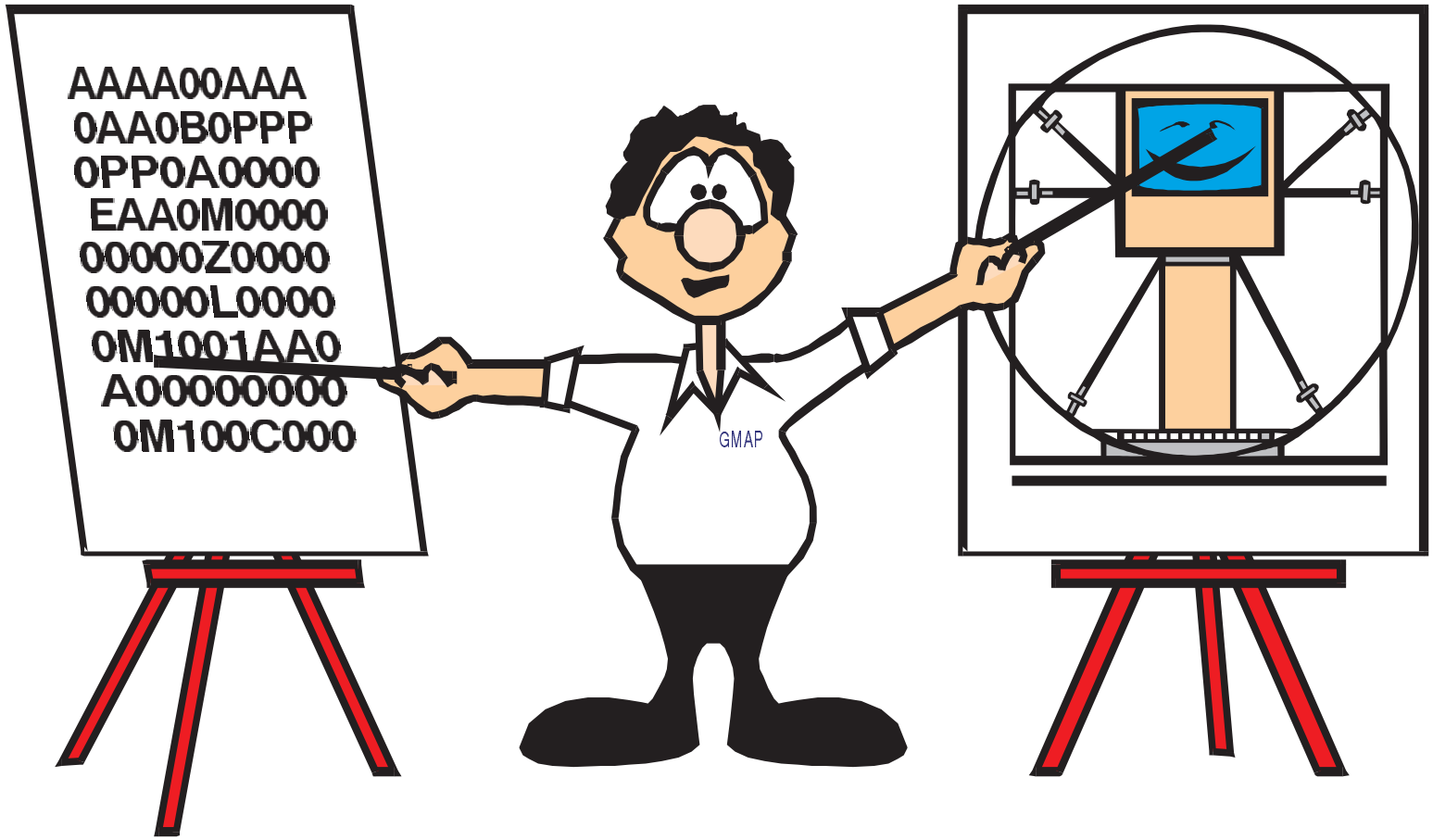
Introduction to the architecture of the code ARPEGE/ALADIN in cycle 25T1

METEO FRANCE



SUMMARY

METEO FRANCE

I

- *Computations organization*

I.1. Setup

I.2. Control routines

I.3. Elementary step

I.4. Grid-point computations

I.5. ALADIN inclusion

II

- *Data flows*

I.1. Spectral arrays

I.2. Gridpoint arrays/buffers

I.3. Data flow below STEPO

I.4. "Semi-lagrangian" buffers

III

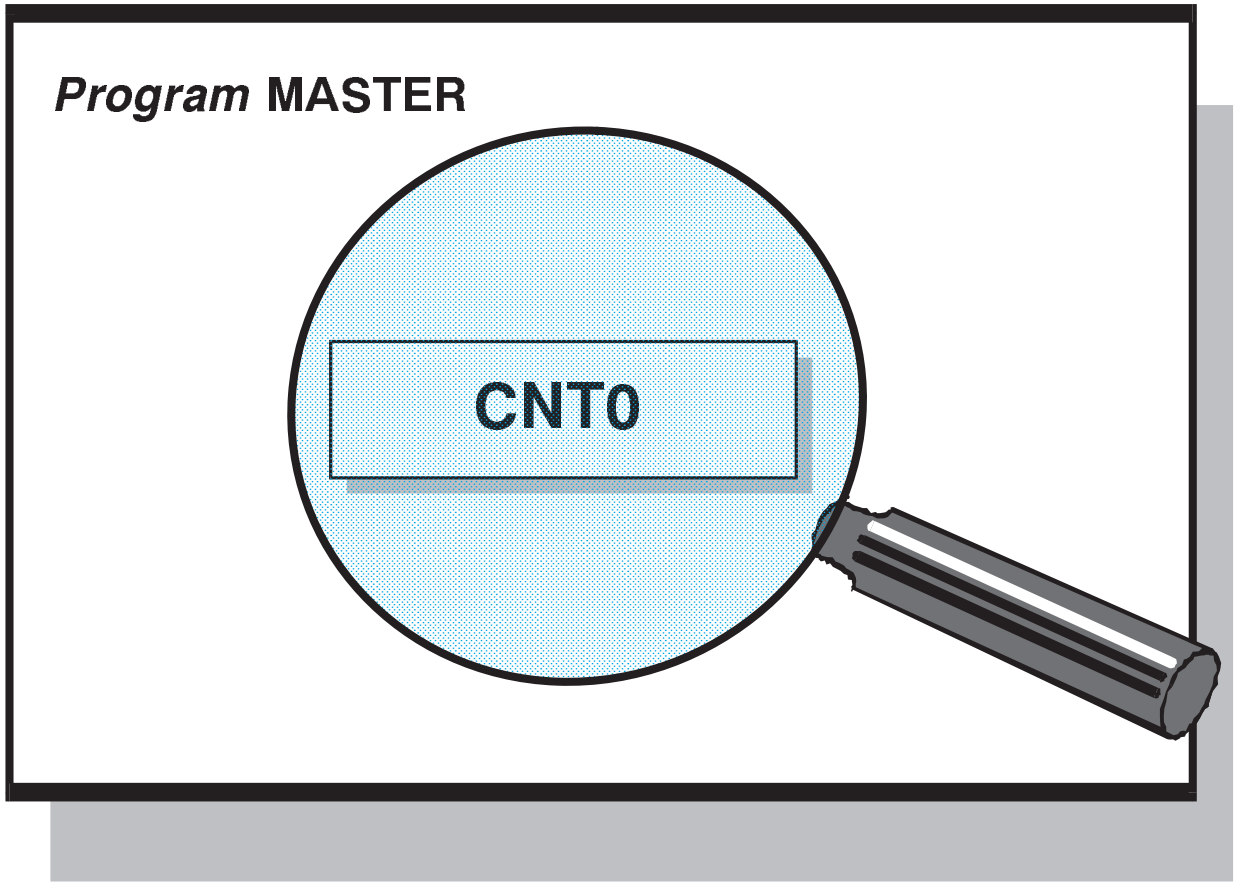
- *An introduction to shared memory / distributed memory*

I.1. Shared and distributed memory

I.2. Multitasking and Message passing

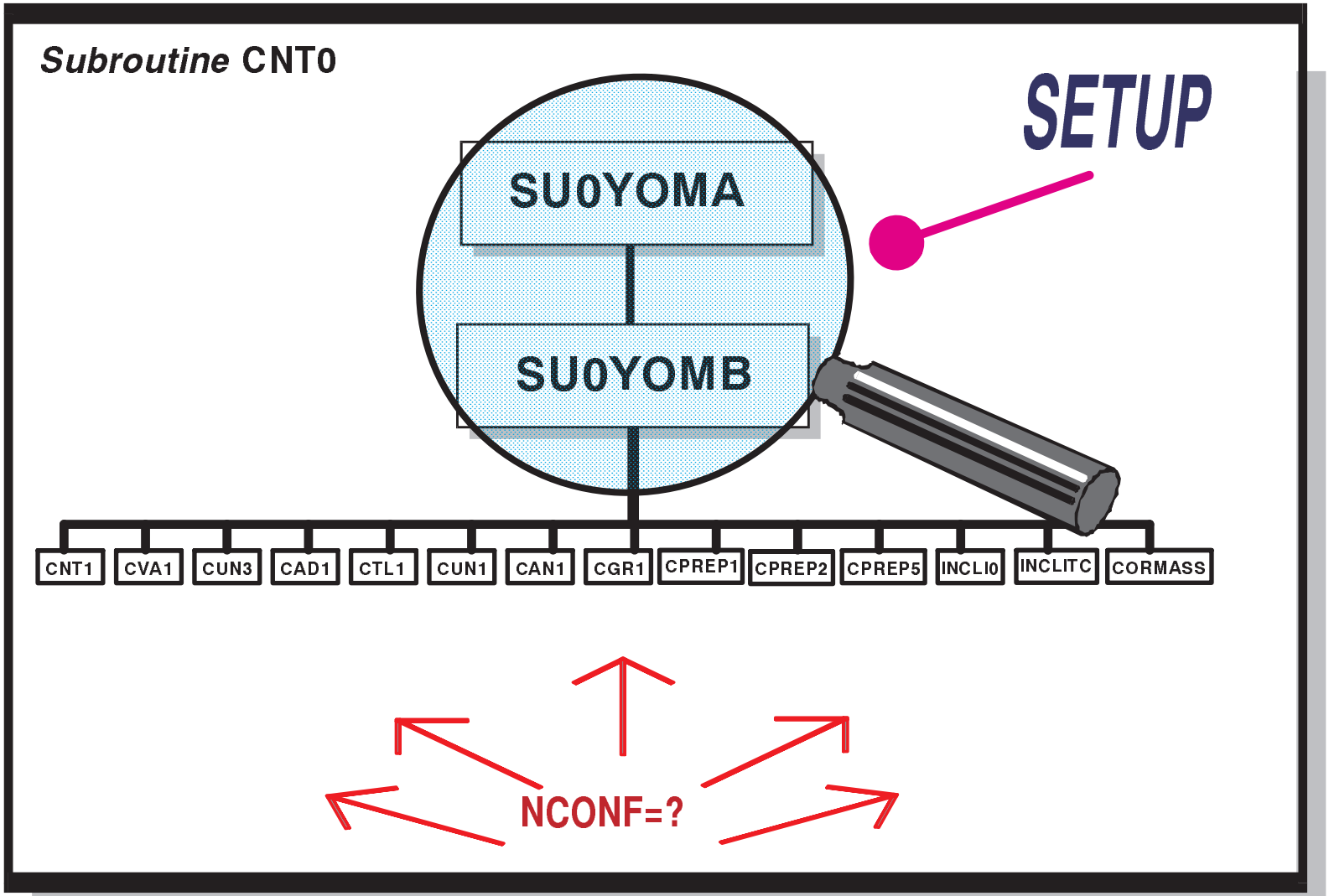
I.3. Aspects in the code

Computations organisation



CONTROL LEVEL 0

METEO FRANCE

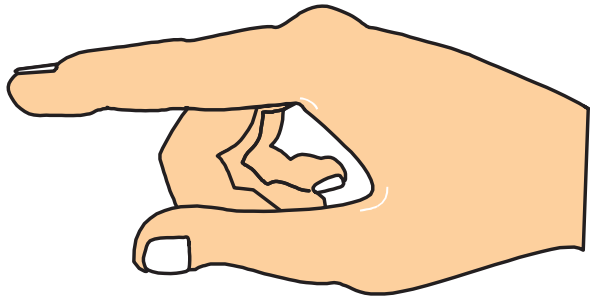


THE SETUP

METEO FRANCE

- To read the parameters controlled by the user
- To initialize all constants (ex : π)
- To allocate and initialize all working arrays

INTERNAL CONSISTANCY OF THE SETUP IS OF PRIME NECESSITY !



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SETUP ORGANIZATION

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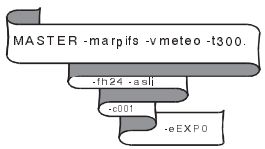
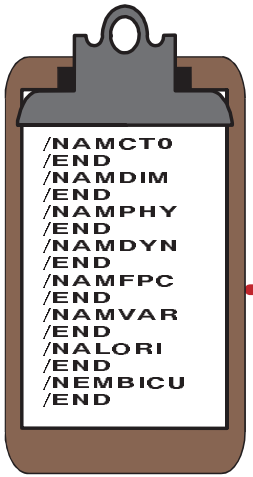


COMMAND LINE

+

DATA FILE HEADER



NAMELISTS FILE

Subroutine SU0YOMA

SUARG

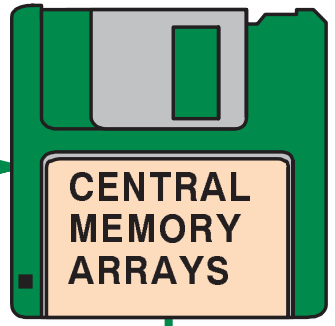
SU...
SU...
SU...
SU...

SUALLO

Reads the command line to simplify the incoming setup

Read namelists + command line to initialise scalar variables or arrays dimensionned by *parameters*

Allocate arrays



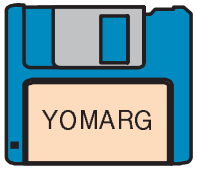
Subroutine SU0YOMB

SU...
SU...
SU...

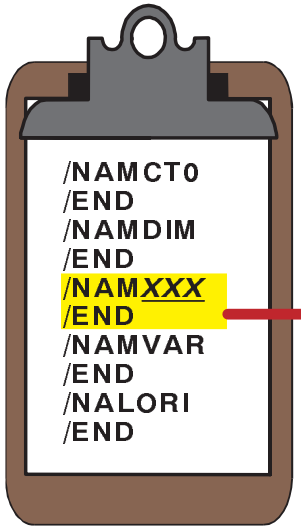
Read more namelists + command line to initialize allocated arrays for the setup

FRAMEWORK OF A SETUP SUBROUTINE

METEO FRANCE



COMMAND LINE ARGUMENTS



NAMELISTS FILE

Subroutine SUXXX

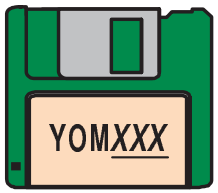
INITIALIZE YOMXXX WITH DEFAULT VALUES

READ NAMELIST NAMXXX IN ORDER TO OVERWRITE (PARTIALLY) YOMXXX

CONTROL YOMXXX VARIABLES

PRINT OUT YOMXXX VARIABLES

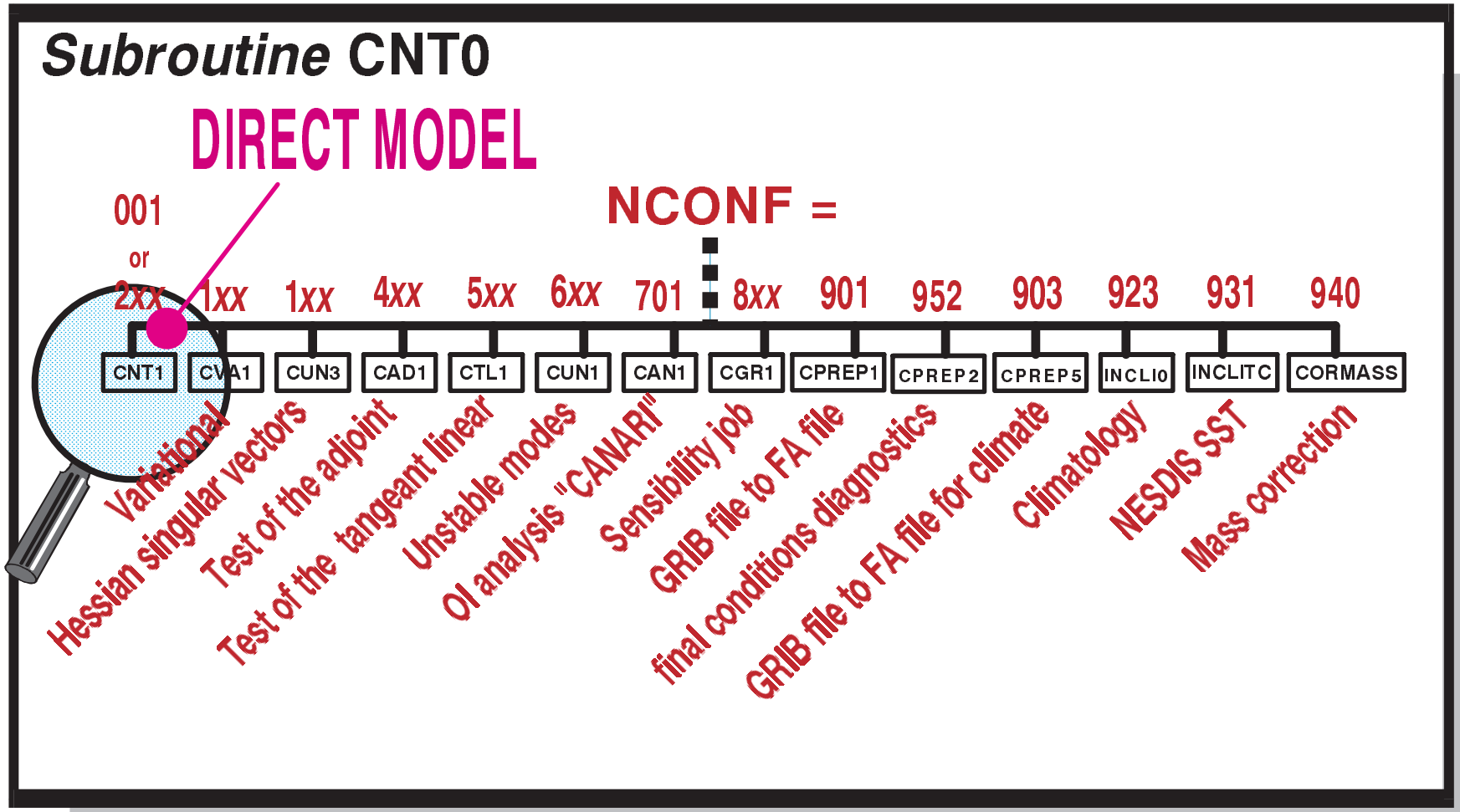
Taking into account command line arguments and namelists already read



MODULE YOMXXX

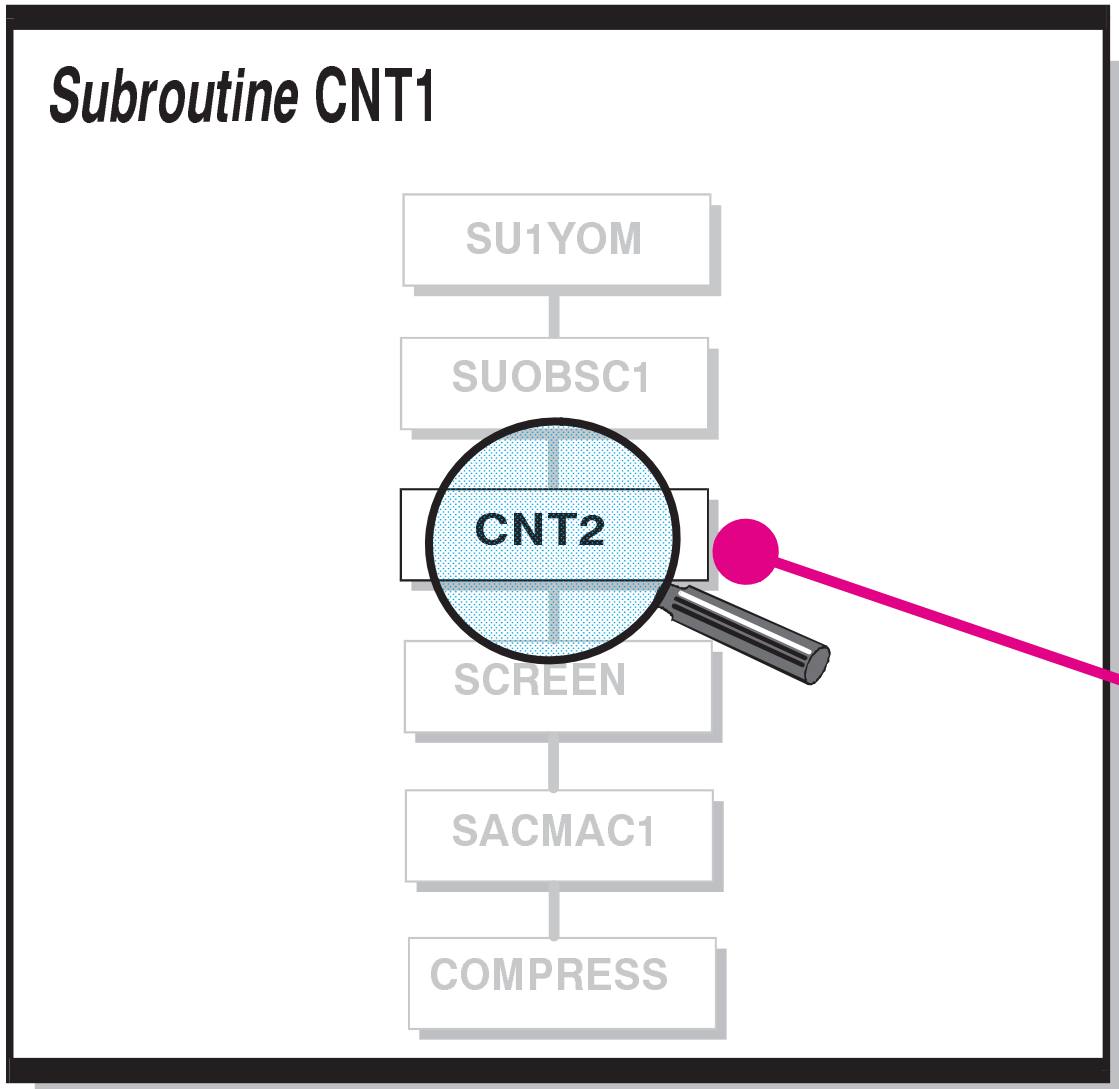
WHICH CONFIGURATION OF WORK ?

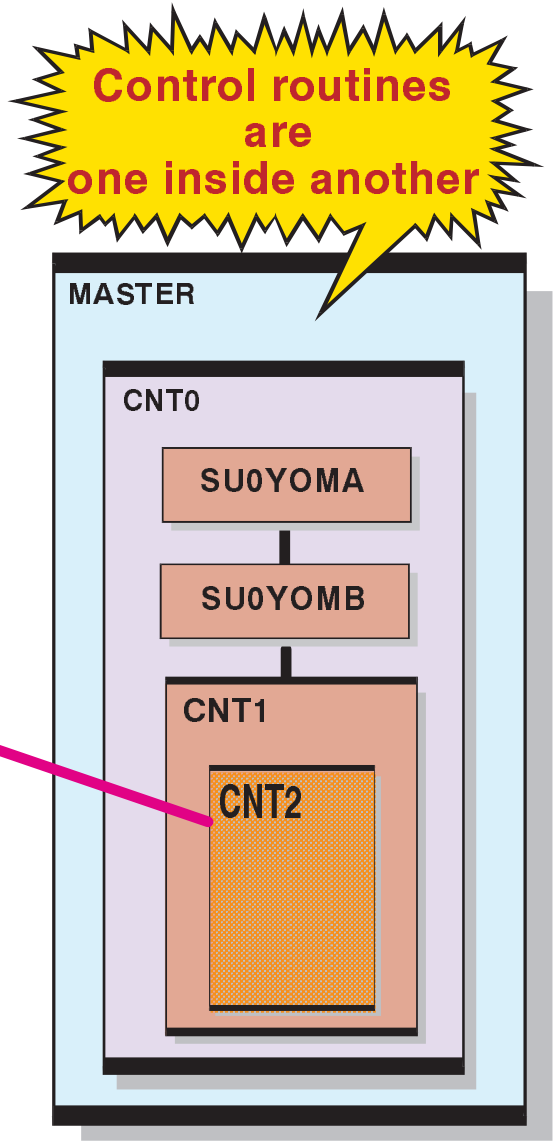
METEO FRANCE



The direct model : CNT1

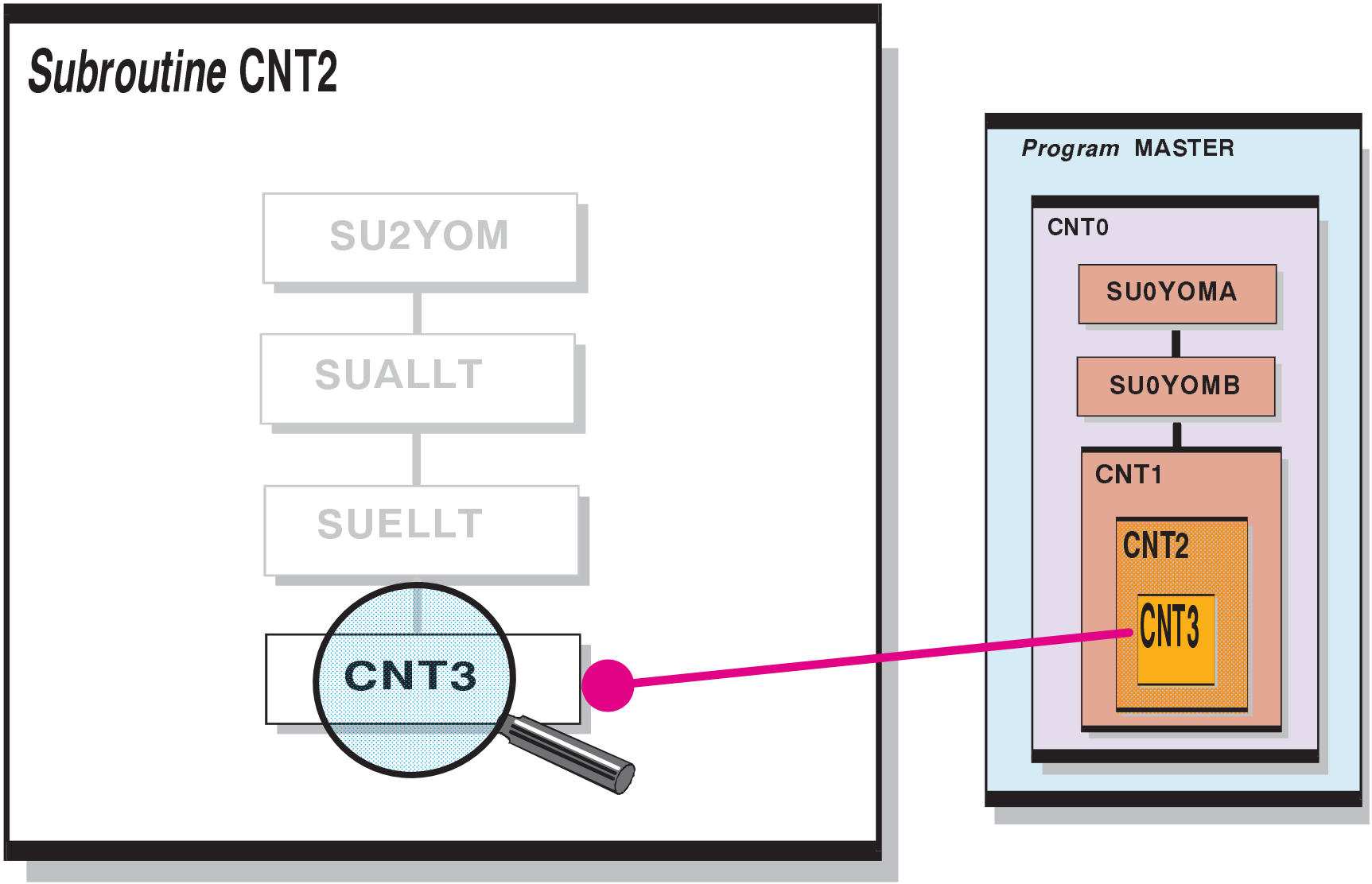
"CONTROL LEVEL 1"





The direct model : CNT2

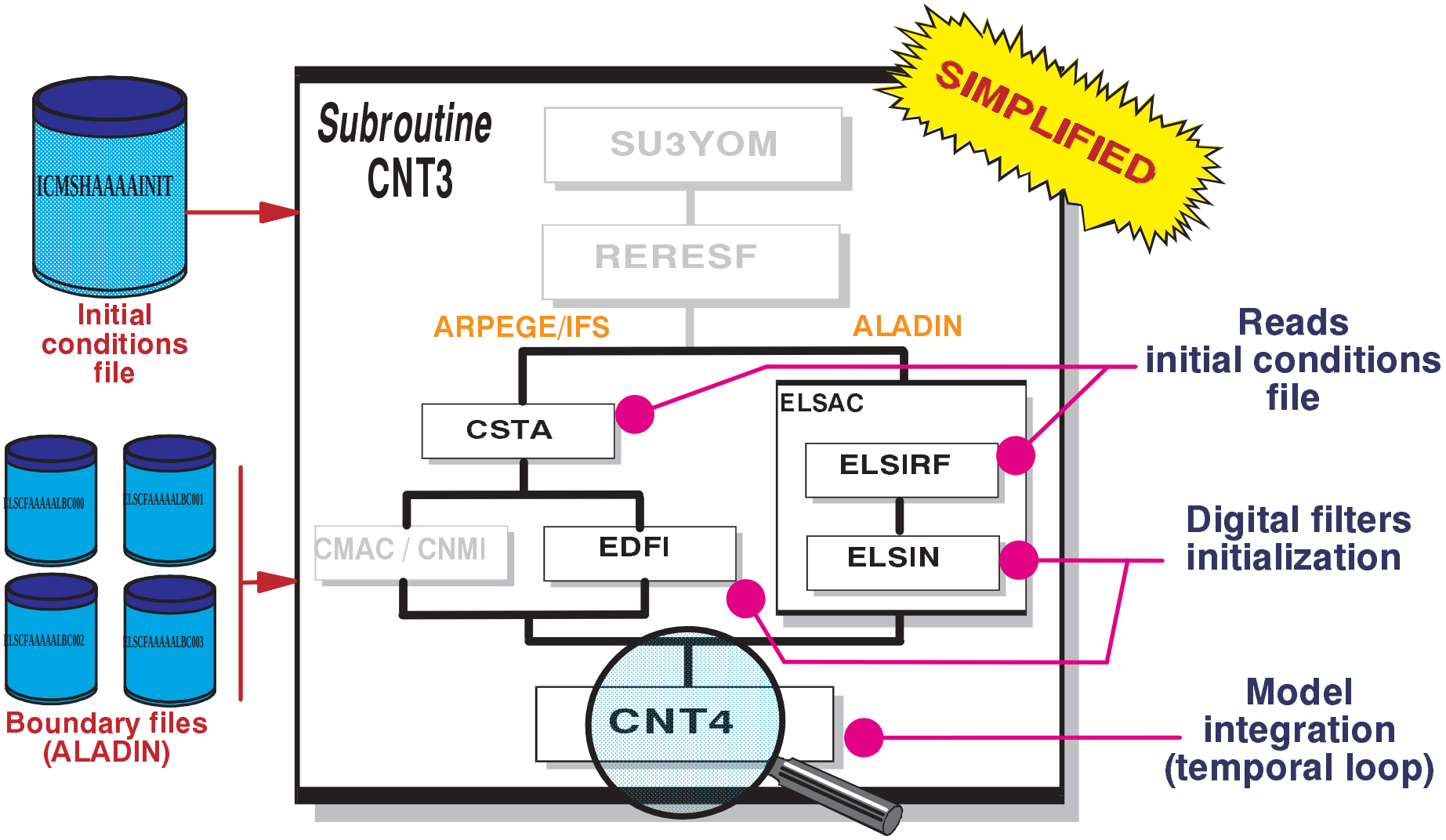
"CONTROL LEVEL 2"



The direct model : CNT3

METEO FRANCE

"CONTROL LEVEL 3" = READ AND INITIALIZE INITIAL FIELDS

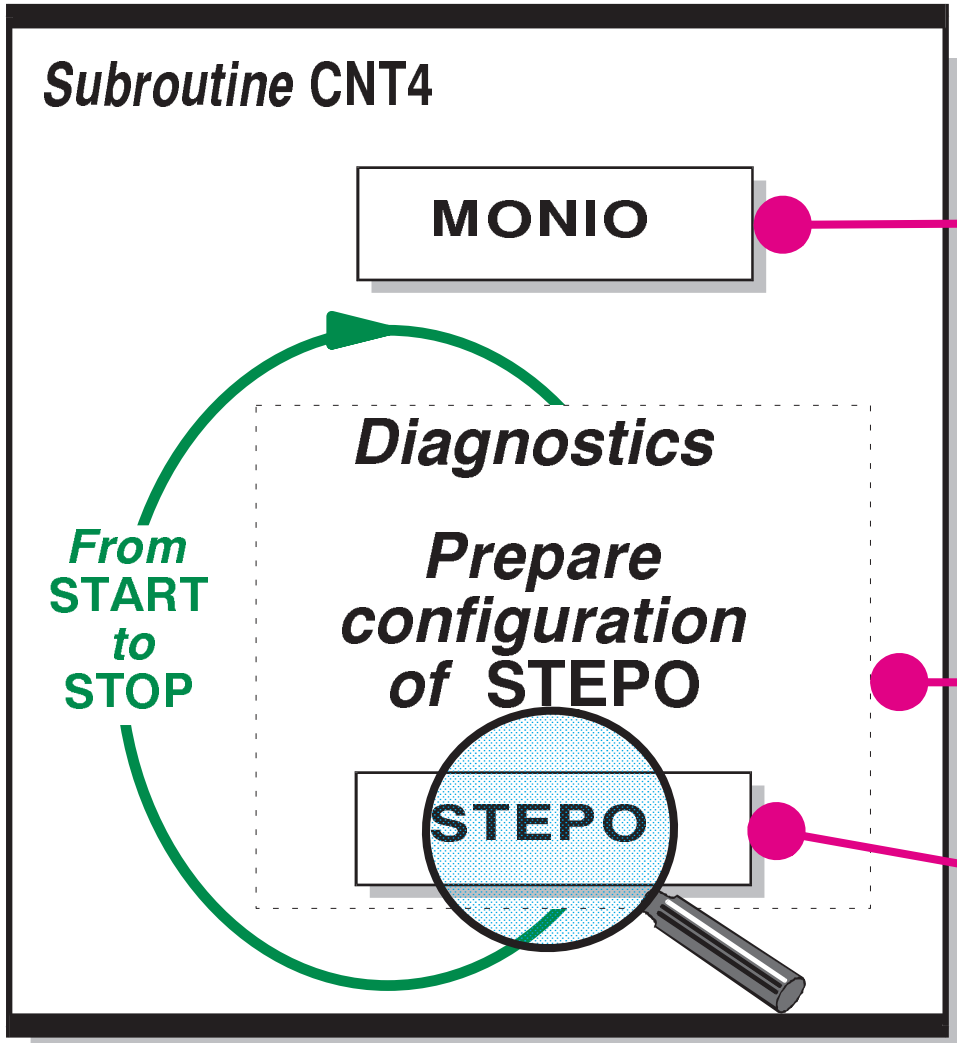


Direct model integration : CNT4

METEO FRANCE

HIGHLY SIMPLIFIED !

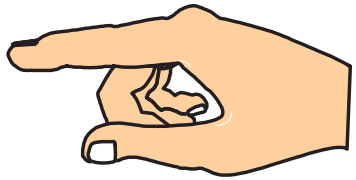
"CONTROL LEVEL 4"= TEMPORAL LOOP



Monitoring of input/output events (diagnostics, post-processing, back-ups, etc)

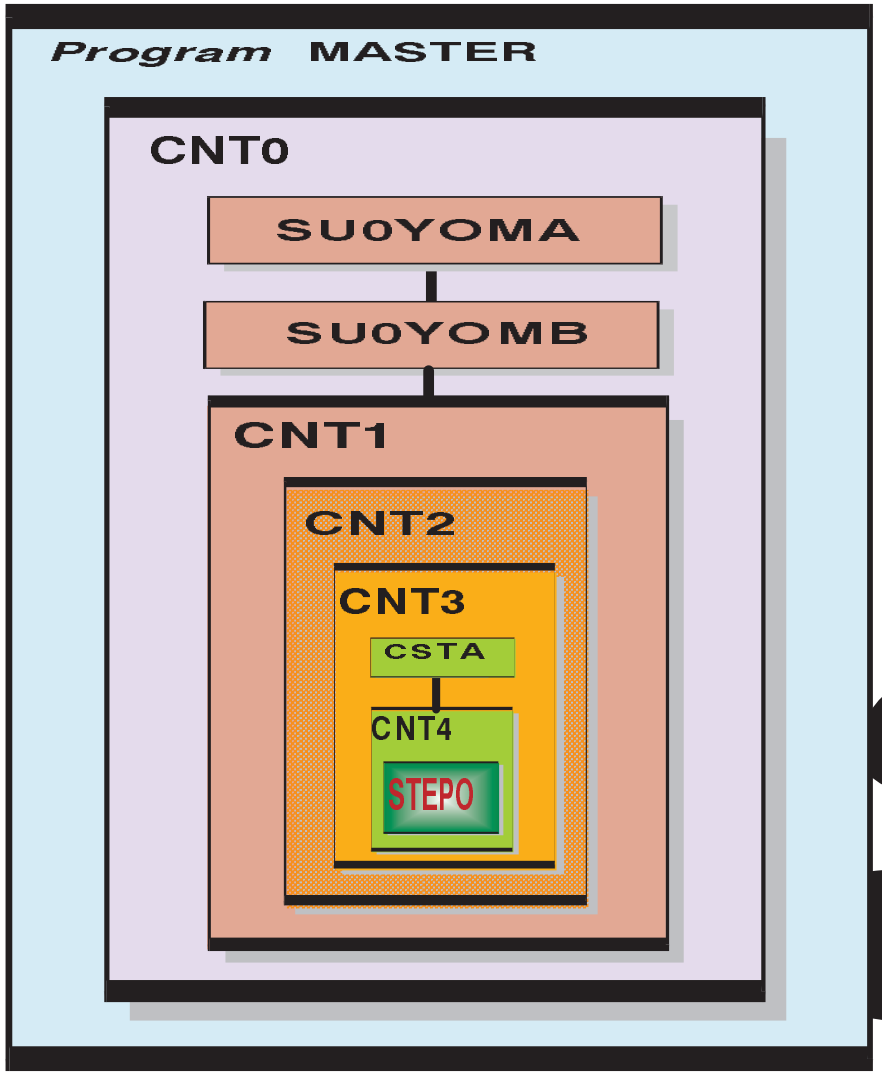
TEMPORAL LOOP

STEPO *is the heart of the model*



STEPO

METEO FRANCE



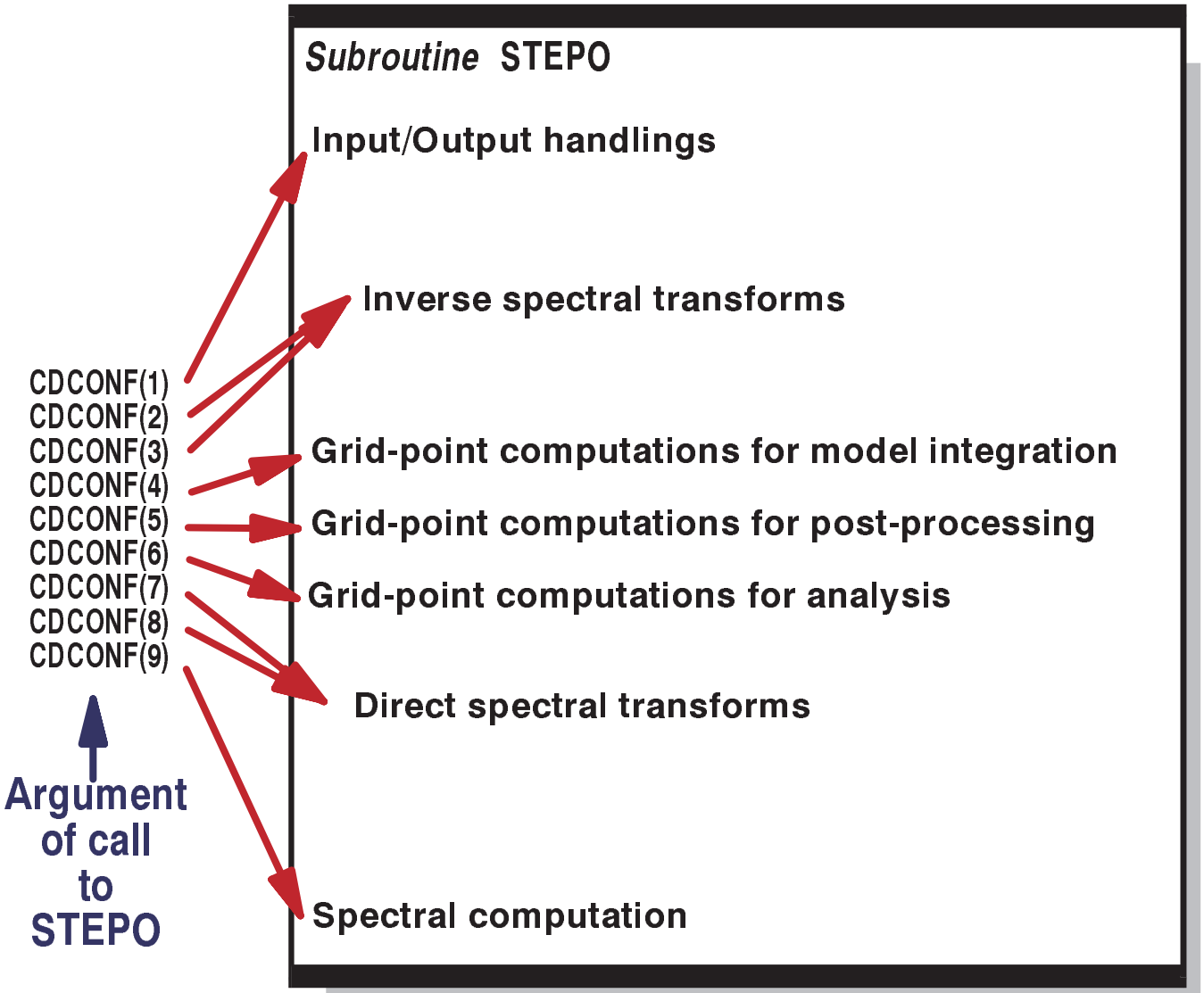
STEPO *IS*
AN ELEMENTARY
STEP
OF THE MODEL

STEPO
IS INVOKED
WITH A
CONFIGURATION STRING
COMPOSED OF
9 CHARACTERS

(Example : Call Stepo ('0AAA00AAA'))

Organization of STEPO

METEO FRANCE



9 PARTS :

EACH PART IS CONTROLLED BY 1 CHARACTER OF THE CONFIGURATION STRING

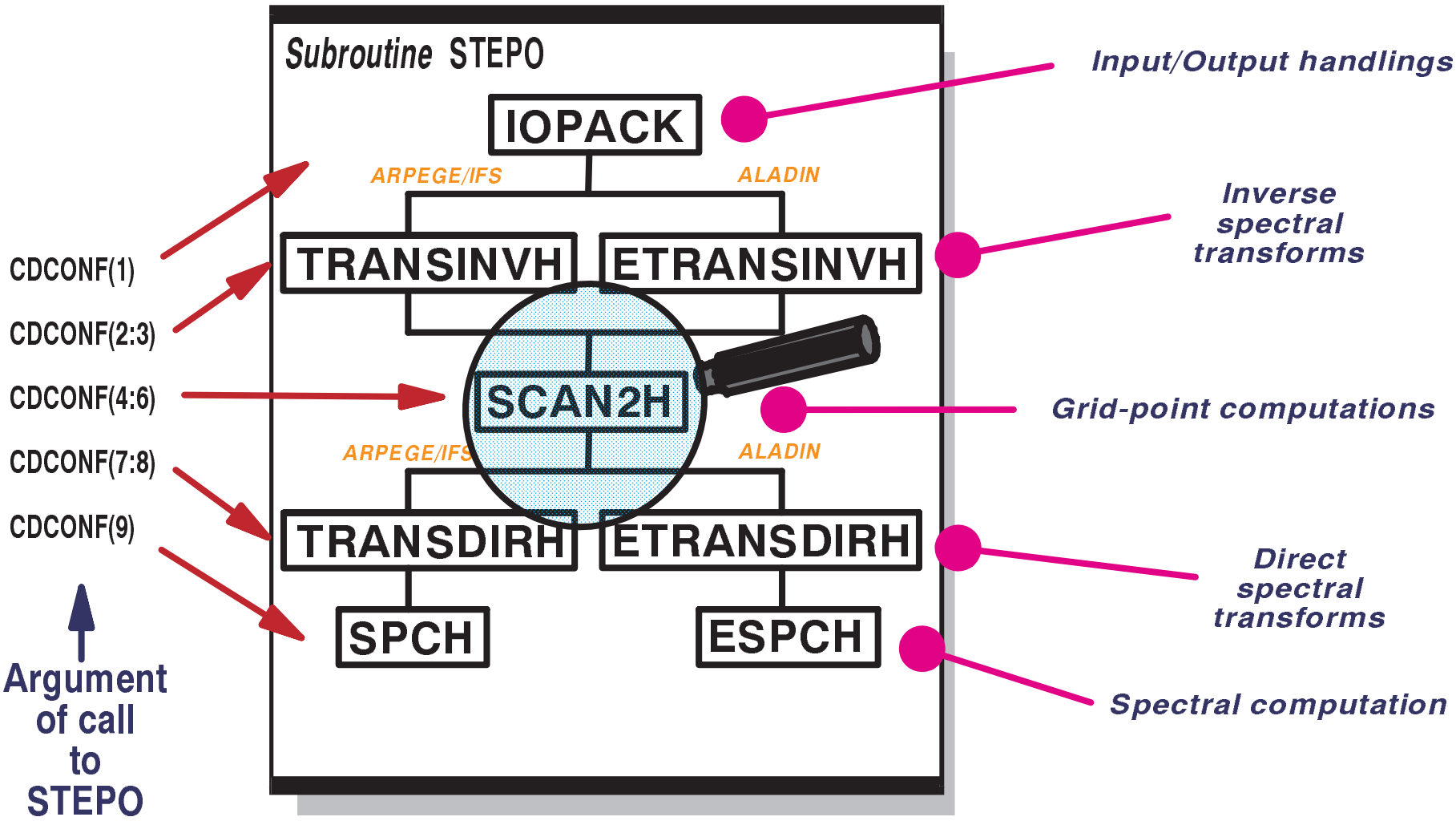
CDCONF(n)='0'
⇔
Do not enter the part n

Example :
a "normal" time step of a forecast is :

CALL STEPO('0AAA00AAA')

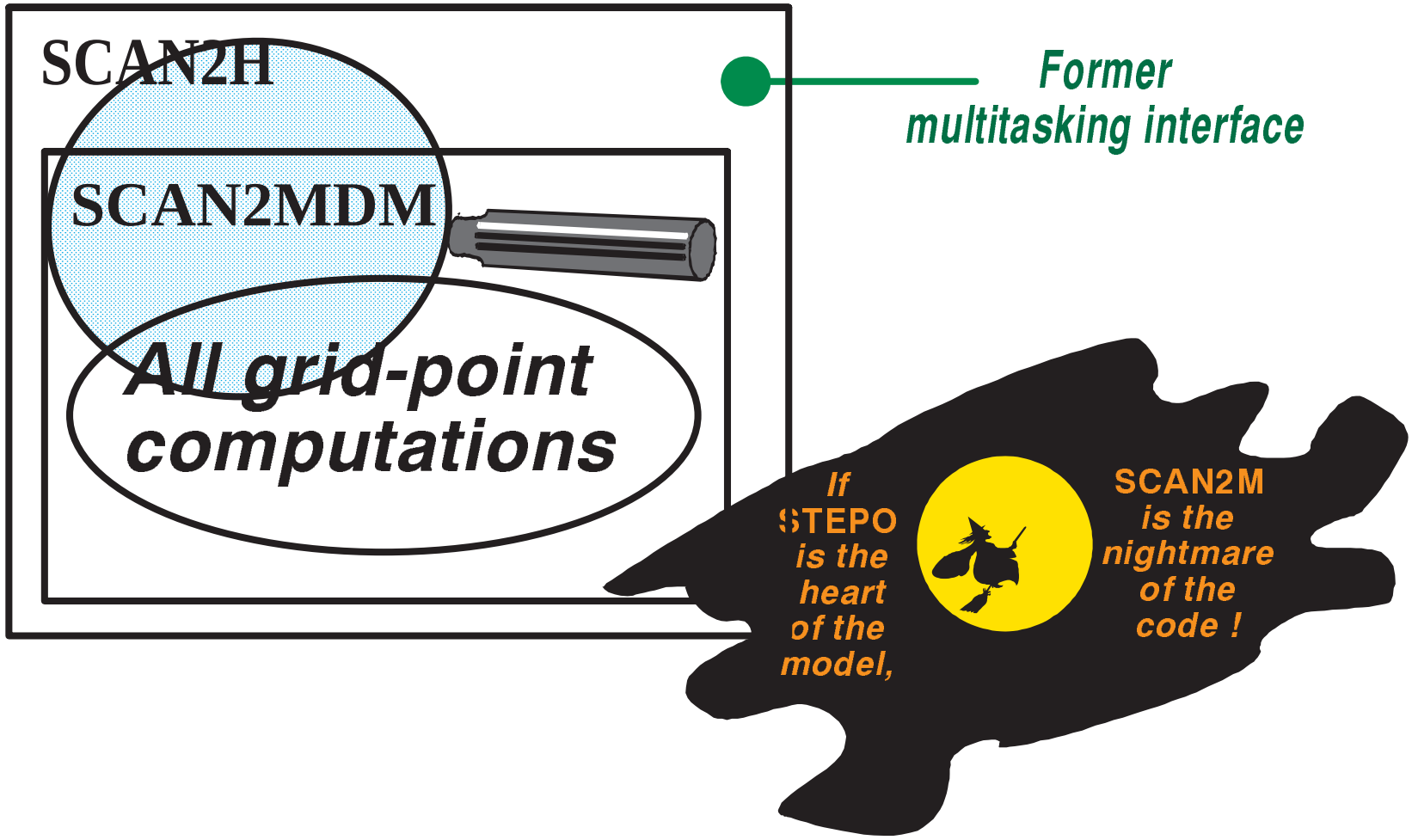
Structure of the code of STEPO

METEO FRANCE

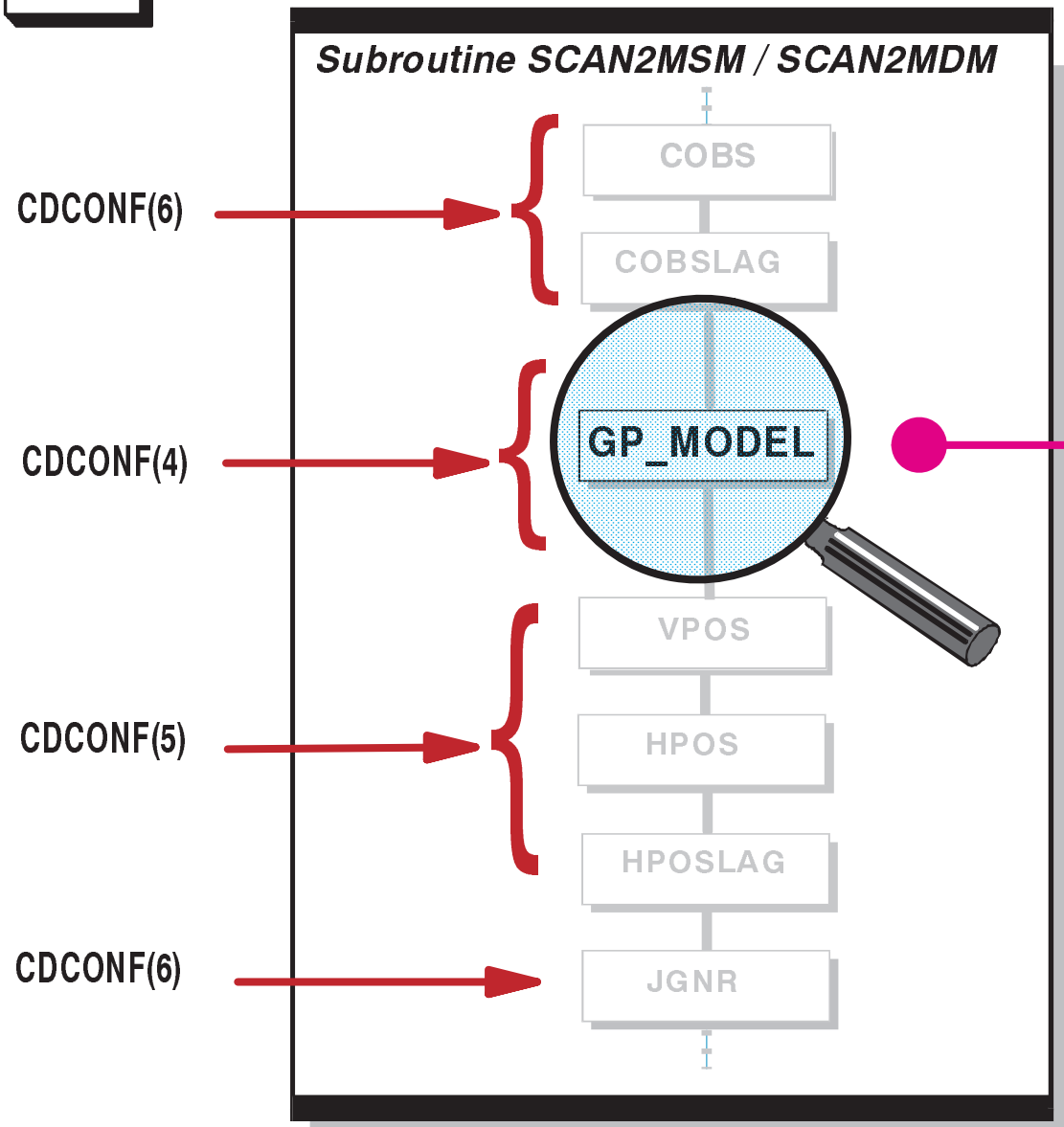


SCAN2H & SCAN2MSM / SCAN2MDM

METEO FRANCE



Gridpoint computations



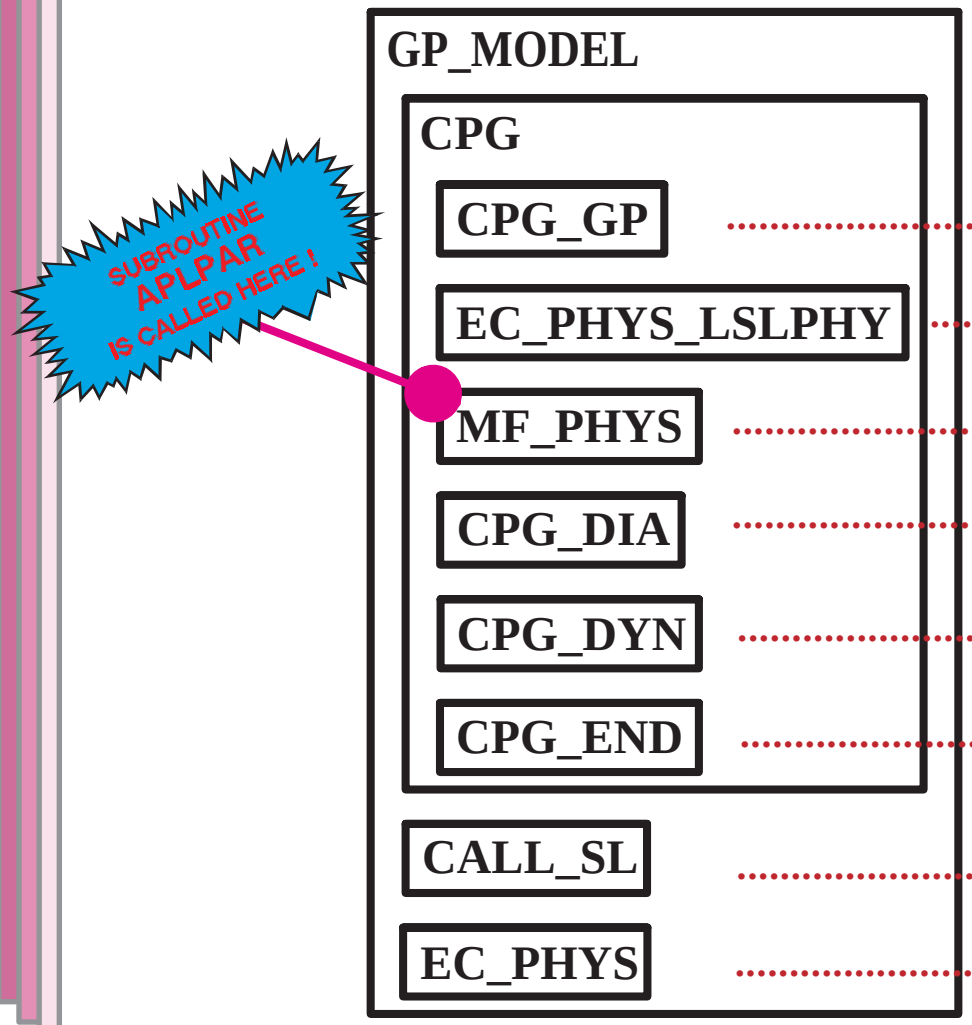
Comparison to observations

Direct model grid-point computations

Post-processing

Cost function JG computations

Direct model gridpoint computation



Inclusion of ALADIN in ARPEGE/IFS

METEO FRANCE

** Specific modules :*
they can be included in ARPEGE/IFS

** Logical key LELAM for Limited Area Model*

```
IF (.NOT.LELAM) THEN
              :
ELSE
              :
ENDIF
```

Correct

```
IF (.NOT.LELAM) THEN
   CALL  ROUTINE
ELSE
   CALL  EROUTINE
ENDIF
```

Better

The key LELAM should be used ONLY IN THE SETUP ROUTINES ... (SUXXX)

Inclusion of ALADIN below the setup of ARPEGE/IFS

METEO FRANCE

** Duplicated subroutines*

(see the updated list in the "Aladin Tech' book)

Very dangerous, but sometimes ... no way out !

** Logical key LRPLANE for plane geometry*

```
IF (.NOT.LRPLANE) THEN
   :
ELSE
   :
ENDIF
```

Safe, but not always possible

With the code of ALADIN, you must be able to run ... ARPEGE/IFS !