATIVE   NBX2RH = 24
Specific Humidity at 2 meters ........ CNX2SH = CLSHUMI.SPECIFIQ   NBX2SH = 24
Surface solar radiation .............. CNXSSR = S000RAYT.SOLAIRE   NBXSSR = 24
Surface Thermal radiation ............ CNXSTR = S000RAYT.TERREST   NBXSTR = 24
Temperature at 2 meters .............. CNX2T  = CLSTEMPERATURE     NBX2T  = 24
Top Solar radiation .................. CNXTSR = SOMMRAYT.SOLAIRE   NBXTSR = 24
Top Thermal radiation ................ CNXTTR = SOMMRAYT.TERREST   NBXTTR = 24
Total Cloud cover .................... CNXTCC = SURFNEBUL.TOTALE   NBXTCC = 24
U-momentum of gusts out of the model . CNXUGST= CLSU.RAF.MOD.XFU   NBXUGST= 24
U-momentum of wind at 10 meters ...... CNX10U = CLSVENT.ZONAL      NBX10U = 24
V-momentum of gusts out of the model . CNXVGST= CLSV.RAF.MOD.XFU   NBXVGST= 24
V-momentum of wind at 10 meters ...... CNX10V = CLSVENT.MERIDIEN   NBX10V = 24
Wind velocity at 10 meters ........... CNX10FF= CLSWIND.VELOCITY   NBX10FF= 24
```

A.2 Example of selection file

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 :

```
/NAMCT0
   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 :

```
/bin/cat <EOF>> xxt00000000
/NAMFPPHY
/END
/NAMFPDY2
   CL2DF(1)='SPECSURFGEOPOTEN',
   CLD2DF(1)='FRANCE:EUROC25',
   CL2DF(2)='SURFPRESSION',
   CLD2DF(2)='EUROC25',
/END
/NAMFPDYP
   CL3DF(1)='GEOPOTENTIEL',
   ILD3DF(1,1)=1,
   CLD3DF(1,1)='FRANCE:EUROC25',
   CL3DF(2)='TEMPERATURE',
   ILD3DF(1,2)=1,2,
   CLD3DF(1,2)='EUROC25',
   CLD3DF(2,2)='FRANCE',
/END
```

```
/NAMFPDYH
/END
/NAMFPDYV
   CL3DF(1)='POT\_VORTICIT',
   ILD3DF(1,1)=1,
   CLD3DF(1,1)='FRANCE',
/END
/NAMFPDYT
/END
/NAMFPDYS
/END
EOF

/bin/cat <EOF>> xxt00000300
/NAMFPPHY
/END
/NAMFPDY2
   CL2DF(1)='SURFPRESSION',
   CLD2DF(1)='EUROC25',
/END
/NAMFPDYP
   CL3DF(1)='GEOPOTENTIEL',
   ILD3DF(1,1)=2,
   CLD3DF(1,1)='FRANCE:EUROC25',
   CL3DF(2)='TEMPERATURE',
   ILD3DF(1,2)=1,
   CLD3DF(1,2)='EUROC25',
/END
/NAMFPDYH
/END
/NAMFPDYV
/END
/NAMFPDYT
/END
/NAMFPDYS
/END
EOF


/bin/ls > dirlst
```

A.3 How to make climatology files

You need to run the configuration 923 (ARPEGE/IFS) for a gaussian grid, or the configuration E923 (ALADIN) for a LAM grid or a LAT X LON grid.
You should not forget to specify in the namelists of the configuration 923/E923 the definition(s) of your output (sub-)domain(s). Remember that in the case of LAT X LON grids there is no extension zone (set `NDGL=NDGUX` and `NDLON=NDLUX` in `NAMDIM`) and the geometry is not plane (set `LRPLANE=.FALSE.` in `NAMCT0`).
Finally do not forget that in the case of any gridpoint output for ordinary post-processing the surface geopotential should not be spectrally fitted (set `LKEYF=.FALSE.` in `NAMCLA`).

A.4 Spectral filters

There are two formulations used to smooth the fields.
The first one — nicknamed *thx* because it uses the hyperbolic tangent function — 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.

Figure A.1 on page 62 illustrates this spectral filter.

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 it 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.

In ALADIN this gaussian filter is used to filter any field ("derivative" or not).

Figure A.2 on page 63 illustrates this spectral filter.

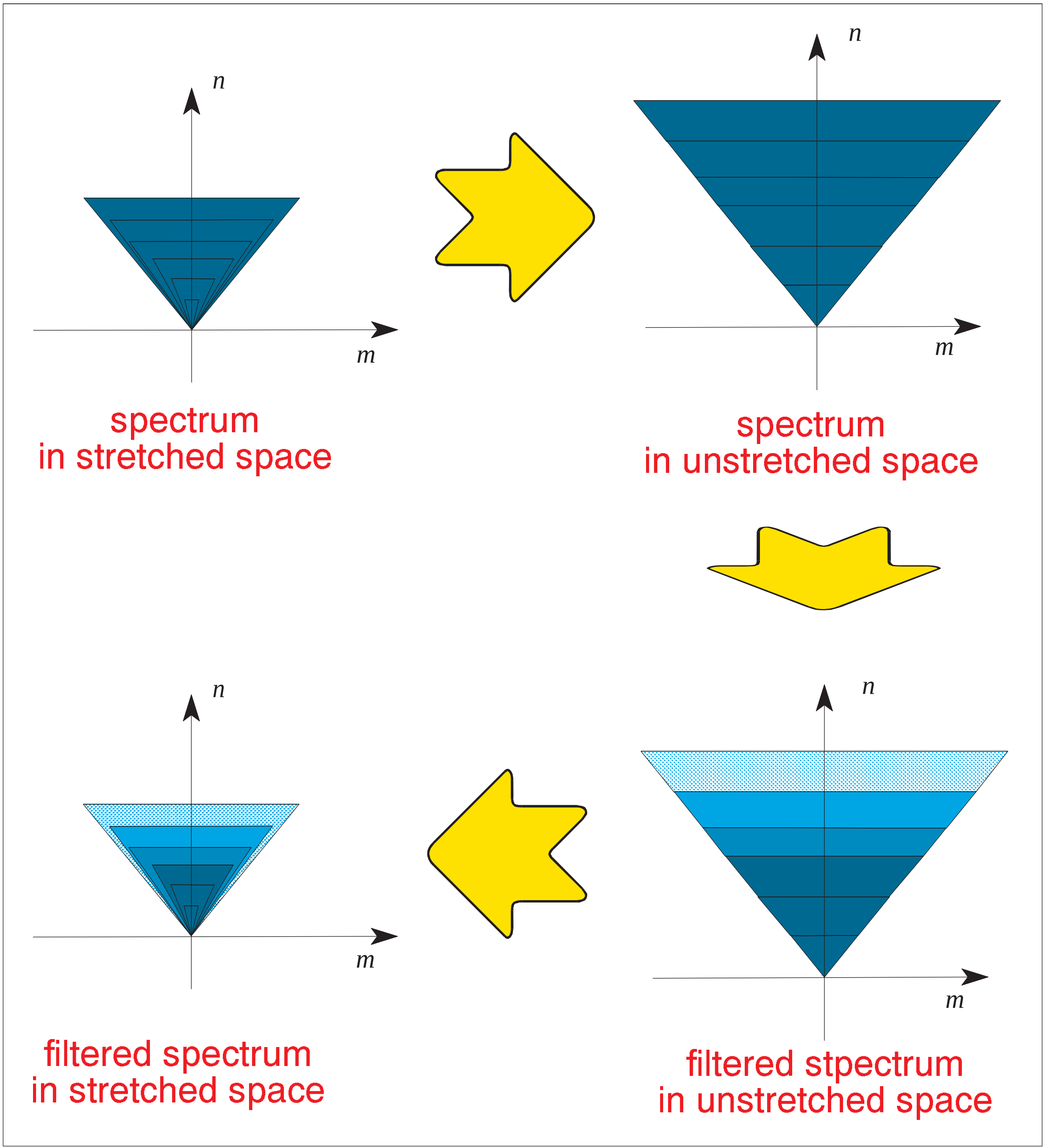

Figure A.1: Illustration of the spectral filter for derivatives in ARPEGE/IFS

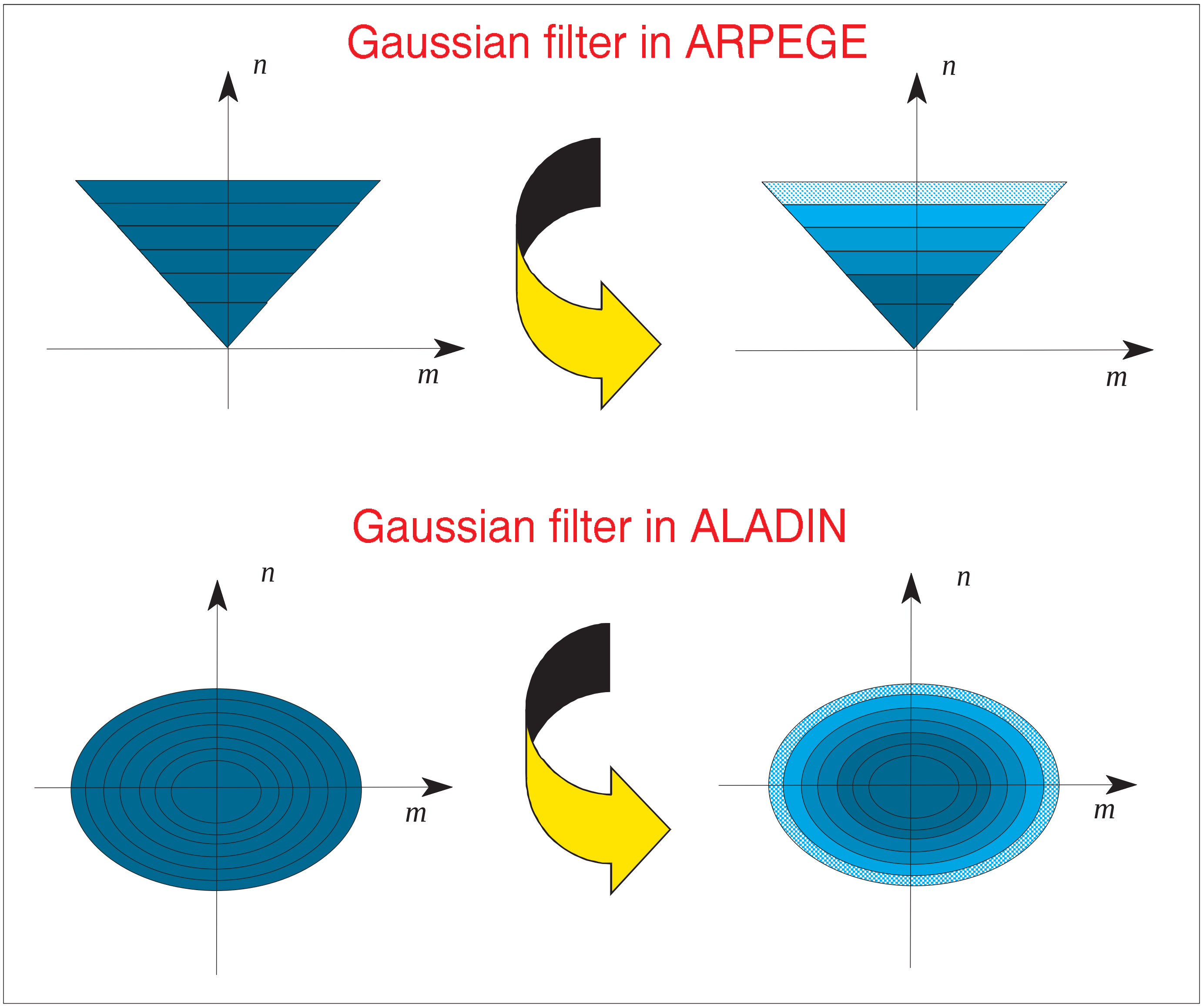

Figure A.2: Illustration of the gaussian spectral filter

A.5 Optimization of the performance

A.5.1 Communications

To write post-processed fields in an output file, you first gather the distributed pieces of these fields from the different processors.
Rather than gathering the fields one after the other, the fields are grouped in chunks, and these chunks are treated one after the other.
The variable `NFPXFLD` is the maximum size of these chunks. Lowering it should save memory to the detriment of inter-processors communications, and vice versa.

A.5.2 Segmentation

Several variables are control the segmentation of the software arrays :

NPROMA is the elementary size of the gridpoint rows in the model geometry. In the post-processing it is in use mostly during the vertical interpolations.

NFPROMAG is the elementary size of the gridpoint rows in the post-processing geometry. It is used mostly during the horizontal interpolations.

NFPROMEL is the elementary size of the gridpoint rows in the post-processed extension zone for LAM output. It is used only in ALADIN during the computation of the post-processed extension zone.

By definition all these variables control a part of the vectorization depth as well as memory cost. The bigger these variables are, the deeper the vectorization is, in detriment to the memory cost. On non-vector machine it is better to use small values for these parameters in order to fit the cache memory. They should not be a power of 2 to avoid memory bank conflicts. One should refer to the machine constructor to choose the best values for these variables.

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