
GEV

GETTING STARTED with ALADIN

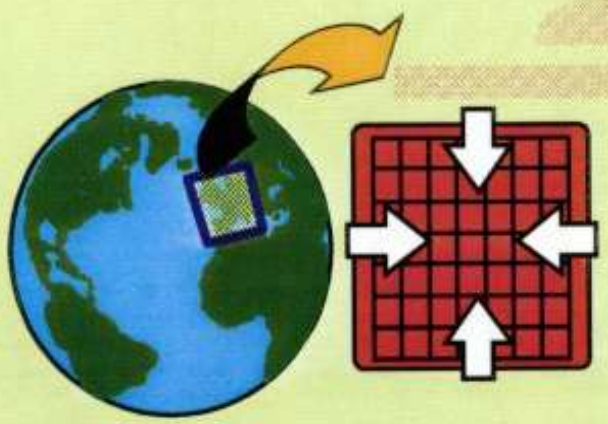
(by Jean-Daniel GRIL - August 1997)

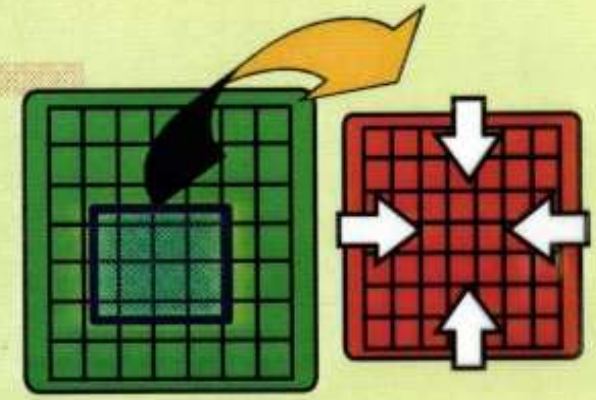
INTRODUCTION

- Aladin is a limited area model
- It works on a cartesian grid
- It needs coupling files and an initial file which may be an ALADIN analysis (not usual in Météo-France)

INTRODUCTION

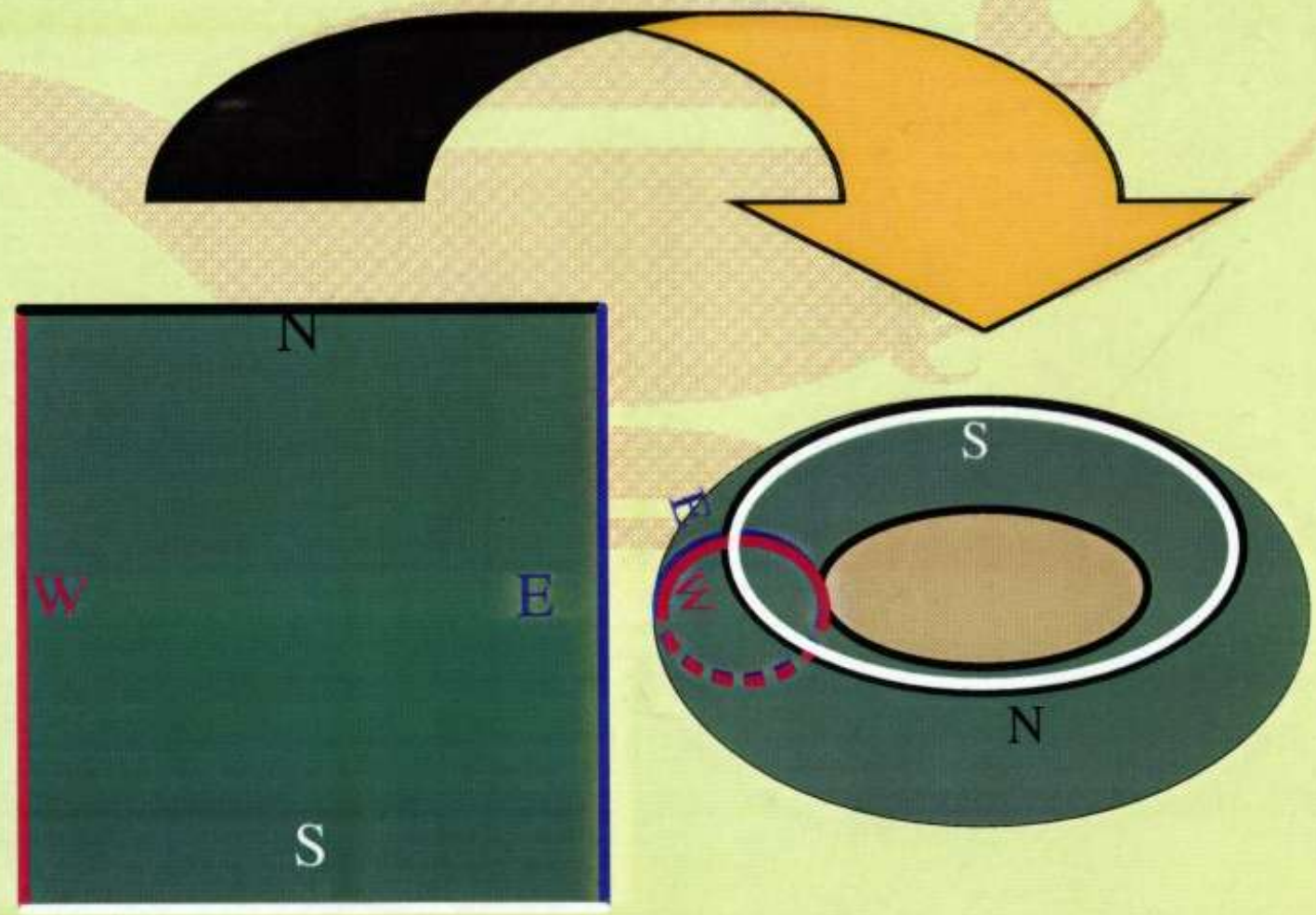
- Coupling is made of informations given to the model at the boundaries of the domain at regular time intervals
- These informations can be extracted from:
  - The global model ARPEGE
  - A larger ALADIN, which domain includes the smaller one



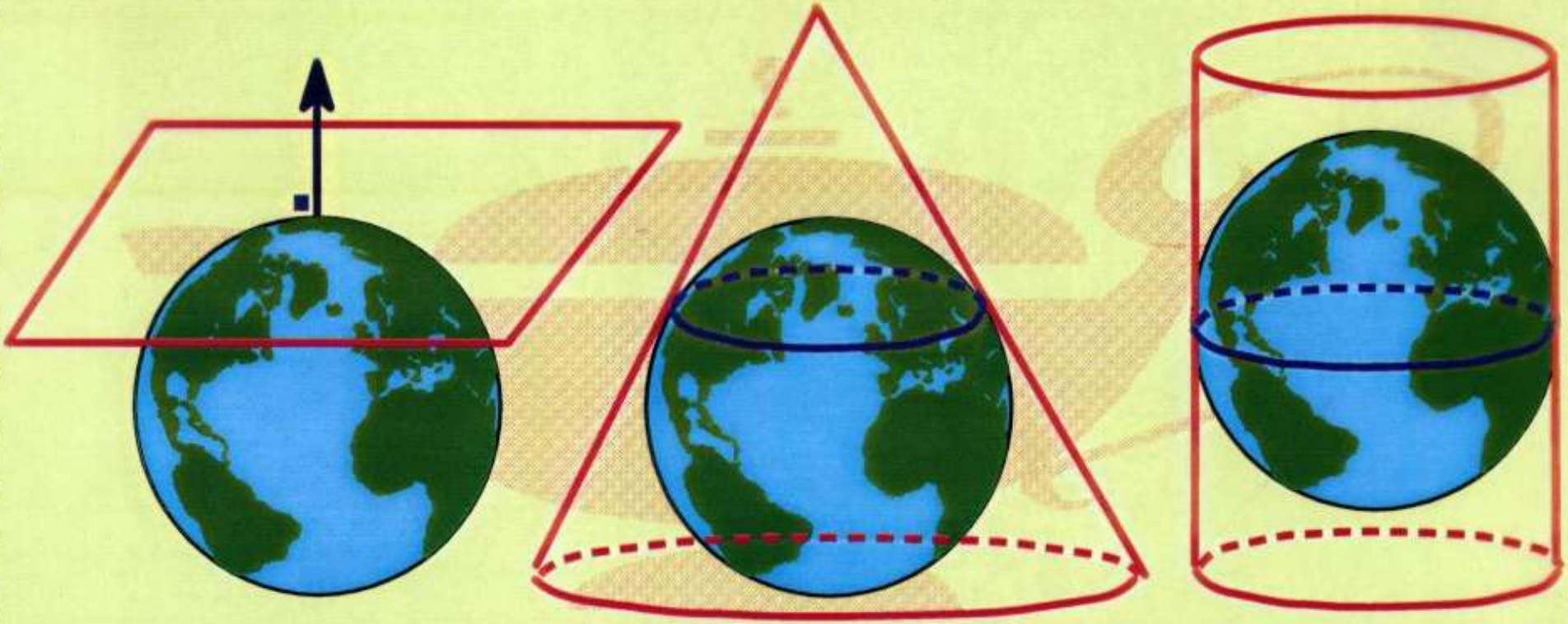


INTRODUCTION

- ALADIN is a bi-periodic model. The representation of its computation area is a torus:



INTRODUCTION



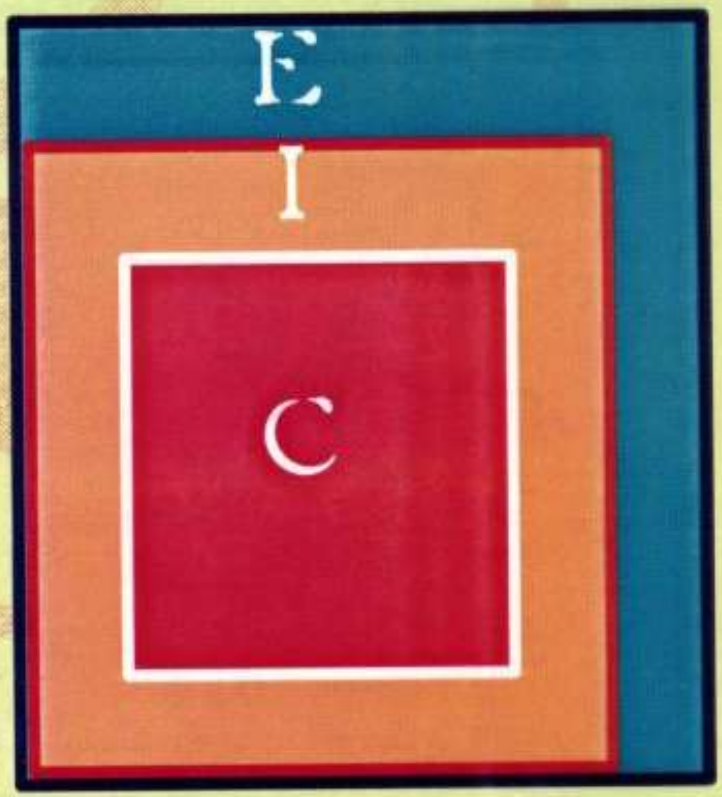
- Cartesian grid can be used with 3 types of projection :
  - Polar Stereographic
  - Lambert Conformal Conic
  - Mercator

HOW to CREATE an ALADIN DOMAIN

- The ALADIN domain is defined by 2 types of parameters :
  - Geographical and projection data. In ALADIN, this part is managed by EGGX library routines
  - Computation array definitions (limits, special indexes, ...)

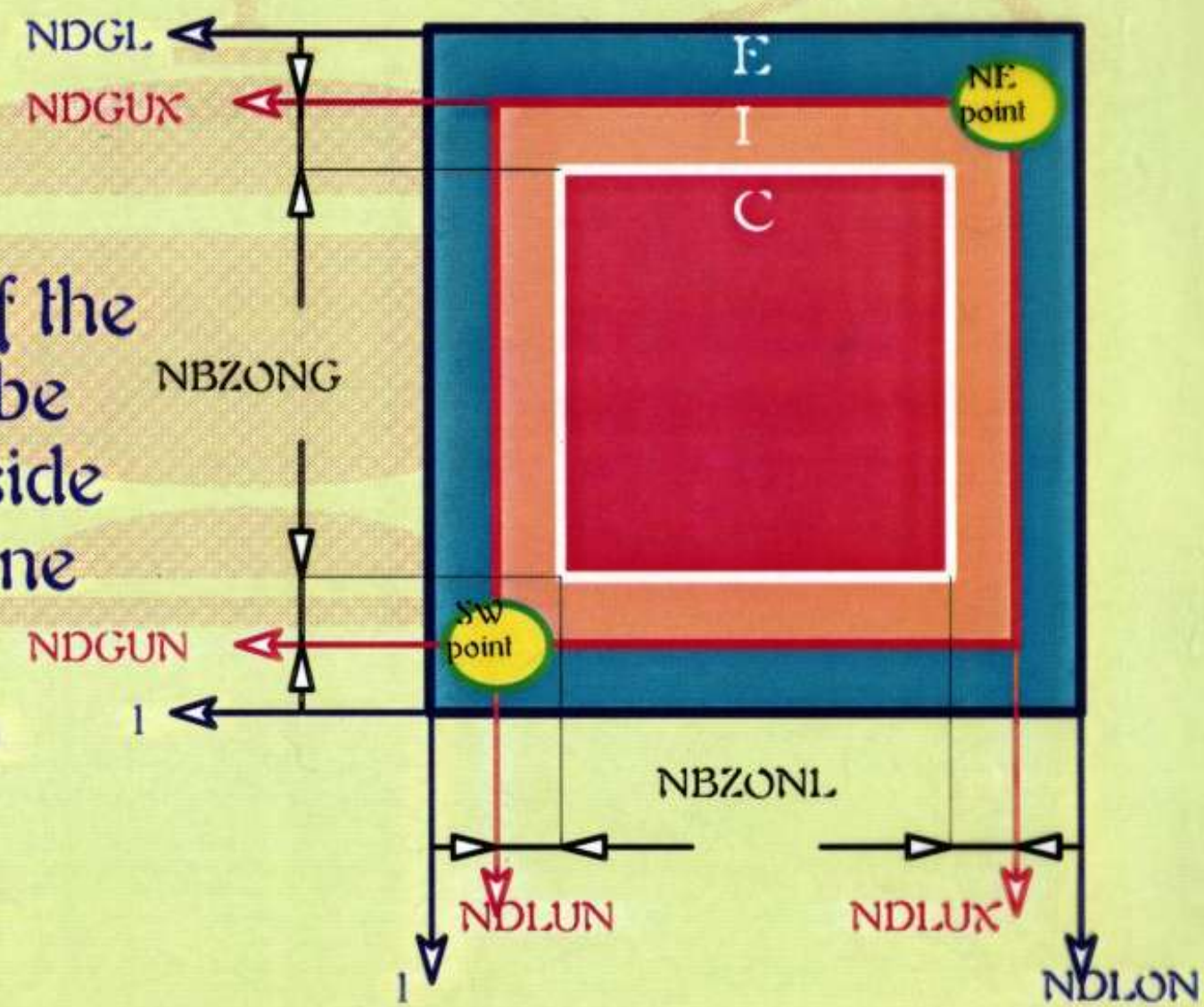
HOW to CREATE an ALADIN DOMAIN - (Computation part)

- ALADIN needs a two-dimensional array divided in 3 regions :
  - C zone : central zone (pure ALADIN computations)
  - I zone : intermediate zone (continuity of data between pure coupling values and pure ALADIN C zone values)
  - E zone : extension zone (mathematical zone to create c the bi-periodicity of the model)



HOW to CREATE an ALADIN DOMAIN - (Computation part)

The position of the C+I zone can be everywhere inside the C+I+E zone (usually in left bottom corner)



HOW to CREATE an ALADIN DOMAIN - (Computation part)

- The use of FFT impose us specific values for NDLON and NDGL.
  - NDLON $= 2^n.3^m.5^p$ $(m,n,p \in N)$
  - NDGL $= 2^i.3^j.5^k$ $(i,j,k \in N)$
- Truncations on X and Y are respectively NMSMAX and NSMAX and verify :
  - 3.NMSMAX + 1 < NDLON
  - 3.NSMAX + 1 < NDGL

HOW to CREATE an ALADIN DOMAIN - (Geographical Part)

EGGX needs as input parameters :

- Reference Point Coodinates (ELON0,ELAT0)
- Center Point Coordinates (ELONC,ELATC)
- Zonal & Meridian Resolution (PDELX,PDELY)
- Zonal & Meridian number of Points (ND.UX-ND.UN+1)

EGGX returns 5 arrays :

- PGELAM(X,Y) Longitude at X,Y point
- PGELAT(X,Y) Latitude at X,Y point
- PGM(X,Y) Map factor at X,Y point
- PGNORX(X,Y) sinus of angle of Grid with Geographic North at X,Y point
- PGNORY(X,Y) cosine of angle of Grid with Geographic North at X,Y point

THE 3 CONFIGURATIONS (introduction)

- The full use of the ALADIN model needs the knowledge of 3 configurations (specific states of run, work, input data and results) :
  - Configuration 923 : prepares climatological files
  - Configuration E927, EE927 : prepares coupling files
  - Configuration 001 : makes forecast files

THE 3 CONFIGURATIONS (configuration 001)

- The forecast part of the namelist defines computing parameters (time-step, time of post-processing, ...) and physical parameters
- The post-processing part of the namelist can define the output domain, data fields, types and values of vertical levels
- This configuration can be launched by using a command line that defines the most important and useful parameters of the namelist and fill some of them with data contained in the input files (-see below-)

THE 3 CONFIGURATIONS (configuration 001)

- This configuration is used for the forecast itself. It needs coupling files at regular time intervals as input files. The first coupling file is used to initialize the model (C+I zone), the others give informations at the boundaries of the domain (inside the I zone). Like the other configurations it works with one namelist file (to specify parameters). This namelist file is divided into two parts (-see below-):
  - one part for the forecast
  - one part for post-processing

THE 3 CONFIGURATIONS (configurations E927, EE927)

- When you run really a forecast with ARPEGE or ALADIN, you can post-process directly the output on a special domain in a coupling ALADIN format, but in this case you can have only this format and not a user-defined grid point post-processing format (useful to plot or to interpret it) because post-processing part do only one output format for a run.
  - For this reason, we will make coupling files by the previous method if the input files come from operational ARPEGE runs (in this case the operational post-processed ARPEGE files are global to be used by forecasters and not in the ALADIN historical format)

THE 3 CONFIGURATIONS (configurations E927, EE927)

- This configuration is in fact a configuration 001 (forecast) with historical file as input and no integration (the type of the model used is function of the type of input file, ARPEGE -configuration E927- or ALADIN -configuration EE927-). The post-processed output file is on the wanted domain used for the ALADIN forecast.
  - Usually you need climatological files for post-processing (see above)
  - To produce each coupling file, you must run the configuration, starting from your corresponding input file
  - The coupling files have a ALADIN historical format (spectral)

NAMELISTS and LIBRARIES (namelists -output selection-)

- You can select the type of output file (historical or/and post-process) and the time of outputs by using the following parameters in **NAMCT0** :
  - **NFRxxx** : frequency
  - **NxxxTS** : (|n| + 1) dimensional array -see below-
    - **xxx** : **HIS** for historical file
      : **POS** for post-process file

NAMELISTS and LIBRARIES (namelists -output selection-)

⇨ If **NxxxTS(0)=0**

↳ regular output each **NFRxxx** time step

⇨ If **NxxxTS(0)=n** (with $n > 0$)

↳ n outputs defined by the user at time-steps

NxxxTS(i)*NFRxxx ($i \in [1,n]$)

⇨ If **NxxxTS(0)=n** (with $n < 0$)

↳ n outputs defined by the user at ranges (full hours)

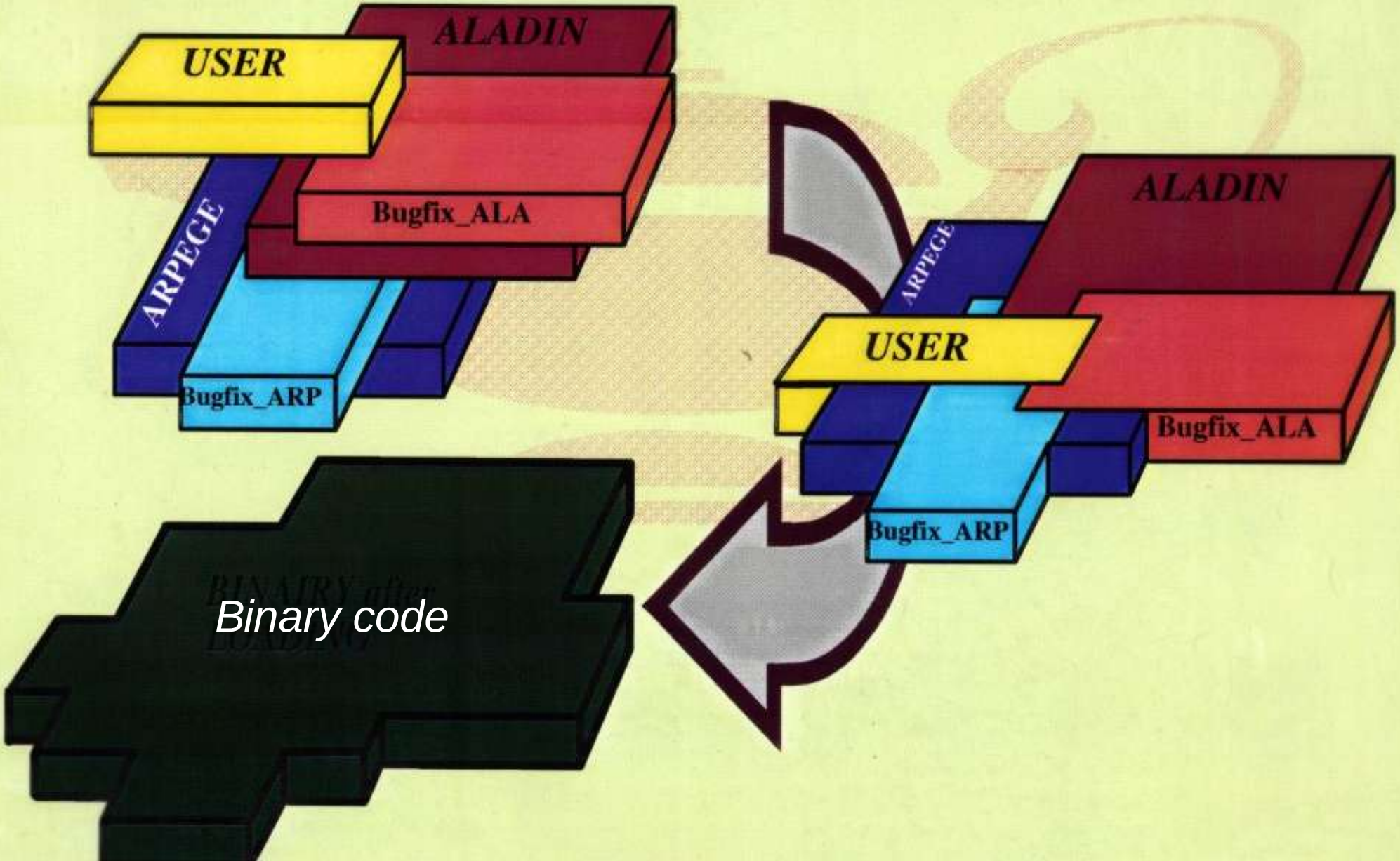
|NxxxTS(i)|*NFRxxx ($i \in [1,-n]$)

💣 The chosen ranges must be an integer number of time-steps

➔ To deselect a file you can do :

- **NxxxTS(0)=1**
- **NxxxTS(1)=NSTOP+1** (**NSTOP** is the last time-step)

NAMELISTS and LIBRARIES (loading representation)



THE COMMAND LINE

- Program of ALADIN model (named usually MASTER) in configuration 001 can be call with an Unix style command line. Benefits are :
  - scripts with namelist are more simple because many parameters of the namelist are filled directly from input file (see below the structure of file) when, at least, one argument is passed to the command line
  - inconsistence of initialization file and namelist can be avoided
  - arguments of the command line permits many different executions without reloading associated namelists but only the change of arguments of the command line for each launch and the use of only one namelist
- Example :

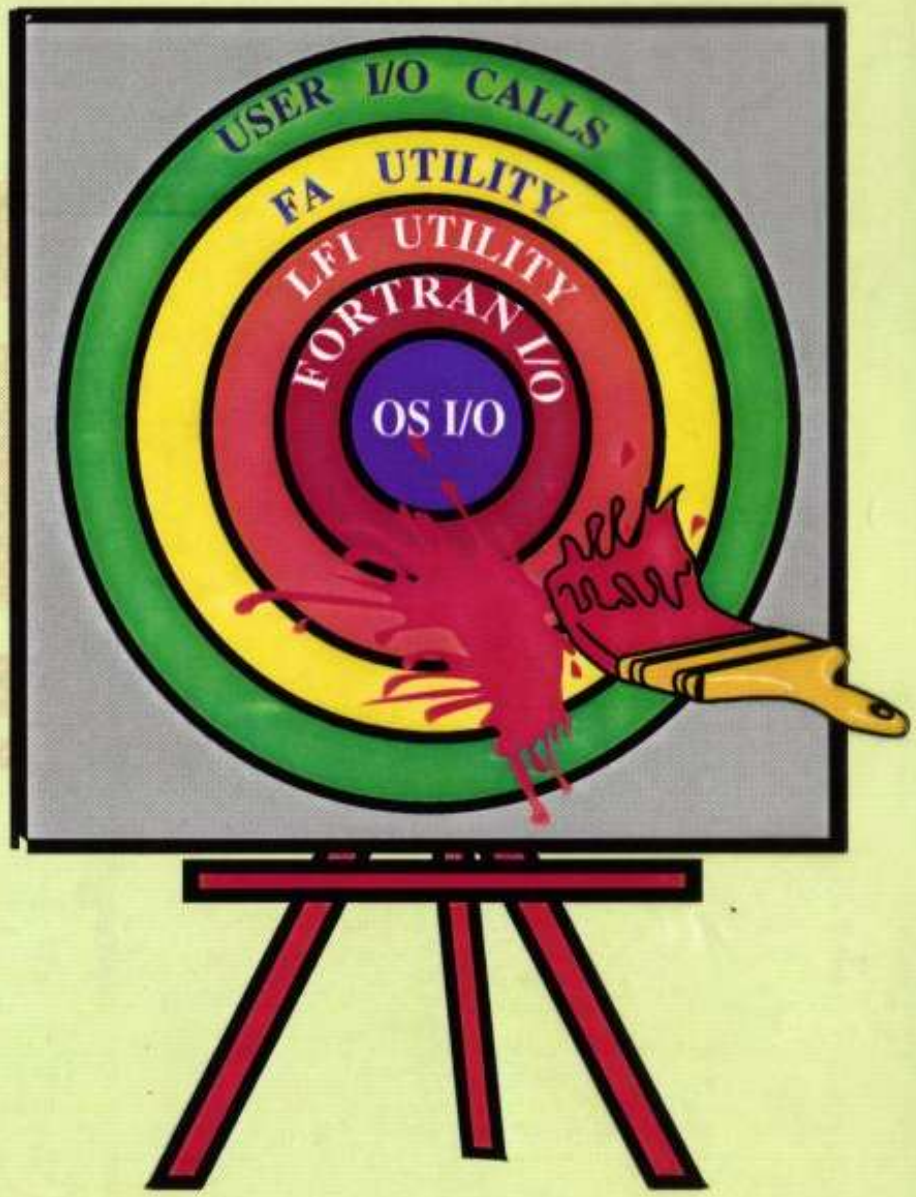
```
MASTER -c001 -vmeteo -maladin -eTEST -t200 -fh36 -asli > lola 1| debug -B -s MASTER
```

THE COMMAND LINE
(options)

- **-c** : configuration (equivalent to NCONF)
  - available values : **001**
- **-v** : version of model (equivalent to LECMWF)
  - available values : **ecmwf** or **meteo**
- **-m** : model
  - available values : **arpifs** or **aladin**
- **-e** : name of experiment (equivalent to CNMEXP)
- **-t** : time step (equivalent to TSTEP)
- **-f** : last time step of integration
  - available values : **dxxxxx** (time in days)
    : **hxxxxx** (time in hours)
    : **txxxxx** (time in steps, equivalent to NSTOP)
- **-a** : advection scheme
  - available values : **eul** for eulerian (equivalent to LSLAG=.F.)
    : **sli** for semi-lagrangeian
    (equivalent to LSLAG=.T. and LVENIN=.F.)
    : **slni** for semi-lagrangeian non interpolating
    (equivalent to LSLAG=.T. and LVENIN=.T.)

FILES STRUCTURES

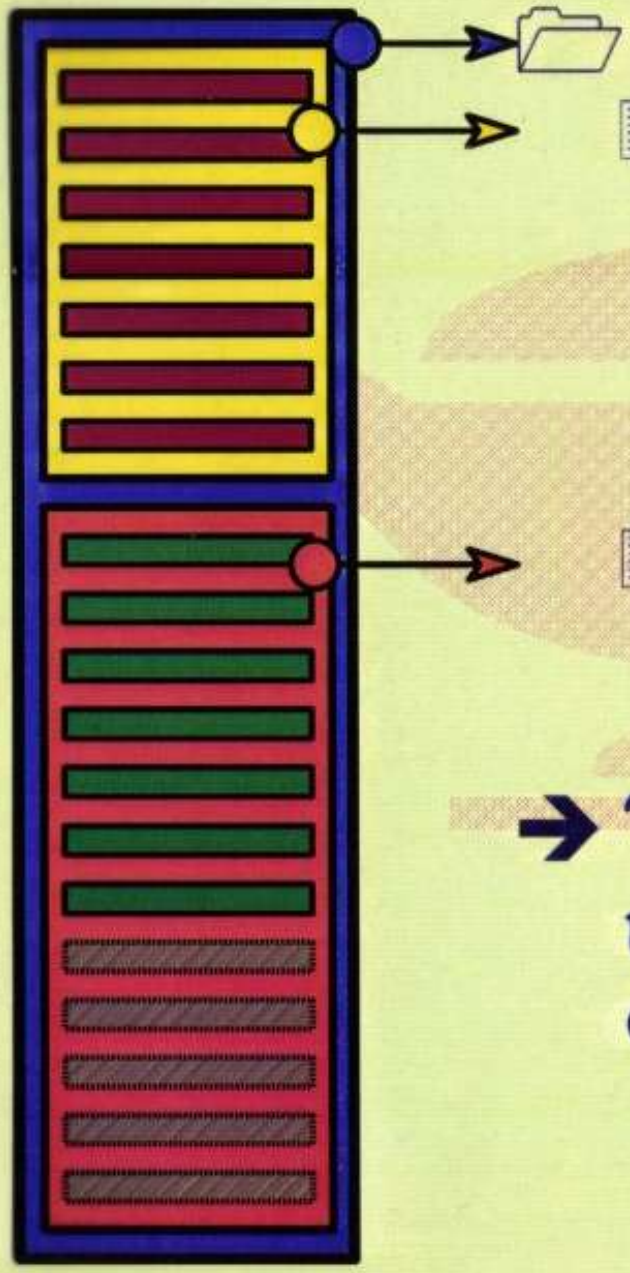
- The files used by ARPEGE or ALADIN model have a specific format named "FA".
  - We need to use auxiliary library that contains LFI routines (Logiciel de Fichiers Indexes) and FA routines (Fichiers ARPEGE/ALADIN)
  - the "FA files" are indexed files driven by LFI; the user may access to these files using FA calls



FILES STRUCTURES

- The "FA" file contains data fields for one type (historical or post-processed), for one forecast time and for a same experiment run (same domain, same namelist parameters) but on different levels
- The "FA" file structure contains two zones :
  - an header zone (with seven fixed articles) describing parameters of the run (domain limits, arrays size, number of levels, hybrid parameters, time, date, type of data -analysis or forecast-) and structure -for LFI used- of the data -second zone- (name of field, offset from the beginning of file, length).
  - a data zone with articles, one for each field of data (these fields can be coded in grid point -post processed- or in spectral -internal data structure used by the model-)

FILES STRUCTURES



- FA file
  - Header part with 7 articles which contain model informations (geographical limits, array size, date ...) and LFI informations (names of data fields, position, size...)
  - Data part with many articles, one per each type of field.

➔ This file refers for one forecast range, for one domain but different levels

FILES STRUCTURES

- The "FA" routines are used to :
  - open or create and close a file
  - read or write a field in a file by using directly his name
  - read data informations from the header zone

→ A tool utility named frodo using "FA" and "LFI" software, prints data informations for a file (see below)