FULL-POS

USERS' GUIDE

in ARPEGE/IFS cycle CY22

and

ALADIN cycle AL12 with ARPEGE/IFS cycle CY22T1

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Contents

1 INTRODUCTION **5**
- 1.1 Organisation of this manual . . . 5
- 1.2 Reporting bugs . . . 5
- 1.3 Terminology . . . 5
- 1.4 Summary of features . . . 6
- 1.5 Acknowledgements . . . 7

2 GETTING STARTED **7**
- 2.1 Installing the software . . . 7
- 2.2 Preparing the namelists file . . . 7
- 2.3 Running FULL-POS . . . 7
- 2.4 About set-up . . . 8

3 MAIN FEATURES OF NAMELISTS **8**
- 3.1 NAMAFN . . . 8
- 3.2 NAMFPC . . . 9
- 3.3 NAMFPD . . . 9
- 3.4 NAMFPG . . . 9
- 3.5 NAMFPF . . . 9
- 3.6 NAMFPSC2 . . . 9
- 3.7 NAMFPIOS . . . 9

4 BASIC NAMELISTS VARIABLES **9**
- 4.1 NAMFPC . . . 9
- 4.2 NAMFPD . . . 11
- 4.3 NAMFPG . . . 13

5 OUTPUT FILE HANDLING **16**
- 5.1 Files structure . . . 16
- 5.2 Name of the output files . . . 16
- 5.3 Content of the output files . . . 16

6 ADVANCED USAGE **17**
- 6.1 scientific or technical options for post-processing . . . 17
  - 6.1.1 Spectral fit on dynamic fields . . . 17
  - 6.1.2 Height levels or hybrid levels . . . 18
  - 6.1.3 Vorticity and Divergence . . . 18
  - 6.1.4 Stream function and velocity potential . . . 18
  - 6.1.5 Usage of an external climatology . . . 19
  - 6.1.6 NAMFPF : Tuning of the spectral filters . . . 20
  - 6.1.7 Water contents . . . 22
  - 6.1.8 Ozone, cloud fraction and upper air water-related variables . . . 22
  - 6.1.9 Adiabatic post-processing . . . 23

6.2 Optimization of the performance . . . 23
6.2.1 Writing to output files . . . 23
6.2.2 I/O schemes on vertical post-processing . . . 23
6.2.3 I/O schemes on horizontal post-processing . . . 24
6.2.4 I/O schemes on preserved model data . . . 25
6.2.5 Other I/O schemes . . . 25
6.2.6 NAMDIM : Vectorization depth in vertical post-processing . . . 26
6.2.7 NAMFPSC2 : horizontal segmentation and vectorization . . . 26
6.2.8 packing/unpacking . . . 27
6.3 Customization . . . 28
6.3.1 Fields names . . . 28
6.3.2 Output files name . . . 28
6.3.3 Free-use fields . . . 28
6.3.4 Making an accurate list of post-processed fields . . . 29
6.4 Miscellaneous . . . 30
6.4.1 Packing of output data . . . 30
6.4.2 Prints out . . . 30
6.4.3 post-processing on model grid and levels . . . 30
6.4.4 GRIB encoding . . . 31
6.4.5 Post-processing of extension zone in ALADIN . . . 31
6.4.6 Customized complexion of certain fields . . . 31

7 THE CONFIGURATIONS 927, E927 and EE927 32
7.1 What does that mean ? . . . 32
7.2 Getting started . . . 32
7.2.1 Configuration 927 . . . 32
7.2.2 Configuration E927 . . . 34
7.2.3 Configuration EE927 . . . 36
7.2.4 Non-hydrostatic historical files . . . 36
7.3 Advanced usage . . . 36
7.3.1 Let your imagination do it ! . . . 36
7.3.2 Process 927 inside a loop . . . 37
7.3.3 In-line process 927 . . . 37

8 BOGUSSING 37
8.1 Cyclone translation in Aladin . . . 37
8.2 Aladin injection in Arpege . . . 37

A NAMELISTS PARAMETERS 40
A.1 NAMAFN . . . 40
A.1.1 3D dynamic fields (CFP3DF) . . . 40
A.1.2 2D dynamic fields (CFP2DF) . . . 41
A.1.3 Surface fields (CFPPHY) . . . 42
A.1.4 Cumulated fluxes (CFPCFU) . . . 43

A.1.5 Instantaneous fluxes (CFPXFU) 45
A.2 NAMCT0 46
A.3 NAMFPC 46
A.4 NAMDIM 48
A.5 NAMDYN 48
A.6 NAMFPD 49
A.7 NAMFPG 49
A.8 NAMFPF 50
A.9 NAMFPSC2 51
A.10 NAMFPEZO 51
A.11 NAMIOS 51
A.12 NAMFPIOS 52
A.13 NAMOPH 53
A.14 NAMPAR1 53

B SELECTION FILES : AN EXAMPLE **54**

1 INTRODUCTION

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

FULL-POS 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 FULL-POS. It is divided into two major sections covering respectively the installation and use, and the management of the code (appendixes).

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 lines, especially in the comdecks.

1.2 Reporting bugs

If you find any bugs or deficiencies in this software, then please write a short report and send it to Ryad.Elkhatib@meteo.fr

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

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

1.3 Terminology

This section describes certain words which are used in this document.

- POS : this is the subroutine which performs the vertical interpolations ; its name will be used to talk about the previous internal post-processing in ARPEGE/IFS.
- Off-line : the post-processing is performed as if it was a particular configuration of ARPEGE/IFS
- In-line : the post-processing is performed during the direct integration of the model
- Spectral fit : after the vertical interpolations, dynamic fields can be fitted in the spectral space before the horizontal interpolations in grid-point space.

- Spectral filter : this concerns only the fields which are spectrally fitted. in the spectral space, these fields can be filtered ; there are two kinds of filters : the so-called "THX" filter for derivatives (vorticity, vertical velocity, deformations etc) and the so-called "bell-shape" filter for geopotential, temperature, medium sea level pressure, etc. Concerning the derivatives, the spectral "THX" filter consists in a smooth overtruncation of the fields in the unstretched spectral space ; concerning the other fields, the spectral filter consists in a bell-shaped diffusion in the stretched spectral space.

- Configuration 927 : special configuration of post-processing which enables to create historical files. Note that the name "configuration 927" is an historical error : in fact, this process is not a specific configuration, but just a particuliar post-processing namelist (inside the configuration 001).

1.4 Summary of features

FULL-POS 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 FULL-POS

- Ability to perform post-processing in-line or off-line

- Ability to make ARPEGE or ALADIN history files, starting from a file ARPEGE or a file ALADIN (processes "927", "E927" and "EE927")

1.5 Acknowledgements

Thanks to Alain Joly who invented first the "French POS" concept which became "FULL-POS", 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 FULL-POS inside ALADIN ; to Jaouad Boutahar and Mehdi Elabed for their debugging in FULL-POS. Thank you to Jean-Noel Thepaut who believed in the use of FULL-POS for the incremental variational analysis. Thank to you all who will use FULL-POS 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.

2 GETTING STARTED

2.1 Installing the software

In METEO-FRANCE, FULL-POS is available in Arpege/Ifs cycle CY22, and in Aladin cycle AL12 matching with Arpege/Ifs cycle CY22T1.

You will also need the auxilary library and eclib for fft's.

2.2 Preparing the namelists file

Be sure that your namelists file contains the following namelists : NAMAFN, NAMFPC, NAMFPD, NAMFPG, NAMFPF, NAMFPIOS, NAMFPSC2. All these namelists are specific to FULL-POS, except NAMAFN which is more general. FULL-POS is also using NAMCT0, and possibly NAMDIM.

2.3 Running FULL-POS

FULL-POS is executable only in configuration 001 ; so set NCONF=1 in NAMCT0. Then, to invoke FULL-POS, you have to set LFPOS = .TRUE. in NAMCT0. Note that it is not possible to run all together FULL-POS and the previous internal post-processing POS ; When LFPOS = .TRUE., POS is desactivated.

Then, to choose the post-processing time steps, you must use NFRPOS and NPOSTS as you did before with POS.

Remember :
if NPOSTS(0)=0 then
post-processing occurs 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 time steps will be :
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 events will occur at :
NPOSTS(1)*NFRPOS hours, NPOSTS(2)*NFRPOS hours,
... NPOSTS(NPOSTS(0))*NFRPOS hours.

If you are running FULL-POS off-line, it is recommanded to use the eulerian advection scheme of the model (LSLAG=.FALSE.)

If you do not specify anything else, then FULL-POS 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 gaussian grid. The output file will be a file ARPEGE named PFAAAA000+nnnn, where 'AAAA' is the name of the experiment (CNMEXP(1 :4)), and nnnn the forecast range (in time steps or in hours, according to the value of LINC in NAMOPH)

2.4 About set-up

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. The namelists which are related to FULL-POS are read in the following order : NAMAFN, then NAMFPC, then NAMFPD, then NAMFPG, then NAMFPF, then NAMFPSC2, then NAMFPIOS. It is mostly useful to remember the order : NAMFPC, then NAMFPD, then NAMFPG, then NAMFPF.

3 MAIN FEATURES OF NAMELISTS

3.1 NAMAFN

This namelist contains the ARPEGE field names and some field descriptors. It is used for a special customization, and it will be described later.

3.2 NAMFPC

This is the main namelist for post-processing. It contains the list of the fields to post-process, the format of the output subdomain(s) (Spherical harmonics, gaussian grid, grid of kind 'Aladin' or grid of kind 'Latitude X longitude'), and various options of post-processing.

3.3 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.

3.4 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 grid of kind 'Aladin'. Default geometry is the geometry of the model.

3.5 NAMFPF

This namelist defines the shape of the filtering functions. It is used for a special customization, and it will be described later.

3.6 NAMFPSC2

This namelist is used to optimize the performance of the code in terms of vectorisation or memory used. It will be described later.

3.7 NAMFPIOS

This namelist is used to activate I/O schemes on new buffers or workfiles which are specific to FULL-POS. It will be described later.

4 BASIC NAMELISTS VARIABLES

This section will describe the main variables of the namelists NAMFPC, NAMFPD and NAMFPG.

4.1 NAMFPC

CFPFMT : format of the output files ; character variable which can be only 'MODEL', 'GAUSS', 'LELAM' or 'LALON', respectively for spherical harmonics, a global model grid, a grid of kind 'ALADIN' or grids of kind 'Latitudes X Longitudes'. Default is 'GAUSS' in Arpege/Ifs, and 'LELAM' in Aladin.

CFPDOM : names of the subdomains ; array of 10 characters ; if CFPFMT is 'GAUSS' or 'LELAM', then you can make only one output domain ; otherwise (CFPFMT is 'LALON'), you can make up to 10 subdomains. The name(s) of the subdomain(s) can be any string of 7 characters maximum. The default values are : CFPDOM(1)='000' and CFPDOM(i)=' ' for i greater than 1. This means by the way that by default, you ask for only one output (sub)domain.

CFP3DF : ARPEGE names of the 3D dynamics fields to be post-processed ; array of 12 characters. By default, the array is blanked, which means : no 3D dynamics fields to post-process. The ARPEGE names of the post-processable 3D dynamics fields are available on the listing of any job (locate : 'YOMAFN') ; or refer to appendix A.1.1 of this documentation.

CFP2DF : same as CFP3DF for the 2D dynamics fields to be post-processed ; array of 16 characters. Refer to appendix A.1.2 of this documentation to get the list of available fields.

CFPPHY : same as CFP2DF for surface grid-point fields from physical parameterisations ; array of 16 characters. Refer to appendix A.1.3 of this documentation to get the list of available fields.

CFPCFU : same as CFPPHY for cumulated fluxes ; array of 16 characters. Refer to appendix A.1.4 of this documentation to get the list of available fields.

CFPXFU : same as CFPPHY for instantaneous fluxes ; array of 16 characters. Refer to appendix A.1.5 of this documentation to get the list of available fields.

RFP3P : post-processing pressure levels ; array of real values in Pa ; No default values.

RFP3H : post-processing height levels (above orography) ; array of real values in meters ; No default values.

RFP3TH : post-processing potential temperature levels ; array of real values in Kelvin ; No default values.

RFP3PV : post-processing potential vorticity levels ; array of real values in S.I. unit ; No default values.

NRFP3S : post-processing eta levels ; array of integer ; No default values.

Note that if you ask for post-processing on fluxes, you do not need to specify anything particuliar in the namelists NAMCFU or NAMXFU : these namelists will be automatically modified by FULL-POS in order to get the required fluxes.

Note that if you ask for spherical harmonics in output (CFPFMT='MODEL'), the upper air grid-point fields, the surface grid point fields and the fluxes will be written out on the model gaussian grid (with poles values added). In fact, this option can be used as an alternative to the previous 'POS' (set up with the namelist NAMPPC).

4.2 NAMFPD

NLAT : number of latitudes for each output (sub)domain (poles not included if a gaussian grid is required) ; array of integers ; corresponds to the variable NDGL of the output grid(s)

NLON : number of longitudes for each output (sub)domain ; array of integers ; corresponds to the variable NDLON of the output grid(s)

RLATN : northern latitude in degrees for each output (sub)domain ; array of reals

RLATS : southern latitude in degrees for each output (sub)domain ; array of reals

RLONW : western longitude in degrees for each output (sub)domain ; array of reals

RLONE : eastern longitudes in degrees for each output (sub)domain ; array of reals

If you ask for a grid ALADIN (CFPFMT='LELAM'), there are additionnal variables that you can specify :

NFPLUX : actual last row of longitude

NFPGUX : actual last row of latitude

NFPZONL : half the size of area I in x

NFPZONG : half the size of area I in y

These variables have many possible default values, depending on the content of the namelist NAMFPC (parameters CFPFMT and CFPDOM), and depending on the model (Arpege or Aladin) :

Case ARPEGE :

- if CFPFMT='LALON', there are many possible default values, according to the value of CFPDOM in NAMFPC :

CFPDOM	NLAT	NLON	RLATN	RLATS	RLONW	RLONE
'HENORD'	60	180	89.25	0.75	0.	358.
'HESUDC'	60	180	-0.75	-89.25	0.	358.
'HESUDA'	30	90	-1.5	-88.5	0.	356.
'ATLMED'	65	129	72.75	24.75	-84.	44.
'EURATL'	103	103	71.25	20.25	-32.	36.
'ZONCOT'	81	81	63.75	33.75	-20.	20.
'FRANCE'	61	61	53.25	38.25	-8.	12.
'GLOB15'	121	240	90.	-90.	0.	358.5
'EURAT5'	105	149	72.	20.	-32.	42.
'ATOUR10'	81	166	80.	0.	-100.	65.
'EUROC25'	105	129	61.	35.	-15.	17.
'GLOB25'	73	144	90.	-90.	0.	357.5
'EURSUD'	41	54	48.25	28.25	-34./3.	24.
'EUREST'	39	73	60.25	41.25	-56/3.	88./3.
'GRID25'	21	41	75.	25.	-50.	50.
'MAROC'	158	171	42.90	19.20	-19.80	5.85
'OCINDIEN'	67	89	33.	-66.	0.	132.
'REUNION05'	61	141	-5.	-35.	30.	100.

- if CFPFMT='LELAM' then there are many possible default values, according to the value of CFPDOM in NAMFPC :

CFPDOM	RLATN	RLATS	NLAT
'BELG'	53.62576250095276	47.00552234610564	72
'SLOV'	50.31862495	41.48230800	48
'MARO'	43.03274783	18.41928424	160
'OPMA'	43.84932233	17.32436063	108
'LACE'	56.04274264	33.07606553	192
'ROUM'	52.86547894	35.28895004	72
'FRAN'	54.97543335	33.66090012	200
other name	55.02332687	36.20003128	180

CFPDOM	RLONW	RLONE	NLON
'BELG'	359.7271331650663	10.81654377459938	72
'SLOV'	8.11809117	19.87921810	48
'MARO'	-19.89127081	9.83167877	160
'OPMA'	-20.79065513	11.39205009	108
'LACE'	1.16026046	41.19323585	216
'ROUM'	14.16917554	39.71861793	72
'FRAN'	-11.17915630	19.64583206	200
other name	-9.18826294	19.26073265	180

CFPDOM	NFPGUX(C+I+E / C+I)	NFPLUX(C+I+E / C+I)
'BELG'	61 / 72	61 / 72
'SLOV'	37 / 48	37 / 48
'MARO'	149 / 160	149 / 160
'OPMA'	97 / 108	97 / 108
'LACE'	181 / 192	205 / 216
'ROUM'	61 / 72	61 / 72
'FRAN'	189 / 200	189 / 200
other name	169 / 180	169 / 180

while NFPZONL=NFPZONG=8 in any case.

- if (CFPFMT='GAUSS' or CFPFMT='MODEL') then the default values are : NLAT=NDGL and NLON=NDLON (same parameters as the model)

Case ALADIN :

- if CFPFMT='LALON', the default values are : NLAT=NDGL ; NLON=NDLON ; while the corners (RLATN, RLATS, RLONW, RLONE) are internally computed in order to remain inside the model area
- if (CFPFMT='LELAM' or CFPFMT='MODEL'), the default values are as follows :

Fullpos	NLAT	NLON	NFPZONL	NFPZONG
Aladin	NDGL	NDLON	NBZONL	NBZONG

Fullpos	NFPGUX(C+I+E/C+I)	NFPLUX(C+I+E/C+I)
Aladin	NDGUX / NDGL	NDLUX / NDLON

Fullpos	RLATN	RLATS	RLONW	RLONE
Aladin	ELAT2	ELAT1	ELON1	ELON2

- if CFPFMT='GAUSS', the default values are : NLAT=32, NLON=64

Note that if you ask for the model horizontal geometry (CFPFMT='MODEL'), all these parameters will be reset to the default values by the program.

4.3 NAMFPG

NFPMAX : truncation order.

If CFPFMT='GAUSS', it is the truncation corresponding to the output grid ; default is NSMAX.

If CFPFMT='LELAM', it is the truncation in the meridional direction ;

default is so that 3*NFPMAX+1=NLAT.

If CFPFMT='LALON', it is the truncation of the gaussian grid which would have been defined by NLAT latitudes and NLON longitudes ; default is so that 3*NFPMAX+1 = MIN(NLAT,NLON).

The next variables are used only if CFPFMT='GAUSS' or if (CFPFMT='MODEL' and LELAM=.FALSE.) :

FPMUCEN : Sine of the latitude of the pole of interest ; default is RMUCEN in Arpege/Ifs and 1. in Aladin

FPLOCEN : Longitude of the pole of interest ; default is RLOCEN in Arpege/Ifs and 0. in Aladin

NFPHTYP : grid reduction :

0 = regular grid

1 = number of points proportional to sqrt(1-mu**2)

2 = number of points read on namelist NAMFPG
Default is NHTYP in Arpege/Ifs if NLAT=NDGL ; otherwise NFPHTYP=0

NFPRGRI : number of active points on a parallel ;
Default is NRGRI in Arpege/Ifs if NLAT=NDGL ; otherwise NFPRGRI(:)=NLON

FPSTRET : stretching factor ; default is RSTRET in Arpege/Ifs and 1. in Aladin

NFPTTYP : 1 = pole of interest at the northern pole of the real Earth ; 2 = pole of interest anywhere on the real Earth ; default is NSTTYP in Arpege/Ifs and 1 in Aladin.

FPNLGINC : increment to get non-linear grid ; default is 1. (quadratic grid)

NFPQUAD : Quadrature (1 : Gauss ; 2 : Lobatto) ;
Default is NQUAD in Arpege/Ifs and 1 in Aladin.

The next variables are used only if CFPFMT='LELAM' or if (CFPFMT='MODEL' and LELAM=.TRUE.) :

NMFPMAX : Truncation order in zonal direction ;
default is so that 3*NMFPMAX+1=NLON.

FPBETA : Angle of rotation (in degrees) ; default is 0.

NFPROTEQ : Parameter for the rotation :

0 = no rotation

1 = the reference point of rotation is rotated to the equator, the north pole is on the new Greenwich meridian

Default is 0 in ARPEGE and NROTEQ in ALADIN.

FPLONR : geographic longitude of reference point of rotation (in degrees) ; default is 0. in ARPEGE and ELONR in ALADIN.

FPLATR : geographic latitude of reference point of rotation (in degrees) ; default is 0. in ARPEGE and ELATR in ALADIN.

NFPGIV0 : choice of reference point for projection ; default is 0 in ARPEGE and NGIV0 in ALADIN.

FPLON0 : geographic longitude of reference for the projection (in degrees)

FPLAT0 : geographic latitude of reference for the projection (in degrees)

FPRPK : K projection parameter and definition

NFPSOTRP : isotropy parameter under projection ; default is 1 in ARPEGE and NSOTRP in ALADIN.

The default values of these four variables depend on the model used :
Case ARPEGE : the default values depend on CFPDOM, as follows :

CFPDOM	FPLON0	FPLAT0	FPRPK
'BELG'	2.57831001	46.46884918	0.725
'SLOV'	17.0	46.24470064	0.7223
'MARO'	-7.0	31.56059436	0.5234
'OPMA'	-7.0	31.56059436	0.5234
'LACE'	17.0	46.24470064	0.7223
'ROUM'	25.0	44.77301983	0.7043
'FRAN'	25.0	44.77301983	0.7043
other name	2.57831001	46.46884918	0.725

Case ALADIN : the default values are as follows :

Fullpos	FPLON0	FPLAT0	FPRPK
Aladin	ELON0	ELAT0	ERPK

Note that if you ask for the model horizontal geometry (CFPFMT='MODEL'), all these parameters will be reset to the default values by the program.

NFPLEV : number of levels ; default is NFLEVG

FPVALH : "A" coefficients of vertical system ; default are VALH

FPVBH : "B" coefficients of vertical system ; defaults are VBH

FPVP00 : Reference pressure ; default is VP00

Note that if NFPLEV is different from NFLEV, FPVALH and FPVBH will be automatically recomputed in order to be by default the values currently used together with NFPLEV.

5 OUTPUT FILE HANDLING

5.1 Files structure

FULL-POS makes files of kind 'ARPEGE/ALADIN' : if you ask for a gaussian grid in output (CFPFMT='GAUSS'), you will get a file of kind ARPEGE ; If you ask for a grid of kind 'ALADIN' (CFPFMT='LELAM'), you will get a file of kind 'ALADIN' ; if you ask for a set of files of kind 'Latitudes X Longitudes' (CFPFMT='LALON'), then you will also get files of kind 'ALADIN', with the only particularity that the output geometry is without any projection.
As a consequence, procedures like 'chagal' which are used in Toulouse to plot output files from ALADIN are re-usable to plot FULL-POS files 'LELAM' or 'LALON'.
Note that if CFPFMT='MODEL', you can get spectral or gridpoint data in output.

5.2 Name of the output files

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

The output files are named : 'PFAAAADDDDDDD+nnnn', where :

- 'PF' is a fixed prefix
- AAAA is the so-called "name of the experiment" (CNMEXP(1 :4))
- DDDDDDD is the name of the output (sub)domain (CFPDOM)
- nnnn is the post-processing time step (in steps or hours according to LINC in NAMOPH)

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

5.3 Content of the output files

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 :

Level type	prefix	unity	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 than 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 !

6 ADVANCED USAGE

The purpose of this section is to describe certain variables (in namelists) which users may need, but which are either too complex, or too rarely needed to warrant complicating the previous section.

6.1 scientific or technical options for post-processing

6.1.1 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. In namelist NAMFPC, you will find the following variables :

LFITP : logical ; .TRUE. to spectrally fit the post-processed fields on pressure levels ; default is .TRUE.

LFITT : same as LFITP for the post-processed fields on potential temperature levels ; default is .FALSE.

LFITV : same as LFITP for the post-processed fields on potential vorticity levels ; default is .FALSE.

LFIT2D : same as LFITP for the 2D dynamic post-processed fields ; default is .TRUE.

Note that if you ask for post-processing of dynamic fields which are not spectral in the model, then these post-processed fields will not be spectrally fitted, even if the corresponding switch LFITxx is .TRUE.

Note that 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.

6.1.2 Height levels or hybrid levels

Additive variables are available in namelist NAMFPC :

LFPQ : logical ; .FALSE. to interpolate relative humidity then deduct specific humidity ; .TRUE. to interpolate the specific humidity then deduct the relative humidity. It is better to use the default value (.FALSE.) : in this case, relative humidity is conserved within displacement of the planetary boundary layer and it is interpolated vertically. Relative humidity is considered to have better properties for an interpolation than mixing ratio even if it is not a conservative quantity.

FPBL : real ; critical thickness of the planetary boundary layer. Default is 17500 Pa.

LSNOWI, LSNOWO : These options are used only if LFPQ=.FALSE. LSNOWO specifies how the output file is created and should be used as LNEIGE in configuration 001 subsequently. LSNOWI requires knowlege about input file. In the case of doubt, use the same option as for LSNOWO (a situation close to LFPQ=.TRUE.). Defaults are : LSNOWI=LNEIGE and LSNOWO=LNEIGE.

RFPMXZ : real ; (non-critical) maximum difference between interpolated orography and output orography. Default is 3000. times the acceleration of the gravity.

6.1.3 Vorticity and Divergence

In the model, wind components, relative vorticity and divergence are all available in grid-point space. As a consequence, there are two possibilities to post-process relative vorticity, absolute vorticity and divergence : either you interpolate these fields starting from the vorticity and the divergence inside the model, or you interpolate these fields starting from the wind components inside the model. In the latter case, wind is vertically interpolated, then transformed into vorticity and divergence in spectral space ; then the vertically interpolated vorticity and divergence are horizontally interpolated.

By default, relative vorticity, absolute vorticity and divergence are post-processed starting from the wind inside the model. To post-process relative vorticity, absolute vorticity and divergence starting from the vorticity and the divergence inside the model, you just have to set LFPUVDZ=.FALSE. in the namelist NAMFPC.

6.1.4 Stream function and velocity potential

In the model, stream function and velocity potential are not available in grid-point space. As a consequence, there are two possibilities to post-process these fields : either you interpolate them starting from the vorticity and the divergence inside the model (set LFPUVKP=.FALSE.), or you interpolate them starting from the wind components inside

the model (set LFPUVKP=.TRUE.,default value). In both cases, the transformations to get stream function and velocity potential are done in spectral space. As a consequence, you need to set the corresponding keys LFITxx to .TRUE.

6.1.5 Usage of an external climatology

It is possible to use auxilary climatological files to improve the accuracy of the horizontal interpolations. The variable which controls the usage of an external climatology is NFPCLI in the namelist NAMFPC. There are three possible options for the time being :

NFPCLI = 0 : climatology is not used.

NFPCLI = 1 : use of auxilary land-sea mask and orography.

In your script, the local name of this external climatology file should be :

'const.clim.DDDDDDD', where DDDDDDD is the variable CFPDOM of the namelist NAMFPC. This file should be of the same geometry as the post-processing file you want to make.

NFPCLI = 2 : use of auxilary land-sea mask, orography, surface temperature, relative surface wetness, deep soil temperature, relative deep soil wetness, albedo, emissivity, standard deviation of orography, percentage of vegetation, roughness lenth, anisotropy coefficient of topography, direction of the main axis of topography and snow depth.

For that you need to make 2 climatology files : the first one, named 'Const.Clim', should be in the input model geometry, the second one, named

'const.clim.DDDDDDD', where DDDDDDD is the variable CFPDOM of the namelist NAMFPC, should in the output (post-processing) geometry.

NFPCLI = 3 : same as NFPCLI = 2, but with more auxilary fields for "ISBA files" purpose : type of vegetation, minimum stomatic resistance, percentage of clay, percentage of sand, root depth, leaf area density and thermal surface roughness length.

Additive variables are at disposal to control the climatology usage :

RFPCORR : critical height difference between source and model orography, for correcting surface temperature through standart profile. Default is 300. times the acceleration of the gravity.

RFPCSAB : Critical sand percentage difference between source and model climatology for computing relative soil moisture in ISBA ; default is 0.01

RFPCD2 : Critical soil depth difference between source and model climatology for computing relative soil moisture in ISBA ; default is 0.001

LFPMOIS : Month allowed for climatology usage :

.FALSE. => month of the model (forecast)

.TRUE. => month of the initial file

Default is .FALSE. ; it is recomanded to set LFPMOIS=.TRUE. to enable in-line post-processing

How to make the external climatology files ? Just run the configuration 923 (Arpege/Ifs) for a gaussian grid, or the configuration E923 (Aladin) for a grid 'ALADIN', Latitudes X longitudes. Do 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 outputs of the kind 'Latitudes X longitudes', there is no extension zone (so : NDGL=NDGUX and NDLON=NDLUX) and the geometry is not a plane (so : LRPLANE=.FALSE.). Note also that in the case of any limited area output, the orography should not be fitted (set LKEYF=.FALSE. in NAMCLA) when you are doing ordinary post-processing.

6.1.6 NAMFPF : Tuning of the spectral filters

In the spectral space, absolute vorticity, relative vorticity, divergence, vertical velocity, stretching and shearing deformations, and potential vorticity are filtered. If you wish to keep these fields unfiltered, then just set LFPFIL=.FALSE. in Arpege/Ifs, or LFPBED=.FALSE. in Aladin.
On the other hand, you can keep the filter active but you can tune the filtering function.

In Arpege/Ifs, this function looks like a smoothed step function ; for a given wavenumber n in the unstretched spectral space, the formula is :

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

(The use of the function hyperbolic tangent is the reason of the nickname "THX" for this filter).

It means that this function equals roughly 1 if n is less than n_0, and 0 if it is bigger than n_0.
k and n_0 are tunable :
n_0 is the variable NFMAX. If CFPFMT='GAUSS' or 'MODEL', the default value is NFPMAX*FPSTRET ; else, it is the truncation of the gaussian grid which would have been defined by NLAT latitudes and NLON longitudes with default so that :
3*NFMAX+1=MIN(NLAT,NLON).
k is defined as follows :

$k = \frac{\ln(1-\varepsilon)/\varepsilon}{L}$ where ε and L are percentages.

This means that : on L times the width of the spectrum, the function will decrease quickly, and that at the boundaries of this "window", the values of the fuction will be respectively $1-\varepsilon$ and ε.

L and ε are respectively RFPWID and RFPEPS. The default values are both 0.1

In Aladin, this filter is a "Bell-shaped" function. For a given pair of wavenumbers (n, m), the formula is :

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

where N is the model truncation (NSMAX) and k a tunable variable. k is RFPBED in namelist.

It is also possible to filter the non-derivative post-processed fields through "Bell-shaped" filters. Separate "Bell-shaped" filters are available for geopotential, temperature, medium sea level pressure, relative humidity and all other non-derivatives. By default, these filters are active for geopotential, temperature, medium sea level pressure and relative humidity.
In Aladin, the formula is the same as above.
In Arpege/Ifs, for a given wavenumber n in the stretched spectral space, the formula is :

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

where N is the model truncation (NSMAX) and k a tunable variable.
The array below summerizes the existing "Bell-shaped" filters (default values are parenthesis) :

Field	Available in Model	Switch (.TRUE. if active)	k
Derivatives		LFPBED	RFPBED
	Aladin only	(.TRUE.)	(6.)
Geopotential		LFPBEG	RFPBEG
	Arpege/Ifs	(.TRUE.)	(4.)
	Aladin	(.TRUE.)	(6.)
Temperature		LFPBET	RFPBET
	Arpege/Ifs	(.TRUE.)	(4.)
	Aladin	(.TRUE.)	(6.)
Mean sea level pressure		LFPBEP	RFPBEP
	Arpege/Ifs	(.TRUE.)	(4.)
	Aladin	(.TRUE.)	(6.)
Relative humidity		LFPBEH	RFPBEH
	Arpege/Ifs	(.TRUE.)	(4.)
	Aladin	(.TRUE.)	(6.)
All other non-derivatives		LFPBEL	RFPBEL
	Arpege/Ifs	(.FALSE.)	(4.)
	Aladin	(.FALSE.)	(6.)

Furthermore, in Arpege/Ifs, it is also possible to perform *at the end* an overtruncation of each post-processed field.
This overtruncation is equivalent to the so-called "THX" filter, but it is applied in the stretched spectral space and then n_0 is equal to the variable NPMAX in the namelist NAMDIM.
Note that this overtruncation is active only if NPMAX is less than NSMAX.

6.1.7 Water contents

Specific variables are available in namelist NAMFPC : since water contents are interpolated as relative values, it is necessary to know the maximum values in output files. If the corresponding variable in namelist is set to -999., then the maximum value in output will be set as the same than in input.

WSXO : real ; maximum surface moisture in output. Default is -999.

WDXO : real ; maximum deep soil moisture in output. Default is -999.

WCXO : real ; maximum "climatological" moisture in output. Default is -999.

Notice : these parameters are useful unly when NFPCLI=0, 1 or 2.

6.1.8 Ozone, cloud fraction and upper air water-related variables

For ozone, cloud fraction, specific humidity, liquid water or ice, it is possible to consider the post-processed fields either as gridpoint or as spectral coefficients,independantly of the state of the model variable (so it is a way to convert these fields from spectral to gridpoint or vice-versa) :

LFPGPQ : .TRUE. to compute gridpoint humidity rather than spectral ;
default = LECMWF

LFPGPL : .TRUE. to compute gridpoint liquid water rather than spectral ;
default =.TRUE.

LFPGPI : .TRUE. to compute gridpoint ice rather than spectral ;
default =.TRUE.

LFPGPA : .TRUE. to compute gridpoint cloud fraction rather than spectral ;
default =.TRUE.

LFPGPO3 : .TRUE. to compute gridpoint ozone rather than spectral ;
default = LECMWF

These variables are in the namelist NAMFPC.

6.1.9 Adiabatic post-processing

To run the post-processing in the adiabatic model, you should (not ask for physical fields and) 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.,
   LREASUR=.TRUE.,
/END
/NAMDPHY
   NVSO=0,
   NVCLIV=0,
   NVRS=0,
   NVSF=0,
   NVSG=0,
   NCSV=0,
   NVCLIN=0,
   NVCLIP=0,
/END
```

Notice : for technical reasons, it is important to keep LREASUR=.TRUE.

6.2 Optimization of the performance

6.2.1 Writing to output files

To write post-processed fields on an output file, you first extract them from an array (or a workfile). Rather than extracting the fields one after the other, the fields are grouped in packets, and these packets of fields are extracted one after the other. You can specify the maximum number of fields in a packet by modifying the variable NFPXFLD in the namelist NAMFPIOS. The default value is the maximum possible depending on the number of fields to produce). Raising the value of NFPXFLD should save CPU time to the detriment of the memory cost, and vice versa.

This is still valid in the distributed memory code ; the specificity is just that the "extraction" process consists in inter-processors communications.

6.2.2 I/O schemes on vertical post-processing

For the vertical post-processing, the data flows have been separated in 2 parts :

- fitted post-processed fields

- unfitted post-processed fields

To spare memory space, the data flow of unfitted post-processed fields can be controlled by a specific I/O scheme. By default, this I/O scheme is activated only at ECMWF (LECMWF=.TRUE.). If you wish to activate/deactivate it, just set LIOGAUX=.TRUE. / .FALSE. in the namelist NAMCT0. Then you can change other related variables in the namelist NAMIOS :

CIOGAUX : workfile name of unfitted vertically post-processed fields ; default is 'miogaux'

NPCKFGX : packing factor for I/O on vertically post-processed fields ; default is 1

NEXPBGX : Number of bits used for exponent when packing I/O on vertically post-processed fields ; default is 6

6.2.3 I/O schemes on horizontal post-processing

For the horizontal post-processing, the data flows have been separated in 4 parts :

- post-processed dynamic data
- post-processed physic/fluxes data
- weights for horizontal interpolations
- output geometry/climatology
- horizontally pre-processed dynamic data (for post-processing on height levels or hybrid levels)

To spare memory space, each of these data flows can be controlled by a specific I/O scheme.

By default, no I/O scheme is activated. If you wish to activate I/O schemes, then use the variables which are in the namelist NAMFPIOS as the array below describs it.
(Defaults values are the ones in parenthesis).

data	.TRUE. to activate I/O scheme	workfile name	packing factor	Number of bits used for exponent when packing
post-processed dynamic	LIOFPD (.FALSE.)	CIOFPD ('miofpdyn')	NPCKFFPD (1)	NEXPBFPD (6)
post-processed physic/fluxes	LIOFPP (.FALSE.)	CIOFPP ('miofpphy')	NPCKFFPP (1)	NEXPBFPP (6)
weights	LIOFPW (.FALSE.)	CIOFPW ('miofpwork')	NPCKFFPW (1)	NEXPBFPW (6)
output geometry, climatology	LIOFPR (.FALSE.)	CIOFPR ('miofpaux')	NPCKFFPR (1)	NEXPBFPR (6)
pre-processed dynamic data	LIOFPA (.FALSE.)	CIOFPA ('miofpapa')	NPCKFFPA (1)	NEXPBFPA (6)

6.2.4 I/O schemes on preserved model data

To ensure the off-line reproductibility of post-processing, it is necessary to save on arrays or workfiles all the model data before a post-processing time step. I/O schemes are available for this operation, as described below (default values are in parenthesis) :

model data	.TRUE. for I/O in NAMCT0	workfile name in NAMIOS
dynamic spectral fields	LIOSPEC (.TRUE.)	CIOSPEC ('miospec')
upper air gridpoint fields	LIOSUA (.TRUE.)	CIOSUA ('fpiosua')
surface fields	LIOSSU (.TRUE.)	CIOSSU ('fpiossu')
cumulated fluxes	LIOSCF (.TRUE.)	CIOSCF ('fpioscf')
instantaneous fluxes	LIOSXF (.TRUE.)	CIOSXF ('fpiosxf')

6.2.5 Other I/O schemes

To spare memory space on the data flow of the fitted vertically post-processed field, it is also possible to use an I/O scheme : this I/O scheme is not specific to the post-processing, but common with the model direct integration : this is an I/O scheme on the Fourier data :

LIOFOU1 : switch in NAMCT0 to activate I/O scheme on Fourier data

CIOFOU1 : workfile name for Fourier data in NAMIOS ; default is 'miofou1'

NBLFOU : segment length for complex IO ; default value depends of the truncation.

You can also possibly use the I/O scheme on Legendre polynomials :

LIOLPOL : switch in NAMCT0 to activate I/O scheme on Legendre polynomial.

CIOLPOL : workfile name for Legendre polynomials in NAMIOS ; default is 'miolpol'

You can also possibly use other I/O schemes on model data :

model data	.TRUE. for I/O in NAMCT0	workfile name in NAMIOS	packing factor	number of bits for exponent when packing
gridpoint fields at t-dt	LIOTMDT	CIOTMDT	NPCKFT9	NEXPBT9
upper air gridpoint fields	LIOGPUA	CIOGPUA	NPCKFGU	NEXPBGU
surface fields	LIOGPP	CIOGPP	NPCKFGP	NEXPBGP
cumulated fluxes	LIOCFU	CIOCFU	NPCKFCF	NEXPBCF
instantaneous fluxes	LIOXFU	CIOXFU	NPCKFXF	NEXPBXF

6.2.6 NAMDIM : Vectorization depth in vertical post-processing

During the vertical interpolations, the memory used and the CPU time used can be tuned thanks to the variable NPROMA in the namelist NAMDIM. The bigger NPROMA is, the quicker the post-processing should run, but then the memory cost should increase as well, and vice-versa. In the case of the configurations 927/e927, ee927, there is another variable playing the same role : IPROM2 (in NAMDIM as well). In such configurations, while IPROM2 deals with the actual vertical interpolations, NPROMA deals with the filling of arrays prior to the actual horizontal interpolations.

Anyway, one should not forget that the values to adopt for NPROMA/IPROM2 are highly related to the architecture of the machine used.

6.2.7 NAMFPSC2 : horizontal segmentation and vectorization

The purpose of this subsection is to describe the variable NFPROMAG in the namelist NAMFPSC2 ; this variable is very useful to find a compromise between the vectorization and the memory cost in the horizontal post-processing, and it is also very useful to make efficient I/O schemes on horizontal post-processing.

The variable NFPROMAG represents the horizontal depth of work in the horizontal post-processing ; it is obvious that this variable has some similarity with the famous variable NPROMA (in namelist NAMDIM) (its use is just more flexiblein the shared memory code). First of all, it is important to explain how the post-processing data flow is managed in the post-processing arrays/workfiles :
the model data is split in packets of points of fixed size NPROMA ; each model packet is treated by one task, and is independant from the other packets.
Each output point (ie where post-processing is performed) is related to one model packet : the one which contains the model point which is the nearest from it. That way, the output

points are sorted out, so that each post-processing packet (ie the group of all the output points which are related to the same model packet) has a specific size.
In order to use the I/O subroutines already available in ARPEGE/IFS, each post-processing packet has been split in sub-rows of fixed size NFPROMAG. Each post-processing packet is treated by one task which performs a loop on the number of sub-rows in the current post-processing packet.
Note that an empty post-processing packet is characterized by a number of sub-rows equal to zero; as a consequence, empty post-processing packets do not lead to memory spill. On the opposite, each non-empty post-processing packet contains a specific number of unused words.
Searching for a compromise between vectorization and memory cost, the value of NFPROMAG can be any integer from 1 to the size of the biggest post-processing packet. The bigger NFPROMAG will be, the more the vectorization will be efficient, and the more memory will be needed. The default value of NFPROMAG is the mean size of the post-processing packets, as this value appeared to be the best compromise. However, if the I/O schemes are activated, the size of the biggest post-processing packet may be a more efficient value. In the listing, the user will find more information to find out the value to adopt : just before "COMMON YOMFPSC2" is printed out, the following information is written :

- size of the smallest post-processing packet
- size of the biggest post-processing packet
- mean size of the post-processing packets
- standart deviation of the size of the post-processing packets

You can also know the memory you have lost in the post-processing arrays : just locate "TOTAL MEMORY LOST IN WORDS ="

6.2.8 packing/unpacking

In the Distributed Memory code, the packing/unpacking of the global fields can be distributed : in namelist NAMPAR1 :

NSTRIN : number of processors used for unpacking

NSTROUT : number of processors used for packing

Concerning NSTRIN, the best performances are obtained when this variable is set like the total number of processors used in the model (NPROC). But concerning NSTROUT, the best performances are obtained for an intermediate value (roughly NPROC/2).

6.3 Customization

6.3.1 Fields names

It is possible to change the name of each output field. The names used by default are printed on the listing (locate "YOMAFN"). The modified variables should be written in the namelist NAMAFN.

6.3.2 Output files name

It is possible to change the prefix 'PF' of the output files : the variable to be changed is CFPDIR in the namelist NAMFPC ; it is a character variable of maximum 180 characters. For instance, if you specify : CFPDIR='$HOME/fullpos/', then your output files will be automatically written on your $HOME/fullpos directory, with the name : AAAADDDDDDD+nnnn

6.3.3 Free-use fields

It is possible to create additive post-processing dynamic fields without making many modifications in the code of FULL-POS.

That way, you can create for you own maximum 3 upper air dynamic fields and 5 surface dynamic fields. Their ARPEGE names correspond respectively to the following variables in the namelist NAMAFN : CNUA1, CNUA2, CNUA3, CNSU1, CNSU2, CNSU3, CNSU4, CNSU5. The default values are respectively : 'UPPER_AIR.01', 'UPPER_AIR.02', 'UPPER_AIR.03', 'SURFACE_FIELD.01', 'SURFACE_FIELD.02', 'SURFACE_FIELD.03', 'SURFACE_FIELD.04', 'SURFACE_FIELD.05'. However, there are no longer free dynamic surface fields : they are occupied by the ICAO fields !

Then in the subroutine POS, you will have to compute the fields you wish and to perform the vertical interpolations under the keys LDUA01, LDUA02, LDUA03, LDSU1, LDSU2, LDSU3, LDSU4, LDSU5.

Your own 3D fields will be treated as fitable non-derivatives : it means that these fields will be fitted or not, according to the switches LFITP, LFITH, LFITV, LFITT, LFITS. It means also that the "Bell-shaped" filter may be performed if LFPBEL=.TRUE., but that the "THX" filter will never be performed on these fields. If you wish to treat your new upper air post-processed fields as derivatives in order to use this filter, then you will have to make additive modifications in the subroutine CPVPOSPR : move the computation of the field pointers KUA01, KUA02, KUA03 below the comment line : "IF YOU WISH TO ADD NEW DERIVED FIELDS, ADD THEM JUST BELOW THIS COMMENT". On the opposite, if you wish never to fit your fields, then move the computation of their pointers to the part "GRID POINT 3D FIELDS".

Your own 2D fields will be treated as fitable non-derivatives as well : these fields will be fitted or not according to the switche LFIT2D, and the "Bell-shaped" filter may be performed if LFPBEL=.TRUE. Note that performing the "THX" filter is NOT possible for the 2D fields. On the opposite, if you wish never to fit your fields, then move the

computation of their pointers KSU01, KSU02, KSU03, KSU04, KSU05 to the part "GRID-POINT 2D FIELDS" and move the count of these 2D fields out of the case LDFIT2.

6.3.4 Making an accurate list of post-processed fields

In ordinary case, at each post-processing time step, all the fields that are written in the namelist NAMFPC are post-processed at all the levels and for all the output domains written in the namelist NAMFPC.
However, it is possible to get, at each post-processing time step, exactly the fields you wish, and nothing more : in that case, you have to make another namelists file which will contains the selection of the fields you wish to get.
First, you have to set in NAMCT0 the variable CNPPATH as the directory where the selection files will be. Under this directory, the name of a selection file must be xxtDDDDDHHMM, where DDDDHHMM specifies the date/time of the post-processing time step.
Then a selection file must contain 7 new namelists : NAMFPPHY, NAMFPDY2, NAMFPDYP, NAMFPDYH, NAMFPDYV, NAMFPDYT and NAMFPDYS.
Namelist NAMFPPHY is for physical fields and fluxes ; it contains the following parameters :

CLPHY : names of selected physical fields ; array of 16 characters

CLDPHY : names of selected subdomains, separated by " :", for each selected physical field ; characters array (example : 'DOM1 :DOM2 :DOM3')

CLCFU : names of selected cumulated fluxes fields ; array of 16 characters

CLDCFU : names of selected subdomains, separated by " :", for each selected cumulated flux ; characters array (example : 'DOM1 :DOM2 :DOM3')

CLXFU : names of selected instantaneous fluxes fields ; array of 16 characters

CLDXFU : names of selected subdomains, separated by " :", for each selected instantaneous flux ; characters array (example : 'DOM1 :DOM2 :DOM3')

Namelist NAMFPDY2 is for 2D dynamics fields ; it contains the following parameters :

CL2DF : names of selected fields ; array of 16 characters

CLD2DF : names of selected subdomains, separated by " :", for each selected field ; characters array (example : 'DOM1 :DOM2 :DOM3')

Namelists NAMFPDY2 NAMFPDYP, NAMFPDYH, NAMFPDYV, NAMFPDYT and NAMFPDYS are for fields postprocessed respectively on pressure levels, height levels, potential vorticity levels, isentropic levels and hybrid levels ; they contain the same following parameters :

CL3DF : names of selected fields ; array of 16 characters

IL3DF : list of selected indexes of post-processing levels, for each selected field ; integer array of 2 dimensions ; first subscript is for selected post-processing level ; second one is the local field index.

CLD3DF : names of selected subdomains, separated by " :", for each selected level and each selected field ; characters array of 2 dimensions ; first subscript is the local index of the selected level ; second one is the local field index (example : 'DOM1 :DOM2 :DOM3')

Note that all the fields or levels or domains written in a selection file should be included in the main namelist NAMFPC, otherwise the job will abort.

Appendix B is an example of use of selection files.

6.4 Miscellaneous

6.4.1 Packing of output data

The number of bits to be used for GRIB packing inside an output file is tunable, through variables in namelist NAMAFN, for each output field. The default value is 24 for all fields except orography which should not be packed in the model in order to keep consistency between spectral and gridpoint orography (default value is 64). If you wish to modify the default values, refer to appendix A.1 or to the prints out of the common YOMAFN in the listing to find out the names of the variables to be changed.

6.4.2 Prints out

By locating 'FULL-POS NORMS' (or 'FULL-POS SPNORMS' in you ask for spectral coefficients) on the listing, you will see that at each post-processing time step the mean value of each subdomain of each field is printed out. This is useful to validate the code of FULL-POS from one cycle to another. If you wish to get rid of these prints, then set LFPNORM=.FALSE. in the namelist NAMFPC. Note that you can also check the content of the output files by using the variable LRFILAF in NAMCT1. If you have to cope with a severe bug in the post-processing, the you may set LTRACEFP=.TRUE. in the namelist NAMFPC : this option is used to print out more information during the post-processing set-up and the post-processing time steps. Be careful with this option : you might get an enormous listing if the number of output points is quite big !
Furthermore, in Aladin, setting LTRACEFP=.TRUE. is a way to find out what is the biggest domain LATxLON that is included in the model : search for the prints after the prints out of YOMFPG.

6.4.3 post-processing on model grid and levels

If you ask for fields on the model grid (CFPFMT='MODEL') and on model levels (NRFP3S=...), there will be no vertical interpolations nor horizontal interpolations ; the dynamic spectral fields will be written out on post-processing files as spectral data. To

get them gridpoint, set LFITS=.FALSE. and/or LFIT2D=.FALSE. in NAMFPC (default values are : .TRUE.)

6.4.4 GRIB encoding

By default, post-processed fields are encoded in Arpege/Aladin files according to a modified version of GRIB. This is changeable through NFPGRIB in NAMFPC :

NFPGRIB=0 : no packing of fields
NFPGRIB=1 : standard GRIB encoding on fields
NFPGRIB=2 : modified GRIB encoding (default value) on fields

6.4.5 Post-processing of extension zone in ALADIN

setting NDOMFP in NAMFPC, you can choose the domain definition of fields in files (for ALADIN) ;

=-1 : physical fields and dynamic fields are gridpoints, stored on (C+I)+E
= 0 : physical fields and dynamic fields are gridpoints, stored on (C+I)

Default is 0 ; you can set NDOMFP=-1 to get the extension zone, providing you are defining it.

Once you have requested the extension zone, you may set the variable of the namelist NAMFPEZO :

NSTREFP : number of processors used to compute the extension zone ; default is 1 (increasing this parameter seems not to bring benefits).

NFPROMEL : Vector length in the computation of the extension zone ; default is odd and is the maximum possible value.

Notice : the computation of the extension zone is possible only with Aladin library.

6.4.6 Customized complexion of certain fields

LFPRH100 : .TRUE. to convert relative humidity in percent ; default = LECMWF

LFPLOSP : is a variable to handle surface pression (Ps) or its logarithm, taking also into account the value of NLOSP :

LFPLOSP =.TRUE. $\Leftrightarrow$

Fill Ps array with Ps or Ln(Ps), according to NLOSP ;

Fill Ln(Ps) array always with Ln(Ps)

LFPLOSP =FALSE. $\Leftrightarrow$

Fill Ps array always with Ps ;

Fill Ln(Ps) array with Ps or Ln(Ps), according to NLOSP

If (LECMWF) then the default value is .FALSE. Else, the default value is .TRUE. except for the configuration 927 where it is set internally.

These variables are in the namelist NAMFPC.

7 THE CONFIGURATIONS 927, E927 and EE927

7.1 What does that mean ?

The configuration 927 is the way to use Fullpos in order to change the geometry and/or the resolution of an historical spectral file. Actually, it is not a specific configuration. Let us rather call it a configuration of post-processing : in that case, the horizontal interpolations are done before the vertical interpolations, and the upper air dynamic variables are (usually) produced as spectral coefficients.
Such a process is switched on by setting LFPSPEC=.TRUE. in the namelist NAMFPC.
"927" is to make a file Arpege, starting from a file Arpege
"E927" is to make a file Aladin, starting from a file Arpege
"EE927" is to make a file Aladin, starting from a file Aladin.

7.2 Getting started

7.2.1 Configuration 927

First, you will have to load the only libraries that are necessary to run Arpege/Ifs
Then, starting from an ordinary namelists file to do off-line post-processing within Arpege/Ifs, change or add the following parameters :

```
/NAMAFN (Let this namelist empty)
/END
/NAMFPC
   CFPFMT='GAUSS',
   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',
   LFPSPEC=.T., (switch on the process 927)
   NRFP3S=1,2,3,4,5,6,7,8,9,10,11,12, .... up to NFPLEV (see below)
   NFPCLI=3,
/END
/NAMFPD
   NLAT= (choose it yourself)
   NLON= (choose it yourself)
/END
/NAMFPG
   FPMUCEN=(choose it yourself)
   FPLOCEN=(choose it yourself)
   NFPHTYP=(choose it yourself)
   NFPRGRI=(fill it yourself if NFPHTYP=2)
   FPSTRET=(choose it yourself)
   NFPTTYP=(choose it yourself)
   NFPMAX=(choose it yourself)
   NFPLEV= (the number of levels you wish)
   FPVALH=(fill it yourself if NFPLEV is an uncommon value)
   FPVBH=(fill it yourself if NFPLEV is an uncommon value)
/END
/NAMCT0
   NFRHIS=1,
   NHISTS(0)=1,
   NHISTS(1)=1,
   NFRPOS=1,
   NPOSTS(0)=1,
   NPOSTS(1)=0,
/END
/NAMDYN
   NLOSP=0, (For better interpolation of surface pressure)
/END
/NAMINI
   NEINI=0,
/END
```

Note that you should have two climatological files in your working directory : the first one, named 'Const.Clim', should be a climatological file Arpege of input geometry ; the second one, named 'const.clim.*CFPDOM* should be a climatological file Arpege of output geometry.

7.2.2 Configuration E927

First, you will have to load all the libraries that are necessary to run Aladin.
Then, the model should be Arpege/Ifs : if you are using the command line system, set -marpifs ; otherwise, set LELAM=.FALSE. in NAMCT0.
Finally, starting from an ordinary namelists file to do off-line post-processing within Arpege/Ifs, change or add the following parameters :

```
/NAMAFN
   CNU='WIND.U.PHYS',
   CNV='WIND.V.PHYS',
/END
/NAMFPC
   CFPFMT='LELAM',
   CFP3DF(1)='TEMPERATURE',
   CFP3DF(2)='WIND.U.PHYS',
   CFP3DF(3)='WIND.V.PHYS',
   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',
LFPSPEC=.T., *(switch on the process 927)*
NRFP3S=1,2,3,4,5,6,7,8,9,10,11,12, ... *up to NFPLEV (see below)*
NFPCLI=3,
/END
/NAMFPD
NLAT= *(choose it yourself)*
NLON= *(choose it yourself)*
RLATN=*(choose it yourself)*
RLATS=*(choose it yourself)*
RLONW=*(choose it yourself)*
RLONE=*(choose it yourself)*
NFPGUX=*(choose it yourself)*
NFPZONL=*(choose it yourself)*
NFPZONG=*(choose it yourself)*
/END
/NAMFPG
NFPMAX=*(choose it yourself)*
NMFPMAX=*(choose it yourself)*
NFPLEV= *the number of levels you wish*
FPVALH=*(fill it yourself if NFPLEV is an uncommon value)*
FPVBH=*(fill it yourself if NFPLEV is an uncommon value)*
FPRPK=*(choose it yourself)*
NFPSOTRP=*(choose it yourself)*
NFPGIV0=*(choose it yourself)*
FPLONR=*(choose it yourself)*
FPLATR=*(choose it yourself)*
NFPROTEQ=*(choose it yourself)*
FPLON0=*(choose it yourself)*
FPLAT0=*(choose it yourself)*
/END
/NAMCT0
NFRHIS=1,
NHISTS(0)=1,
NHISTS(1)=1,
NFRPOS=1,
NPOSTS(0)=1,
NPOSTS(1)=0,
/END
/NAMDYN
NLOSP=0, *(For better interpolation of surface pressure)*

/END
/NAMINI
  NEINI=0,
/END

Note that you should have two climatological files in your working directory : the first one, named 'Const.Clim', should be a climatological file Arpege (input geometry) ; the second one, named 'const.clim.*CFPDOM* should be a climatological file Aladin (output geometry).

7.2.3 Configuration EE927

First, you will have to load all the libraries that are necessary to run Aladin.
Then, starting from an ordinary namelists file to do off-line post-processing within Aladin, change the namelists as suggested above for E927.

Note that you should have two climatological files in your working directory : the first one, named 'Const.Clim', should be a climatological file Aladin of input geometry ; the second one, named 'const.clim.*CFPDOM* should be a climatological file Aladin of output geometry.

7.2.4 Non-hydrostatic historical files

To make non-hydrostatic historical files, you just have to run the configuration e927 or ee927 with the following additive parametres :
/NAMDYN
  NDLNPR=1, *(special discretisation of delta(Log(P)))*
/NAMFPC
  CFP3DF(5)='PRESS.DEPART', *(pressure departure)*
  CFP3DF(6)='VERTIC.DIVER', *(vertical divergence)*
/NAMCT0
  LNHDYN=.FALSE./.TRUE., *(depending whether your input file is hydrostatic or not)*

7.3 Advanced usage

7.3.1 Let your imagination do it !

Once you have a good knowledge of FULL-POS, you can tune various parameters of namelists as you wish !
Furthermore, doing the horizontal interpolations before the vertical interpolations can help you get fields that are uncomputable with the normal configuration of post-processing. For example, starting from a file Arpege, try to postprocess the potential vorticity on the model levels, onto a grid Aladin : with the normal post-processing configuration, the request will abort, because some derivatives will be missing. But this should work using the configuration E927 and asking for gridpoint fields (LFITS=.FALSE.).

7.3.2 Process 927 inside a loop

You may need to write a script in order to run FULL-POS process 927 inside a loop : for instance, to prepare boundary conditions for Aladin, starting from Arpege forecasts. In that case, between two requests, you must remove a control file which is created by FULL-POS. Its name is defined by the variable CFPNCF in the namelist NAMCT0 ; the default value is 'ncf927'.

7.3.3 In-line process 927

You may wish to use FULL-POS process 927 inside a forecast run. This is possible, but for that, you must set LFPBACK=.TRUE. in the namelist NAMFPC. This key enables you to come back to the initial geometry of the model.

8 BOGUSSING

8.1 Cyclone translation in Aladin

It is possible to translate a cyclone inside an Aladin file. This procedure will translate the cyclone to a geographical point given in namelist. The following variables should be set in the namelist NAMFPG :

NFPTTYP : set NFPTTYP=2 to activate the translation if the output grid is not global

FPMUCEN : In Aladin : sine of the latitude of the observed cyclone; default value is sin(ELAT0)

FPLOCEN : In Aladin : longitude of the observed cyclone (in degrees) ; default value is ELON0

Notice : to define the translation vector, the cyclone seen by the model is located through the minimum of surface pressure in the whole model area (C+I).

Usually, this procedure is used to re-build the upper-air fields of an historical file Aladin (using the configuration EE927 in adiabatic mode). In order not to translate the orography, one should first lower the orography to zero, then translate, and finally re-set the original orography.

8.2 Aladin injection in Arpege

It is possible to "inject" data out of Aladin post-processing inside a file Arpege : this is called "the bogussing configuration", or "the configuration 927E" because it works like the configuration E927 but in a "reverse" way.

To use this configuration, you should use a namelist of configuration 927, but invoking "aladin" instead "arpifs", and set in namelist NAMFPC the new variable NFPINCR=1 (default value is 0). Furthermore, you have to provide 3 input files instead of one :

ICMSH${CNMEXP(1 :4)}INIT : Aladin bogussed coupling file

ELSCF${CNMEXP(1 :4)}ALBC : Aladin coupling file (before bogussing)

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

Notice : the Arpege background file should contain all the fields of a normal historical file in gridpoint. Furthermore : in this file surface pressure should be the true surface pressure and not its logarithm.

Important notice : for the time being, this configuration "927E" works only in adiabatic mode (i.e. : it is not yet possible to inject physical surface fields except orography).

APPENDIXES

A NAMELISTS PARAMETERS

A.1 NAMAFN

This namelist contains the ARPEGE field names and some field descriptors.

A.1.1 3D dynamic fields (CFP3DF)

Post-processable fields	Variable	Default name	number of bit
wind zonal/x component	CNU	'VENT_ZONAL '	N(B/S)U
wind meridian/y component	CNV	'VENT_MERIDIE'	N(B/S)V
wind velocity	CNWND	'WIND_VELOCIT'	N(B/S)WND
temperature	CNT	'TEMPERATURE '	N(B/S)T
geopotential	CNZ	'GEOPOTENTIEL'	N(B/S)Z
pressure	CNP	'PRESSURE '	N(B/S)P
specific humidity	CNQ	'HUMI.SPECIFI'	N(B/S)Q
relative humidity	CNR	'HUMI_RELATIV'	N(B/S)R
vertical velocity (omega)	CNVV	'VITESSE_VERT'	N(B/S)VV
divergence	CNDIV	'DIVERGENCE '	N(B/S)DIV
relative vorticity	CNVOR	'VORTICITY '	N(B/S)VOR
absolute vorticity	CNABS	'ABS_VORTICIT'	N(B/S)ABS
potential vorticity	CNPV	'POT_VORTICIT'	N(B/S)PV
potential temperature	CNTH	'TEMPE_POTENT'	N(B/S)TH
stretching deformation	CNSTD	'STRET_DEFORM'	N(B/S)STD
shearing deformation	CNSHD	'SHEAR_DEFORM'	N(B/S)SHD
passive scalars nr 1	CNSCVA(1)	'#001.SCALAR'	N(B/S)SCVA(1)
passive scalars nr 2	CNSCVA(2)	'#002.SCALAR'	N(B/S)SCVA(2)
passive scalars nr 3	CNSCVA(3)	'#003.SCALAR'	N(B/S)SCVA(3)
liquid water	CNW	'LIQUID_WATER'	N(B/S)W
solid water	CNS	'SOLID_WATER'	N(B/S)S
cloud fraction (ECMWF)	CNCLF	'CLOUD_FRACTI'	N(B/S)CLF
ozone mixing ratio	CNO3MX	'OZONE'	N(B/S)O3MX
stream function	CNKHI	'FONC.COURANT'	N(B/S)KHI
velocity potential	CNPSI	'POT.VITESSE'	N(B/S)PSI
wet bulb potential temperature	CNTPW	'THETA_PRIM_W'	N(B/S)TPW
NH pressure departure	CNPD	'PRESS.DEPART'	N(B/S)PD
NH vertical divergence	CNVD	'VERTIC.DIVER'	N(B/S)VD
NH vertical velocity (w)	CNVW	'VERT.VELOCIT'	N(B/S)VW
Free upper air field nr 1	CNUA1	'UPPER_AIR.01'	N(B/S)UA1
Free upper air field nr 2	CNUA2	'UPPER_AIR.02'	N(B/S)UA2
Free upper air field nr 3	CNUA3	'UPPER_AIR.03'	N(B/S)UA3

Notice : vertical velocity "omega" is expressed in Pa/s ; true vertical velocity "w" is

expressed in m/s.

Notice : (B/S) = B : in gridpoint ; S : in spectral

A.1.2 2D dynamic fields (CFP2DF)

Post-processable fields	Variable	Default name	number of bit
surface pressure	CNSP	'SURFPRESSION '	N(B/S)SP
mean sea level pressure	CNMSL	'MSLPRESSURE '	N(B/S)MSL
interpolated model orography	CNFIS	'SPECSURFGEOPOTEN '	N(B/S)FIS
Map factor	CNGM	'MAP_FACTOR '	N(B/S)GM
folding indicator of the iso-2 PVU surface	CNFOL	'TROPO_FOLD_INDIC'	N(B/S)FOL
ICAO jet zonal/x component of wind	CNSU1	'JETVENT_ZONAL '	N(B/S)SU1
ICAO jet meridian/y component of wind	CNSU2	'JETVENT_MERIDIEN '	N(B/S)SU2
ICAO jet pressure	CNSU3	'JETPRESSURE '	N(B/S)SU3
ICAO tropopause pressure	CNSU4	'ICAOTROP.PRESSUR '	N(B/S)SU4
ICAO tropopause temperature	CNSU5	'ICAOTROP.TEMPERA '	N(B/S)SU5
Log. of surface pressure	CNLNSP	'LOG.SURF.PRESS '	N(B/S)LNSP
Surface vertical velocity (w)	CNWWS	'SURFVERT.VELOCIT '	N(B/S)WWS

Notice : (B/S) = B : in gridpoint ; S : in spectral

A.1.3 Surface fields (CFPPHY)

Post-processable fields	Variable	Default name	number of bit
Land/sea mask	CNLSM	'SURFIND.TERREMER'	NBLSM
OUTPUT Grid-point orography, times g	CNGFIS	'SURFGEOPOTENTIEL'	NBGFIS
Surface temperature	CNST	'SURFTEMPERATURE '	NBST
Deep soil temperature	CNDST	'PROFTEMPERATURE '	NBDST
interpolated surface temperature	CNRDST	'INTSURFTEMPERATU'	NBRDST
Surface soil wetness	CNSSW	'SURFRESERV.EAU '	NBSSW
Deep soil wetness	CNDSW	'PROFRESERV.EAU '	NBDSW
Frozen deep soil wetness	CNFDSW	'PROFRESERV.GLACE'	NBFDSW
Relaxation deep soil wetness	CNRDSW	'RELAPROP.RMAX.EA'	NBRDSW
Clim. relative surface soil wetness	CNCSSW	'SURFPROP.RMAX.EA'	NBCSSW
Clim. relative deep soil wetness	CNCDSW	'PROFPROP.RMAX.EA'	NBCDSW
Snow depth	CNSD	'SURFRESERV.NEIGE'	NBSD
Snow density	CNSNDE	'SURFDENSIT.NEIGE'	NBSNDE
Surface roughness, times g	CNSR	'SURFZ0.FOIS.G '	NBSR
Roughness length of bare surface, times g	CNBSR	'SURFZ0REL.FOIS.G'	NBBSR
Snow surface albedo	CNAL	'SURFALBEDO '	NBAL
Bare surface albedo	CNALSN	'SURFALBEDO NEIGE'	NBALSN
Albedo	CNBAAL	'SURFALBEDO.COMPL'	NBBAAL
Emissivity	CNEMIS	'SURFEMISSIVITE '	NBEMIS
Std. deviation of orography, times g	CNSDOG	'SURFET.GEOPOTENT'	NBSDOG
percentage of vegetation	CNVEG	'SURFPROP.VEGETAT'	NBVEG
percentage of land	CNLAN	'SURFPROP.TERRE '	NBLAN
Anisotropy coeff. of topography	CNACOT	'SURFVAR.GEOP.ANI'	NBACOT
Direction of main axis of topography	CNDPAT	'SURFVAR.GEOP.DIR'	NBDPAT
Type of vegetation	CNIVEG	'SURFIND.VEG.DOMI'	NBIVEG
Stomatal minimum resistance	CNRSMIN	'SURFRESI.STO.MIN'	NBRSMIN
Silt percentage within soil	CNARG	'SURFPROP.ARGILE'	NBARG
Percentage of sand	CNSAB	'SURFPROP.SABLE'	NBSAB
Root depth	CND2	'SURFEPAIS.SOL'	NBD2
Leaf area density	CNLAI	'SURFIND.FOLIAIRE'	NBLAI
Resistance to evapotranspiration	CNHV	'SURFRES.EVAPOTRA'	NBHV
Thermal roughness length (times g)	CNZ0H	'SURFGZ0.THERM'	NBZ0H
Interception content	CNIC	'SURFRESERV.INTER'	NBIC
Frozen superficial soil wetness	CNFSSW	'SURFRESERV.GLACE'	NBFSSW
Frozen deep soil wetness	CNFDSW	'PROFRESERV.GLACE'	NBFDSW

A.1.4 Cumulated fluxes (CFPCFU)

Post-processable fields	Variable	Default name	number of bit
Large Scale Precipitation	CNCLSP	'SURFPREC.EAU.GEC'	NBCLSP
Convective precipitation	CNCCP	'SURFPREC.EAU.CON'	NBCCP
Large Scale Snow fall	CNCLSS	'SURFPREC.NEI.GEC'	NBCLSS
Convective Snow Fall	CNCCSF	'SURFPREC.NEI.CON'	NBCCSF
U-stress	CNCUSS	'SURFTENS.TURB.ZO'	NBCUSS
V-stress	CNCVSS	'SURFTENS.TURB.ME'	NBCVSS
Surface Sensible Heat Flux	CNCSSH	'SURFFLU.CHA.SENS'	NBCSSH
Surface Latent Heat Flux	CNCSLH	'SURFCHAL LATENTE'	NBCSLH
Tendency of Surface pressure	CNCTSP	'SURFPRESSION SOL'	NBCTSP
Total Cloud cover	CNCTCC	'ATMONEBUL.TOTALE'	NBCTCC
Boundary Layer Dissipation	CNCBLD	'SURFDISSIP SURF '	NBCBLD
Surface solar radiation	CNCSSR	'SURFFLU.RAY.SOLA'	NBCSSR
Surface Thermal radiation	CNCSTR	'SURFFLU.RAY.THER'	NBCSTR
Top Solar radiation	CNCTSR	'SOMMFLU.RAY.SOLA'	NBCTSR
Top Thermal radiation	CNCTTR	'SOMMFLU.RAY.THER'	NBCTTR
Convective Cloud Cover	CNCCCC	'ATMONEBUL.CONVEC'	NBCCCC
Surface downward moon radiation	CNCSMR	'SURFRAYT.LUNE.DE'	NBCSMR
High Cloud Cover	CNCHCC	'ATMONEBUL.HAUTE '	NBCHCC
Medium Cloud Cover	CNCMCC	'ATMONEBUL.MOYENN'	NBCMCC
Low Cloud Cover	CNCLCC	'ATMONEBUL.BASSE '	NBCLCC
U-Gravity-Wave Stress	CNCUGW	'SURFTENS.DMOG.ZO'	NBCUGW
V-Gravity-Wave Stress	CNCVGW	'SURFTENS.DMOG.ME'	NBCVGW
Water Evaporation	CNCE	'SURFFLU.MEVAP.EA'	NBCE
Snow Sublimation	CNCS	'SURFFLU.MSUBL.NE'	NBCS
Latent Heat Evaporation	CNCLHE	'SURFFLU.LAT.MEVA'	NBCLHE
Latent Heat Sublimation	CNCLHS	'SURFFLU.LAT.MSUB'	NBCLHS
Cloudiness	CNCC	'SURFCUMUL NEBUL '	NBCC
Soil Moisture	CNCWS	'SURFCONTENU EAU '	NBCWS
Snow mass	CNCSNS	'SURFRESERV NEIGE'	NBCSNS
Total precipitable water	CNCQTO	'ATMOHUMI TOTALE '	NBCQTO
Total Ozone	CNCTO3	'ATMOOZONE TOTALE'	NBCTO3
Top mesospheric enthalpy	CNCTME	'TOPMESO ENTH '	NBCTME
Solid specific moisture	CNCICE	'ATMOHUMI SOLIDE '	NBCICE
Liquid specific moisture	CNCLI	'ATMOHUMI LIQUIDE'	NBCLI
Contribution of Convection to U	CNCCVU	'SURFFL.U CONVEC'	NBCCVU
Contribution of Convection to V	CNCCVV	'SURFFL.V CONVEC'	NBCCVV
Contribution of Convection to Q	CNCCVQ	'SURFFL.Q CONVEC'	NBCCVQ
Contribution of Convection to Cp.T	CNCCVS	'SURFFL.CT CONVEC'	NBCCVS
Contribution of Turbulence to Q	CNCTUQ	'SURFFL.Q TURBUL'	NBCTUQ
Contribution of Turbulence to Cp.T	CNCTUS	'SURFFL.CT TURBUL'	NBCTUS

Post-processable fields	Variable	Default name	number of bit
Clear sky shortwave radiative flux	CNCSOC	'SURFRAYT SOL CL '	NBCSOC
Clear sky longwave radiative flux	CNCTHC	'SURFRAYT THER CL'	NBCTHC
Surface parallel solar flux	CNCSOP	'SURFRAYT DIR SUR'	NBCSOP
Top parallel solar flux	CNCTOP	'TOPRAYT DIR SOM '	NBCTOP
Surface down solar flux	CNCSOD	'SURFRAYT DIFF DE'	NBCSOD
Surface down thermic flux	CNCTHD	'SURFRAYT THER DE'	NBCTHD
Melt snow	CNCFON	'SURFFONTE NEIGE '	NBCFON
flux de chaleur dans le sol	CNCCHS	'SURFCHAL. DS SOL'	NBCCHS
flux d eau dans le sol	CNCEAS	'SURFEAU DANS SOL'	NBCEAS
Ruissellement du reservoir superficiel	CNCSRU	'SURFRUISSELLEMEN'	NBCSRU
Ruissellement du reservoir profond	CNCDRU	'PROFRUISSELLEMEN'	NBCDRU
Ruissellement du reservoir d interception	CNCIRU	'SURFRUISS. INTER'	NBCIRU
Evapotranspiration	CNCETP	'SURFEVAPOTRANSPI'	NBCETP
Transpiration	CNCTP	'SURFTRANSPIRATIO'	NBCTP

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

A.1.5 Instantaneous fluxes (CFPXFU)

Post-processable fields	Variable	Default name	number of bit
U-component of wind at 10 meters (pbl)	CNX10U	'CLSVENT.ZONAL '	NBX10U
V-component of wind at 10 meters (pbl)	CNX10V	'CLSVENT.MERIDIEN'	NBX10V
Maximum temperature at 2 meters	CNXX2T	'CLSMINI.TEMPERAT'	NBXX2T
Minimum temperature at 2 meters	CNXN2T	'CLSMAXI.TEMPERAT'	NBXN2T
Temperature at 2 meters (pbl)	CNX2T	'CLSTEMPERATURE '	NBX2T
Specific Humidity at 2 meters (pbl)	CNX2SH	'CLSHUMI.SPECIFIQ'	NBX2SH
Relative Humidity at 2 meters (pbl)	CNX2RH	'CLSHUMI.RELATIVE'	NBX2RH
Total Cloud cover	CNXTCC	'SURFNEBUL.TOTALE'	NBXTCC
Convective Cloud Cover	CNXCCC	'SURFNEBUL.CONVEC'	NBXCCC
High Cloud Cover	CNXHCC	'SURFNEBUL.HAUTE '	NBXHCC
Medium Cloud Cover	CNXMCC	'SURFNEBUL.MOYENN'	NBXMCC
Low Cloud Cover	CNXLCC	'SURFNEBUL.BASSE '	NBXLCC
Contribution of Convection to U	CNXCVU	'S000FL.U CONVEC'	NBXCVU
Contribution of Convection to V	CNXCVV	'S000FL.V CONVEC'	NBXCVV
Contribution of Convection to Q	CNXCVQ	'S000FL.Q CONVEC'	NBXCVQ
Contribution of Convection to Cp.T	CNXCVS	'S000FL.CT CONVEC'	NBXCVS
Contribution of Turbulence to U	CNXTUU	'S000FL.U TURBUL'	NBXTUU
Contribution of Turbulence to V	CNXTUV	'S000FL.V TURBUL'	NBXTUV
Contribution of Turbulence to Q	CNXTUQ	'S000FL.Q TURBUL'	NBXTUQ
Contribution of Turbulence to Cp.T	CNXTUS	'S000FL.CT TURBUL'	NBXTUS
Large Scale Precipitation	CNXLSP	'S000PLUIE STRATI'	NBXLSP
Convective precipitation	CNXCP	'S000PLUIE CONVEC'	NBXCP
Large Scale Snow fall	CNXLSS	'S000NEIGE STRATI'	NBXLSS
Convective Snow Fall	CNXCSF	'S000NEIGE CONVEC'	NBXCSF
Contribution of Gravity Wave drag to U	CNXGDU	'S000FL.U ONDG.OR'	NBXGDU
Contribution of Gravity Wave drag to V	CNXGDV	'S000FL.V ONDG.OR'	NBXGDV
Top solar radiation	CNXSSR	'S000RAYT.SOLAIRE'	NBXSSR
Top Thermal radiation	CNXSTR	'S000RAYT.TERREST'	NBXSTR
Top Solar radiation	CNXTSR	'SOMMRAYT.SOLAIRE'	NBXTSR
Top Thermal radiation	CNXTTR	'SOMMRAYT.TERREST'	NBXTTR
Cloudiness out of "Araneb", at the level the closest to 550 hPa	CNXC	'SURFCUMUL NEBUL '	NBXC

A.2 NAMCT0

This namelist contains control parameters used in FULL-POS

NCONF : configuration ; see section 2.3

LFPOS : FULL-POS main switch ; see section 2.3

NFRPOS : post-processing frequency ; see section 2.3

NPOSTS : post-processing control array ; see section 2.3

LIOGAUX : I/O on unfitted vertically post-processed fields ; see section 6.2.2

LIOFOU1 : I/O on Fourier data ; see section 6.2.5

LIOLPOL : I/O on Legendre polynomial see section 6.2.5

LIOSPEC : I/O on saved spectral data ; see section 6.2.4

LIOSUA : I/O on saved upper air gridpoint data ; see section 6.2.4

LIOSSU : I/O on saved surface data ; see section 6.2.4

LIOSCF : I/O on saved cumulated fluxes data ; see section 6.2.4

LIOSXF : I/O on saved instantaneous fluxes data ; see section 6.2.4

LMLTSK : switch for multitasking

NTASKS : number of processors

CNPPATH : path name for selection files ; see section 6.3.4

CFPNCF : file name for FULL-POS control file ; see section 7.3.2

A.3 NAMFPC

This namelist contains the list of the fields to post-process, the format of the output subdomain(s), and various options of post-processing.

CFPFMT : format of the output files ; see section 4.1

CFPDOM : names of the subdomains ; see section 4.1

CFP3DF : 3D dynamics fields to post-process ; see section 4.1

CFP2DF : 2D dynamics fields to post-process ; see section 4.1

CFPPHY : Physical fields to post-process ; see section 4.1

CFPCFU : Cumulated fluxes to post-process ; see section 4.1

CFPXFU : Instantaneous fluxes to post-process ; see section 4.1

RFP3P : post-processing pressure levels ; see section 4.1

RFP3H : post-processing height levels (above orography) ; see section 4.1

RFP3TH : post-processing potential temperature levels ; see section 4.1

RFP3PV : post-processing potential vorticity levels ; see section 4.1

NRFP3S : post-processing eta levels ; see section 4.1

LFITP : Spectral fit of pressure levels post-processed fields ; see section 6.1.1

LFITT : Spectral fit of isentropic levels post-processed fields ; see section 6.1.1

LFITV : Spectral fit of potential vorticity levels post-processed fields ; see section 6.1.1

LFIT2D : Spectral fit of 2D dynamic post-processed fields ; see section 6.1.1

LFITS : Spectral fit of eta levels post-processed fields ; see section 6.4.3

LFPQ : .F. to interpolate specific humidity from relative humidity ; see section 6.1.2

FPBL : Critical thickness of the planetary boundary layer ; see section 6.1.2

LSNOWI : Snow in input file ; see section 6.1.2

LSNOWO : Snow in output file ; see section 6.1.2

LFPUVDZ : divergence/vorticities computed from wind ; see section 6.1.3

LFPUVKP : velocity potential/stream function computed from wind ; see section 6.1.4

NFPCLI : Level usage of climatology ; see section 6.1.5

LFPNORM : prints out mean values of post-processed fields ; see section 6.4.2

LTRACEFP : verboose option ; see section 6.4.2

LFPSPEC : switch for "process 927" ; see section 7.1

LFPBACK : switch for going back to the initial geometry ; see section 7.3.3

CFPDIR : prefix for the output files ; see section 6.3.1

NFPGRIB : level of GRIB coding in output file for fields ; see section 6.4.4

RFPMXZ : Non-critical maximum difference between interpolated orography and output orography ; see section 6.1.2

WSXO : maximum surface moisture in output ; see section 6.1.7

WDXO : maximum deep soil moisture in output ; see section 6.1.7

WCXO : maximum "climatological" moisture in output ; see section 6.1.7

NDOMFP : domain definition of fields in files for LAM output ; see section 6.4.5

LFPGPQ : to compute gridpoint humidity rather than spectral ; see section 6.1.8

LFPGPL : to compute gridpoint liquid water rather than spectral ; see section 6.1.8

LFPGPI : to compute gridpoint ice rather than spectral ; see section 6.1.8

LFPGPA : to compute gridpoint cloud fraction rather than spectral ; see section 6.1.8

LFPGPO3 : to compute gridpoint ozone rather than spectral ; see section 6.1.8

LFPRH100 : to convert relative humidity in percent ; see section 6.4.6

LFPLOSP : to handle surface pression or its logarithm, taking into account the value of NLOSP ; see section 6.4.6

RFPCORR : critical height difference between source and model orography ; see section 6.1.5

RFPCSAB : Critical sand percentage difference between source and model climatology ; see section 6.1.5

RFPCD2 : Critical soil depth difference between source and model climatology ; see section 6.1.5

LFPMOIS : Month allowed for climatology usage ; see section 6.1.5

NFPINCR : bogussing parameter ; see section 8.2

A.4 NAMDIM

This namelist contains dimensionning parameters for FULL-POS ; see section 6.2.6

NPMAX : Post-processing over-truncation

NPROMA : Vector length for the first part of the configurations 927, e927, ee927, and for standard post-processing.

IPROM2 : Vector length for the second part of the configurations 927, e927, ee927

A.5 NAMDYN

This namelist contains variables related to the dynamics of the model, that may be useful for the post-processing :

NLOSP : To use surface pressure or its logarithm as the primitive variable

NDLNPR : special discretisation of delta(Log(P)) for non-hydrostatism.

A.6 NAMFPD

This namelist defines the boundaries and the horizontal dimensions of the output (sub)-domain(s). See to section 4.2

NLAT : number of latitudes for each output (sub)domain

NLON : number of longitudes for each output (sub)domain

RLATN : northern latitude in degrees for each output (sub)domain

RLATS : southern latitude in degrees for each output (sub)domain

RLONW : western longitude in degrees for each output (sub)domain

RLONE : eastern longitudes in degrees for each output (sub)domain

NFPGUX : actual last row of latitude for LAM output

NFPZONL : half the size of area I in x for LAM output

NFPZONG : half the size of area I in y for LAM output

A.7 NAMFPG

This namelist defines the geometry of the output (sub)domain(s). See section 4.3

NFPLEV : number of output eta levels

FPVALH : "A" coefficients of output vertical system

FPVBH : "B" coefficients of output vertical system

FPVP00 : Reference pressure for output vertical system

NFPMAX : truncation order (in meridional direction for LAM output)

NFPTTYP : Rotation parameter for Gaussian grid, or translation parameter for limited area grids

FPMUCEN : Sine of the latitude of the pole of interest for Gaussian grid, or sine of the latitude of the observed cyclone for limited area grids.

FPLOCEN : Longitude of the pole of interest for Gaussian grid, or longitude of the observed cyclone (in degrees)

NFPHTYP : grid reduction for Gaussian grid for limited area grids.

NFPRGRI : number of active points on each for Gaussian grid

FPSTRET : stretching factor for Gaussian grid

NFPQUAD : Quadrature for Gaussian grid

NMFPMAX : Truncation order in zonal direction for LAM output

FPRPK : K projection parameter and definition for LAM output

NFPSOTRP : isotropy parameter under projection for LAM output

NFPGIV0 : choice of reference point for projection for LAM output

FPLON0 : geographic longitude of projection reference point in degrees for LAM output

FPLAT0 : geographic latitude of projection reference point in degrees for LAM output

NFPROTEQ : Parameter of rotation for LAM output

FPLONR : geographic longitude of rotation reference point in degrees for LAM output

FPLATR : geographic latitude of rotation reference point in degrees for LAM output

FPBETA : Angle of rotation in degrees for LAM output

FPLX : wavelength in longitude for LAM output

FPLY : wavelength in latitude for LAM output

A.8 NAMFPF

This namelist defines the filtering functions in spectral space after the vertical interpolations. See section 6.1.6

LFPFIL : switch to filter derivatives in Arpege/Ifs

NFMAX : truncation order in unstretched space to filter derivatives in Arpege/Ifs

RFPWID : "window" of the filter for derivatives in Arpege/Ifs

RFPEPS : value at the window right side of the filter for derivatives in Arpege/Ifs

LFPBED : switch for bell-shaped filter on derivatives in Aladin

RFPBED : Intensity of bell-shaped filter on derivatives in Aladin

LFPBEG : switch for bell-shaped filter on geopotential

RFPBEG : bell-shaped filter on geopotential

LFPBET : switch for bell-shaped filter on temperature

RFPBET : bell-shaped filter on temperature

LFPBEP : switch for bell-shaped filter on mean sea level pressure

RFPBEP : bell-shaped filter on mean sea level pressure

LFPBEH : switch for bell-shaped filter on relative humidity

RFPBEH : bell-shaped filter on relative humidity

LFPBEL : switch for Bell-shaped filter on all other non-derivatives

RFPBEL : bell-shaped filter on all other non-derivatives

A.9 NAMFPSC2

This namelist deals with vectorisation and memory space in FULL-POS. See section 6.2.7

NFPROMAG : Working dimension of horizontal post-processing subrows

A.10 NAMFPEZO

This namelist deals with vectorisation / memory used and distribution of the computation of the extension zone in FULL-POS. see section 6.4.5

NSTREFP : number of processors used to compute the extension zone

NFPROMEL Vector length in the computation of the extension zone

A.11 NAMIOS

This namelist contains I/O parameters used in FULL-POS ; see section 6.2.2, 6.2.4 and 6.2.5

CIOGAUX : workfile name of unfitted vertically post-processed fields

NPCKFGX : packing factor for I/O on vertically post-processed fields

NEXPBGX : Number of bits for exp. when packing on vertically post-processed fields

CIOFOU1 : workfile name for Fourier data

NBLFOU : segment length for complex IO on Fourier data

CIOLPOL : workfile name for Legendre polynomials

CIOTMDT : workfile name of gridpoint fields at t-dt

NPCKFT9 : packing factor for I/O on gridpoint fields at t-dt

NEXPBT9 : Number of bits for exp. when packing gridpoint fields at t-dt

CIOGPUA : workfile name of upper air gridpoint fields

NPCKFGU : packing factor for I/O on upper air gridpoint fields

NEXPBGU : Number of bits for exp. when packing upper air gridpoint fields

CIOGPP : workfile name of surface fields

NPCKFGP : packing factor for I/O on surface fields

NEXPBGP : Number of bits for exp. when packing surface fields

CIOCFU : workfile name of cumulated fluxes

NPCKFCF : packing factor for I/O on cumulated fluxes

NEXPBCF : Number of bits for exp. when packing cumulated fluxes

CIOXFU : workfile name of instantaneous fluxes

NPCKFXF : packing factor for I/O on instantaneous fluxes

NEXPBXF : Number of bits for exp. when packing instantaneous fluxes

CIOSPEC : workfile name of saved spectral data

CIOSUA : workfile name of saved upper air gridpoint data

CIOSSU : workfile name of saved surface data

CIOSCF : workfile name of saved cumulated fluxes data

CIOSXF : workfile name of saved instantaneous fluxes data

A.12 NAMFPIOS

This namelist deals with I/O and memory space in FULL-POS.

NFPXFLD : Number of fields extracted from a post-processing buffer/workfile ; see section 6.2.1

For the following parameters, see section 6.2.3

LIOFPD : I/O switch for post-processed dynamic data

LIOFPP : I/O switch for post-processed physic/fluxes

LIOFPW : I/O switch for weights

LIOFPR : I/O switch for output geometry and climatology

LIOFPA : I/O switch for pre-processed dynamic data

CIOFPD : workfile name for post-processed dynamic data

CIOFPP : workfile name for post-processed physic/fluxes

CIOFPW : workfile name for weights

CIOFPR : workfile name for output geometry and climatology

CIOFPA : workfile name for pre-processed dynamic data

NPCKFFPD : packing factor for post-processed dynamic data

NPCKFFPP : packing factor for post-processed physic/fluxes

NPCKFFPW : packing factor for weights

NPCKFFPR : packing factor for output geometry/climatology

NPCKFFPA : packing factor for pre-processed dynamic data

NEXPBFPD : Number of bits for exp. when packing on post-processed dynamic data

NEXPBFPP : Number of bits for exp. when packing on post-processed physic/fluxes

NEXPBFPW : Number of bits for exp. when packing on weights

NEXPBFPR : Number of bits for exp. when packing on output geometry/climatology

NEXPBFPA : Number of bits for exp. when packing on pre-processed dynamic data

A.13 NAMOPH

This namelist contains parameters used in FULL-POS to control output file names

LINC : .TRUE. to get time stamp in hours rather than in time steps

A.14 NAMPAR1

This namelist contains parameters used in FULL-POS to control the distribution during I/O operations :

NSTRIN : number of processors used for reading then unpacking

NSTROUT : number of processors used for packing

B SELECTION FILES : AN EXAMPLE

Imagine you want 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

The solution can be :

```
/NAMCT0
   CNPPATH='.',
/END
/NAMFPC
   CFP2DF(1)='SPECSURFGEOPOTEN',
   CFP2DF(2)='SURFPRESSION',
   CFP3DF(1)='GEOPOTENTIEL',
   CFP3DF(2)='TEMPERATURE',
   CFP3DF(3)='POT_VORTICIT',
   RFP3P(1)=500.,
   RFP3P(2)=850.,
   RFP3T(1)=300.,
   CFPDOM(1)='FRANCE',
   CFPDOM(2)='EUROC25',
/END
```

And then under the current directory :

```
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
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
```