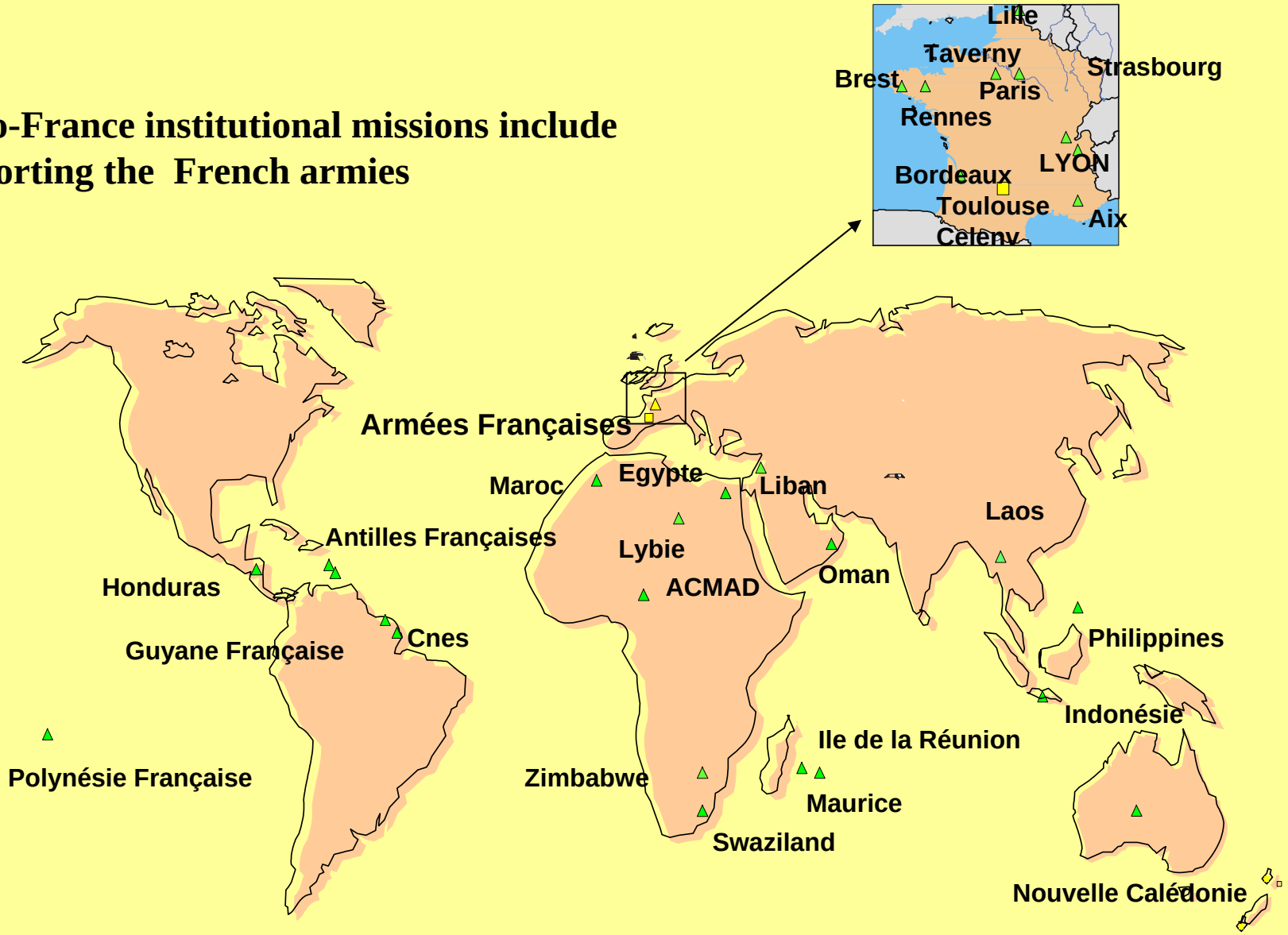
Meteorological visualisation applications

Definition of Decision Aid Products for military support

Brigitte Benech, Meteo-France

Meteo-France institutional missions include supporting the French armies



Brigitte Bénech, M-Françoise Voidrot

•Meteo-France has to develop and maintain tools which can be used by armies in different places, under various material conditions.

•Representatives of the 3 forces (land, air or naval) and of Meteo-France have worked together to specify some needs of the armies, as much for occasional operations as for met services on permanent bases.

Context

Requirements

To be able to analyse in real time how military decisions can be impacted by meteorological conditions.

Constraints

Telecommunications, reliability, delays,…

Means

- Data bases
- Productions of specific data
- Means of diffusion
- Technical skill
- Consulting/studies
- Training
- Operational Support
- Men

Requirements

Data? — Kind of data, spatial extent, format, data amount

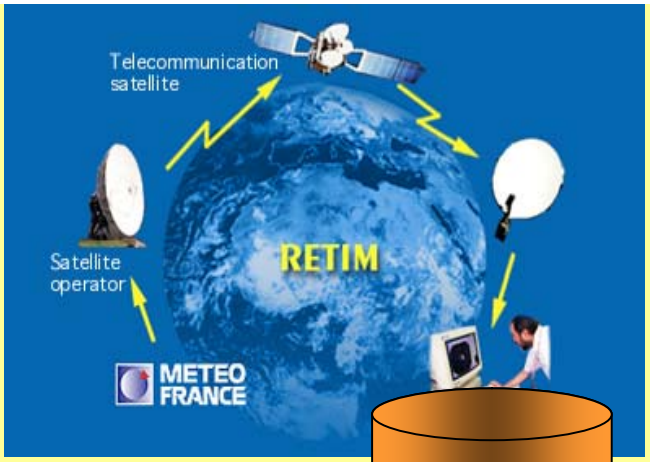
Where? — **France, Europe, Afrique, Asia…**

How? — Retim 2000, Retim Afrique, Inmarsat, Syracuse, Direct satellite reception, dedicated line, Internet…

What for? To whom? — Forecasters, decision makers

Tool(s) — Synergie, dedicated web site, PIC, IAA (access on request)…

Data flow



- **GTS**

NWP

Satellites

Skilled data

Retim

non military, all but Retim

« military» all but Retim

I A A

All but Retim Syracuse, …

Data flow depending on density of operations/ Narrow bandwidth

Measures in situ

Météo-France | **Headquarters** | **Theatres**

Definition of Decision Aid Products for military support

Many kinds of products are now available threw different tools; let us see some of these products and tools :

- The TADS on Synergie
- Web sites for Land forces and Air forces
- Storm : a special application for the Navy

Synergie,
one of main tools of the forecaster in Meteo-France

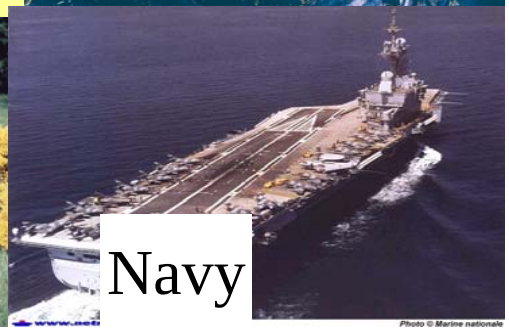
Made available to the armies

SYNERGIE

Snow mantle

Air

Land



Navy

SYNERGIE

- **SY**steme
- **N**umérisé
- d'**E**xploitation
- **R**ationnelle et
- de **G**estion
- **I**nteractive
- et **E**volutive
- des informations météorologiques par les prévisionnistes

The French Approach to generic TDA

BMSS
Bourges-April 2005
DGA Armée de Terre-
Météo-France

Wednesday, 16 November 05

Brigitte Bénech, M-Françoise Voidrot

Tenth workshop on Meteorological Operational Systems

METEO FRANCE
Toujours un temps d'avance

Synergie for military support

Synergie, which is One of main tools of forecasters in Meteo-France has been made available to the armies.

TDAs production within a meteorological forecasting system: Synergie

•Meteo-France develops and maintains a mature forecasting system already « all geographical region », « all climate » « all data in WMO formats» capable

•The militar forecasters are trained on this system since 1993

•The system is able to be used on past data for retex purpose,

The TDA factory is integrated within Synergie

- **TDAs can be defined on any observed or NWP model data received in standard WMO format :**
  - **Whichever the upstream telecommunication mean (Retim, dedicated link, clé USB…),**
  - **Which ever the origin of the data ingested into the Synergie data base (Météo-France, ECMWF, UKMet, DWD, US…),**
  - **Whichever the geographical domain,**

  ***Restrictions* (for the moment) :**

  - **criterias have to be defined on consistent data in term of grid resolution**

    Still not on other data (satellite, radar…)

Input data

•Any NWP model data into WMO GRIB format

•Observation in WMO Formats : SYNOP, SYNOR, SHIP, BUOY, QUICKSCAT, ….

Observations

- Same behavior than with Numerical model …BUT
- « Holes » can appear when the observations network is not dense enough

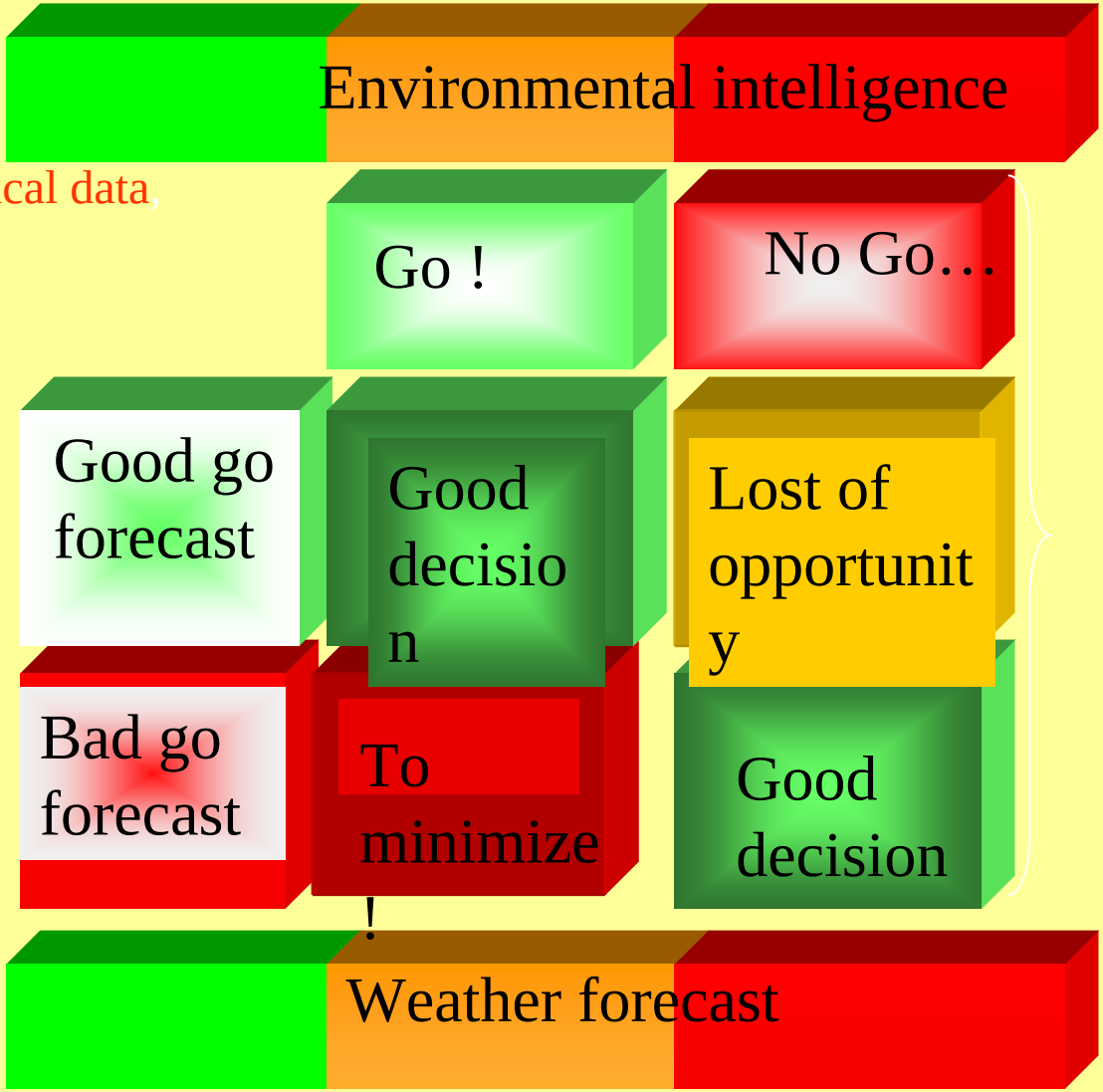
Forecast versus Decision Aid

Non meteorological data,

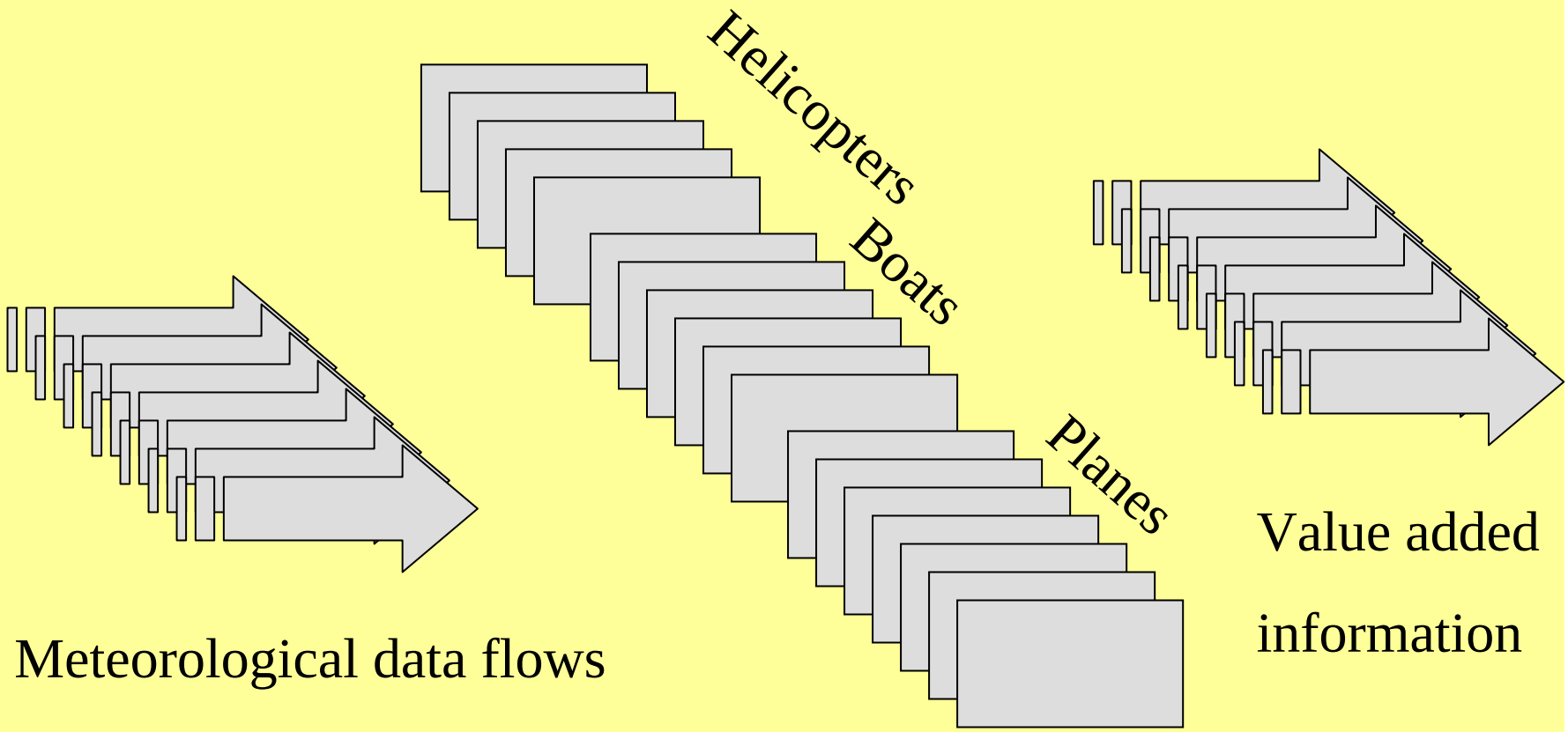
System information, Mathematicals models,

Business cases,

Expérience, …



A rules library=Elementary generic TDAs



One system = one set of rules

Rules design

ELEMENT

Helicopter

Label to display as an information

 # DATA MINOR/MAJOR PROD_MODELE Model_name parameter vertical_unit

vertical_level calculated/raw

 # C1 First level of thresholds : amber area

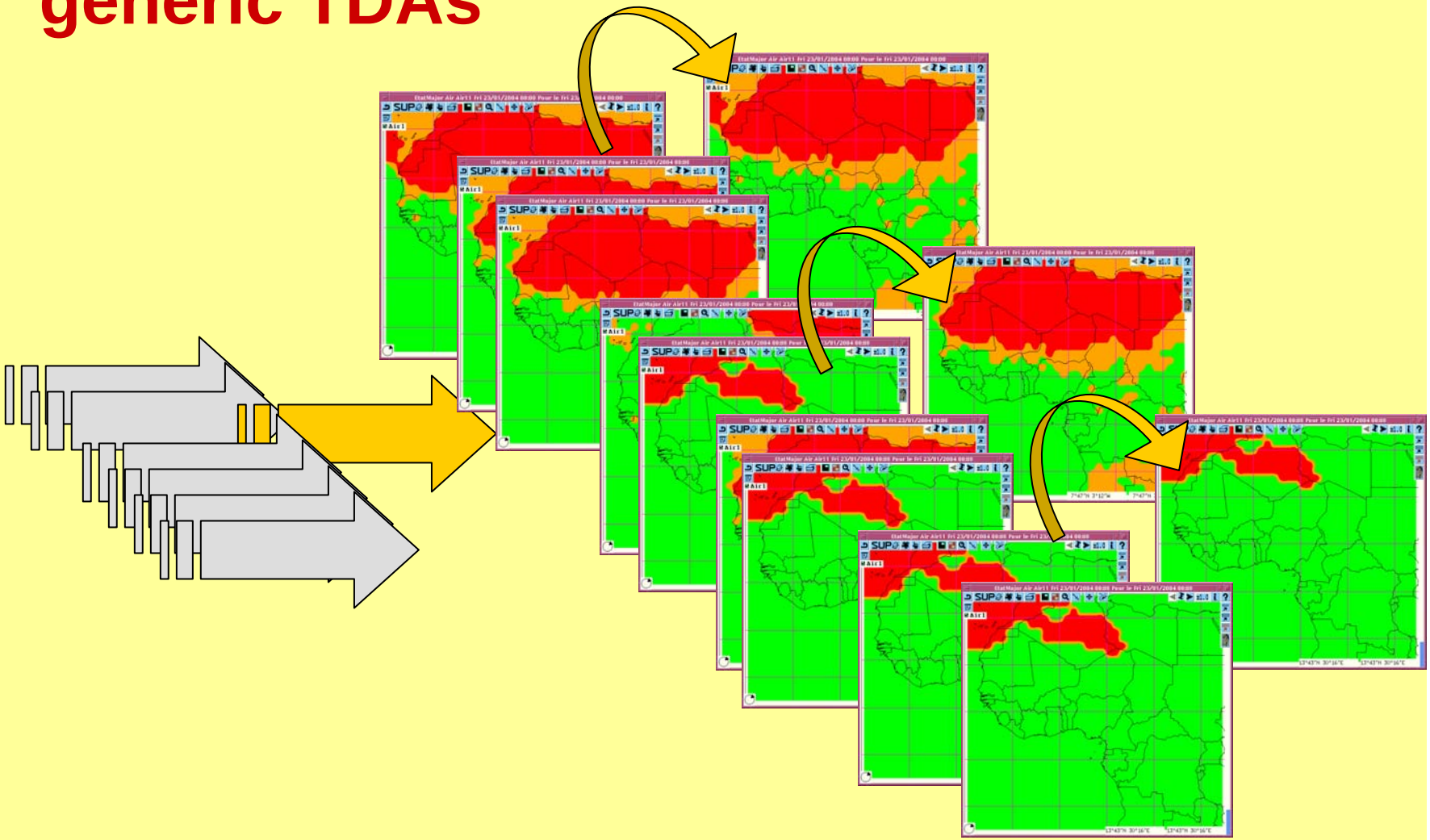
 # C2 Second level of thresholds : red area

DATA MINOR PROD_MODELE ECMWF1.5 FF H 10M calculated

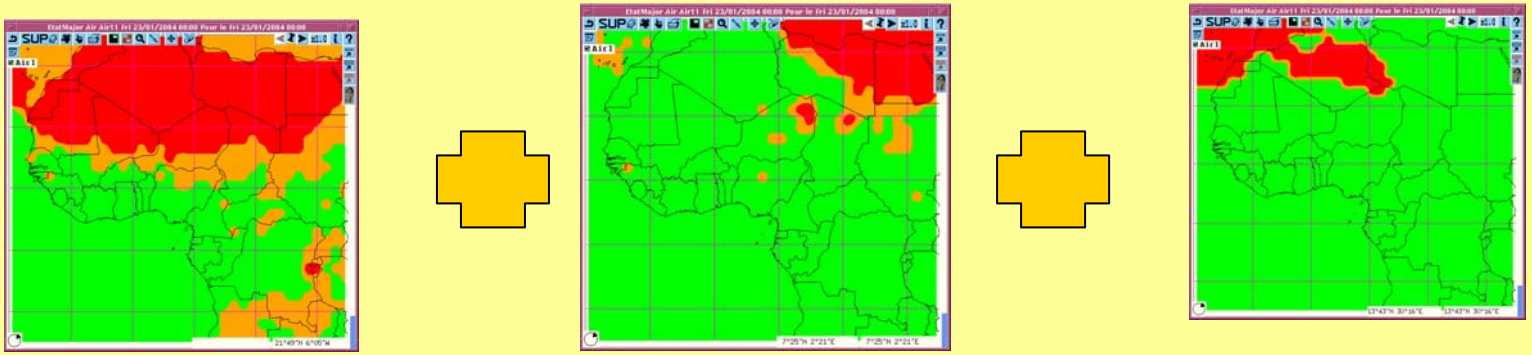
C1 FF>20 AND FF<=25

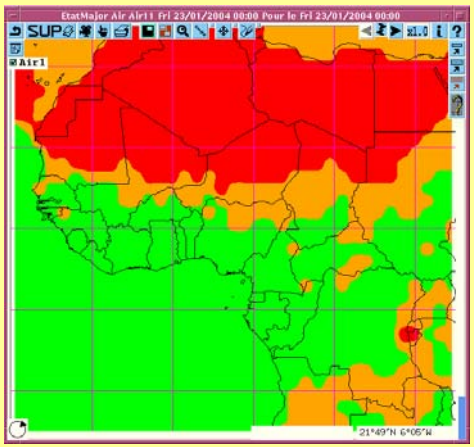
C2 FF>30

One mission : ΣRules =synthetic generic TDAs



Selection of one helicopter, one boat, one plane = one mission



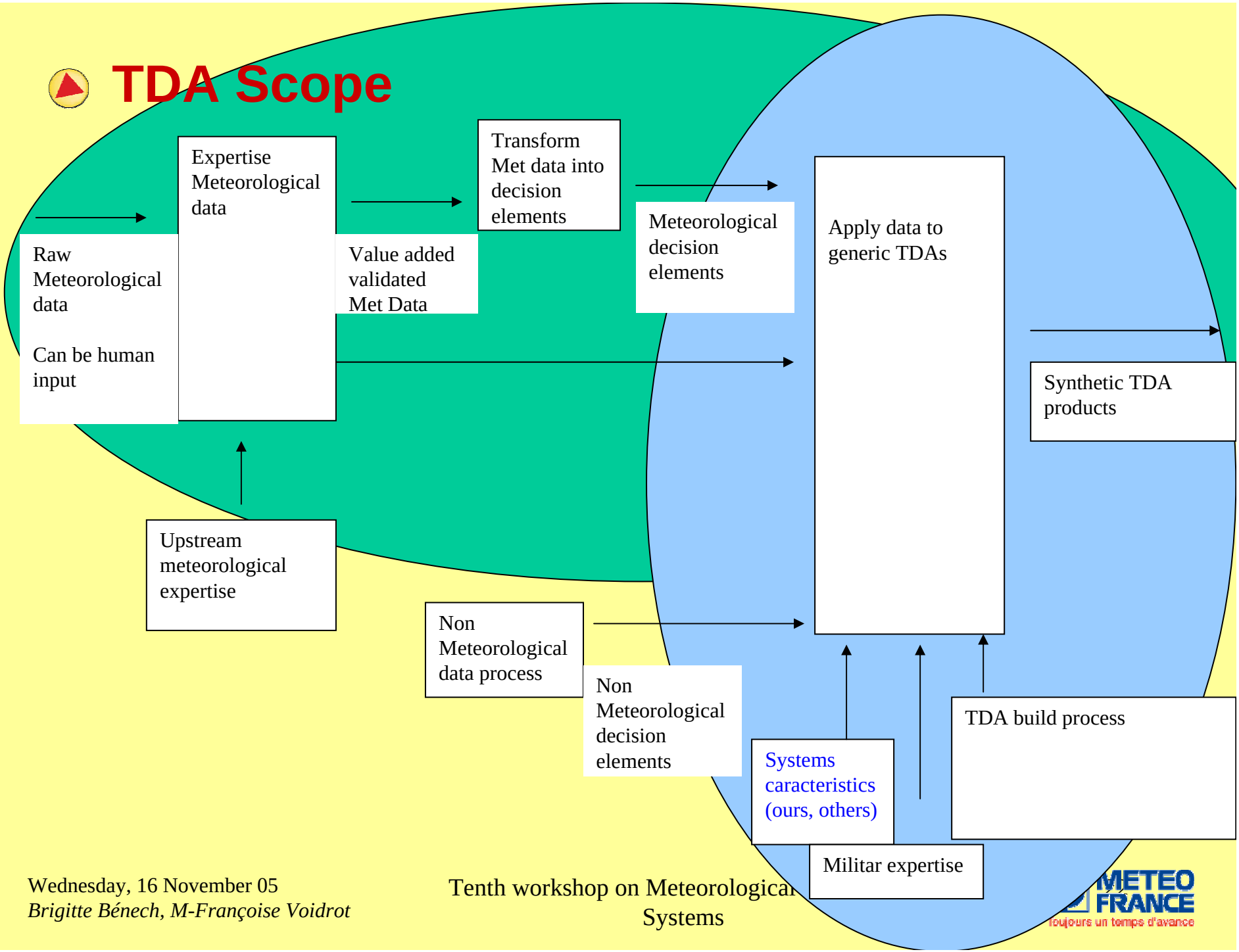


One synthetic product

Compound TDA access organisation

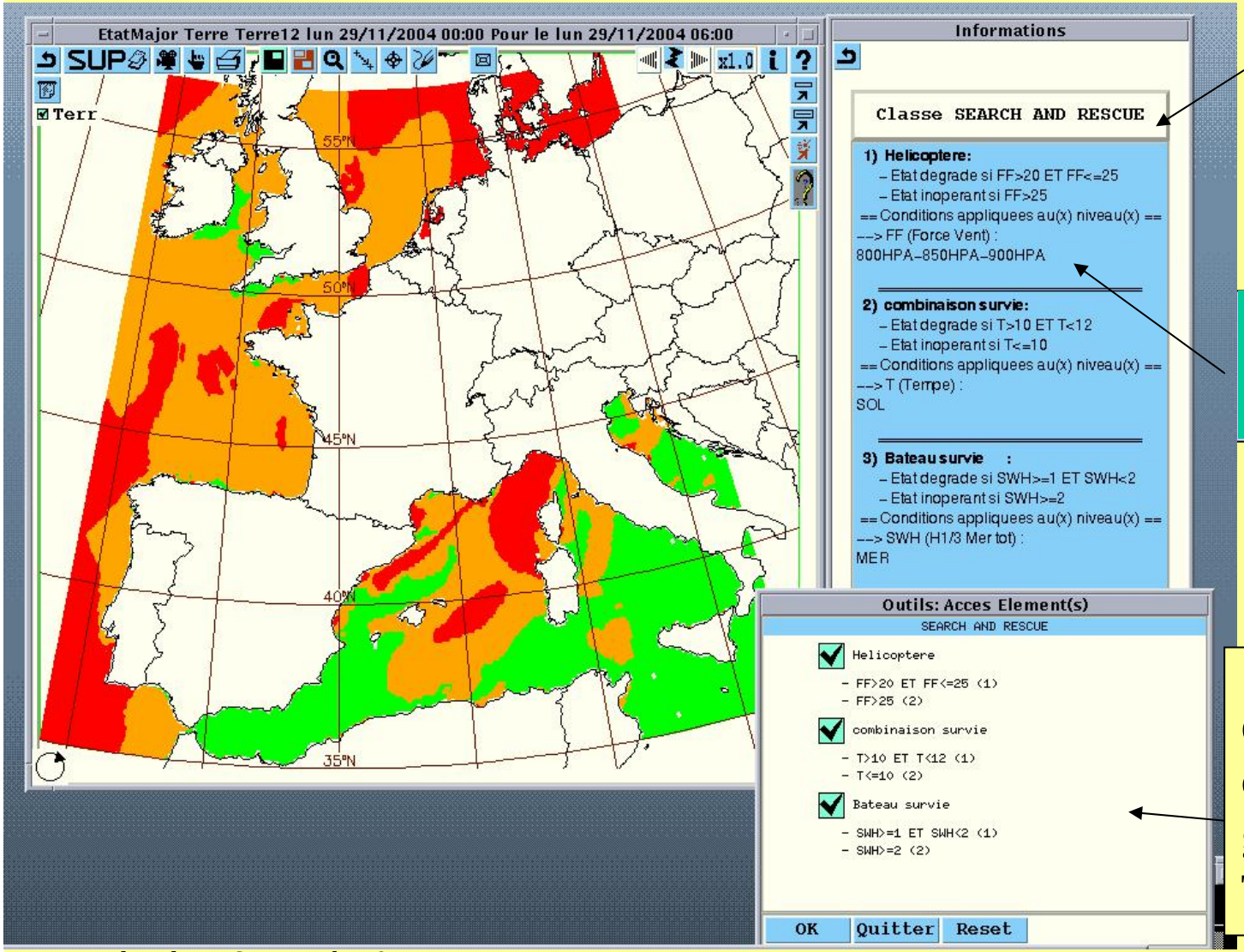
- Combination leads to large amount of TDAs
- A user-defined tree organisation allows efficient access

TDA Scope


Expertise Meteorological data
Transform Met data into decision elements
Raw Meteorological data
Can be human input
Value added validated Met Data
Meteorological decision elements
Apply data to generic TDAs
Synthetic TDA products
Upstream meteorological expertise
Non Meteorological data process
Non Meteorological decision elements
Systems caracteristics (ours, others)
TDA build process
Militar expertise

A TDA Product

One data set is applied to a generic compound TDA

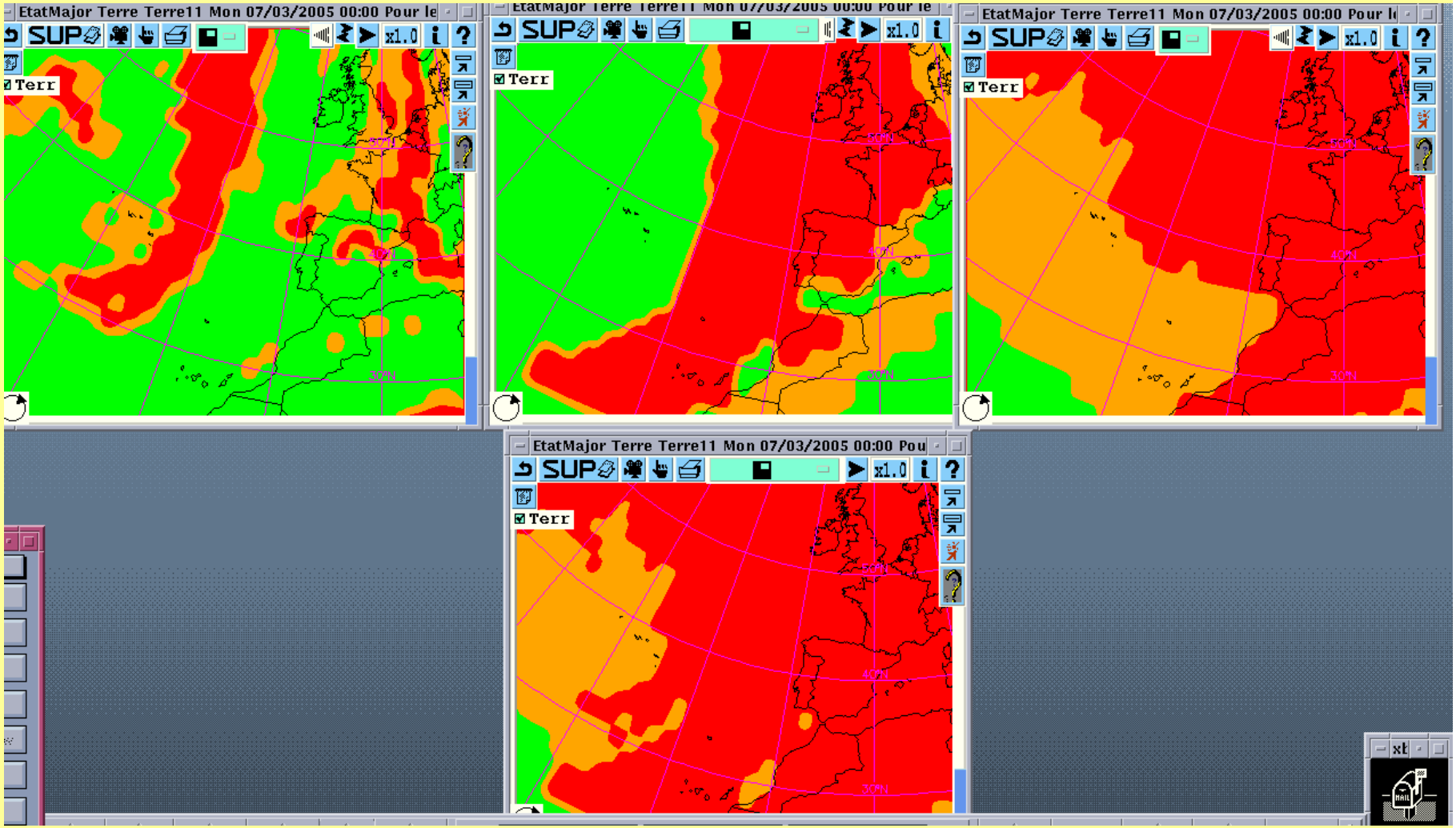


Information = descrition of the synthetic generic TDA

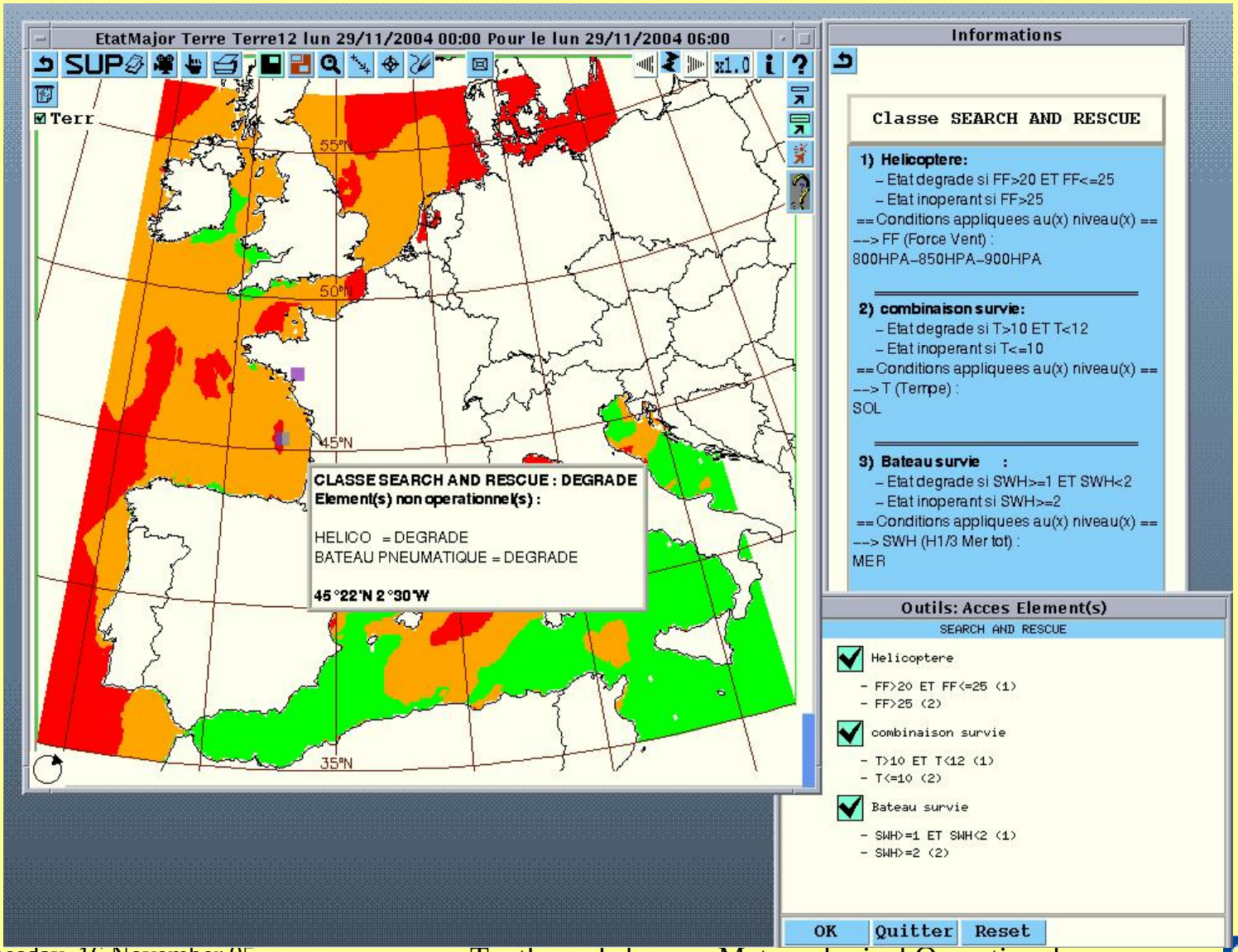
3D integration is possible

Select or unselect elementary TDAs composing the generic synthetic TDAs

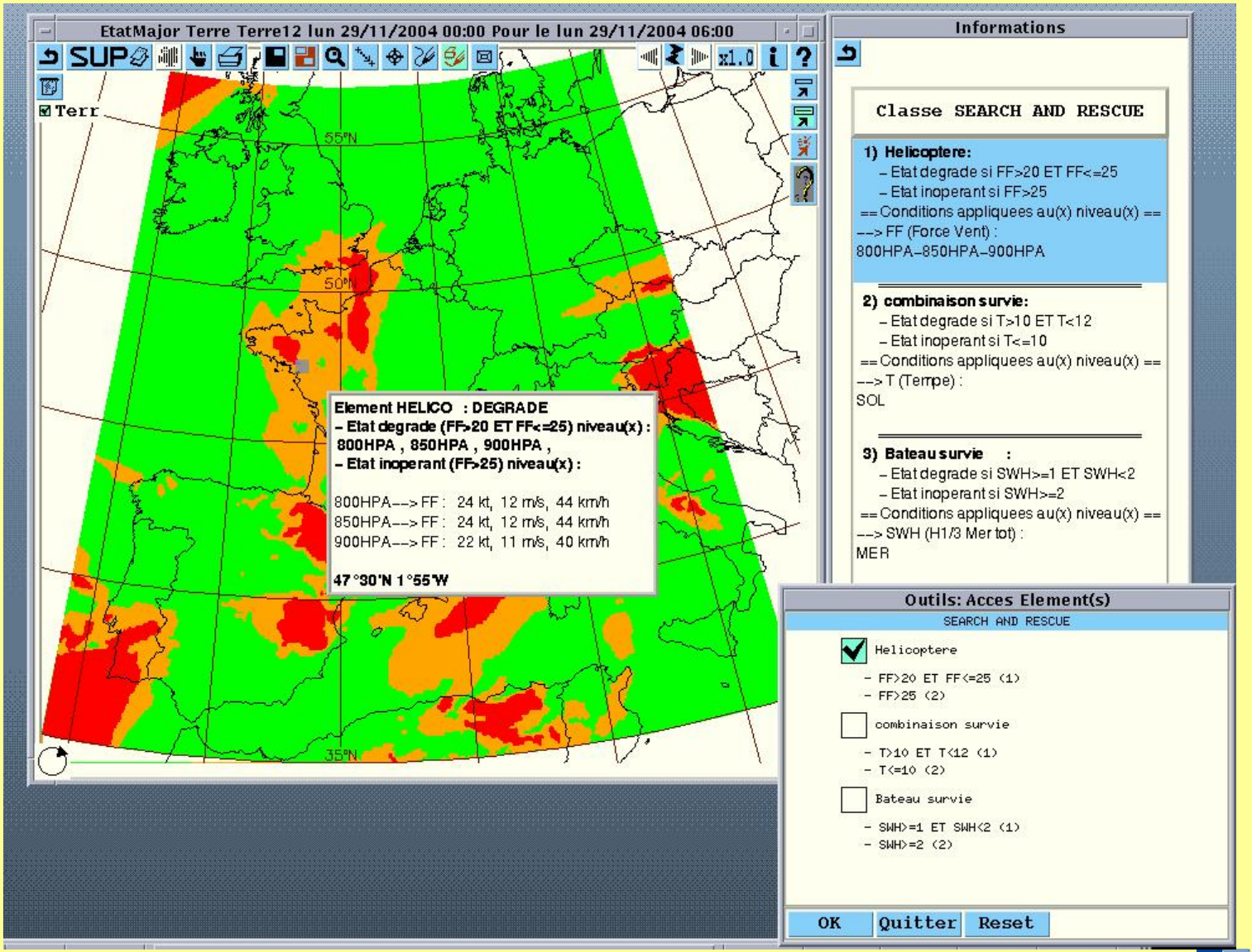
1 element unfavorable=unfavorable synthesis



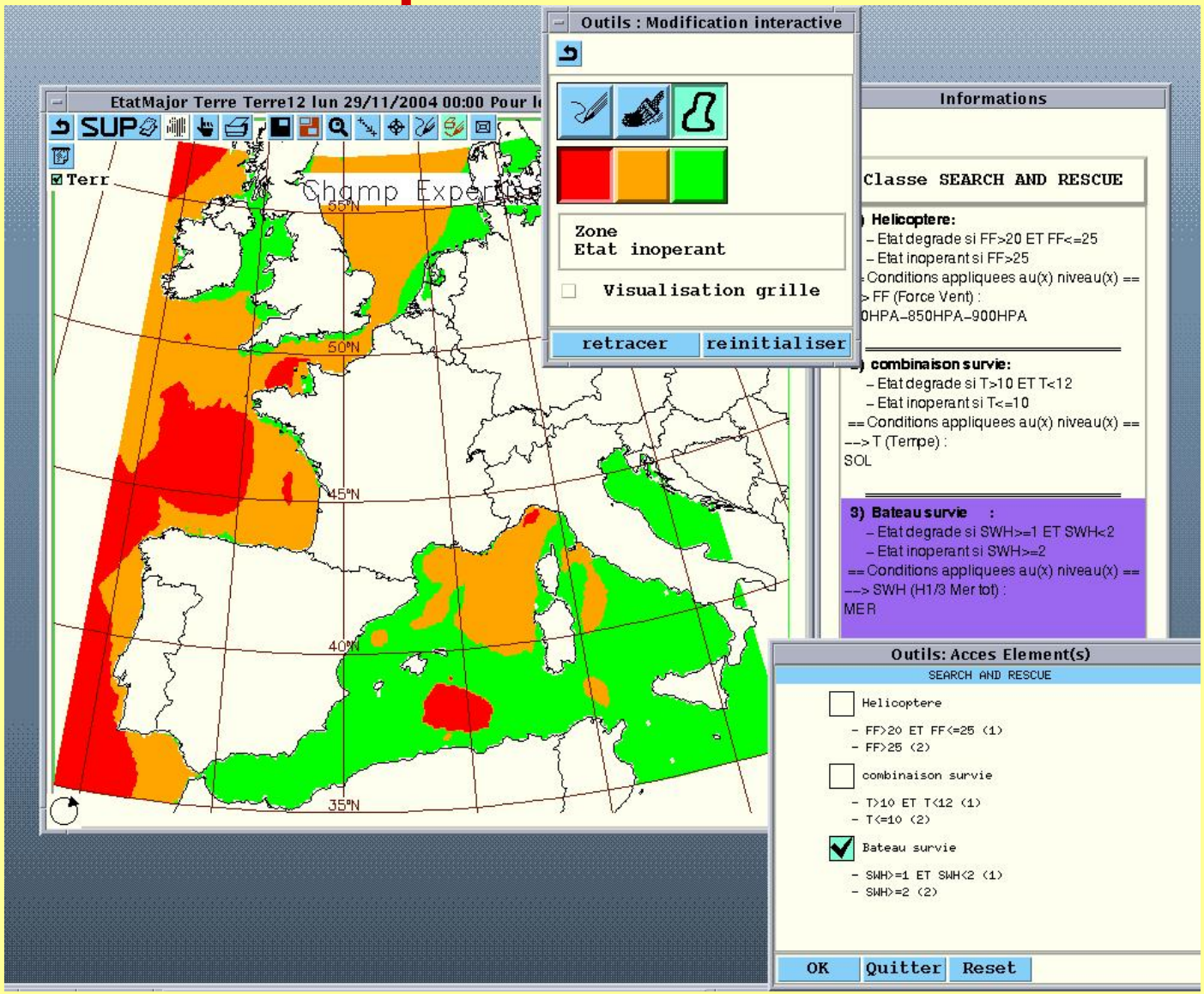
Multi-elements information gauge



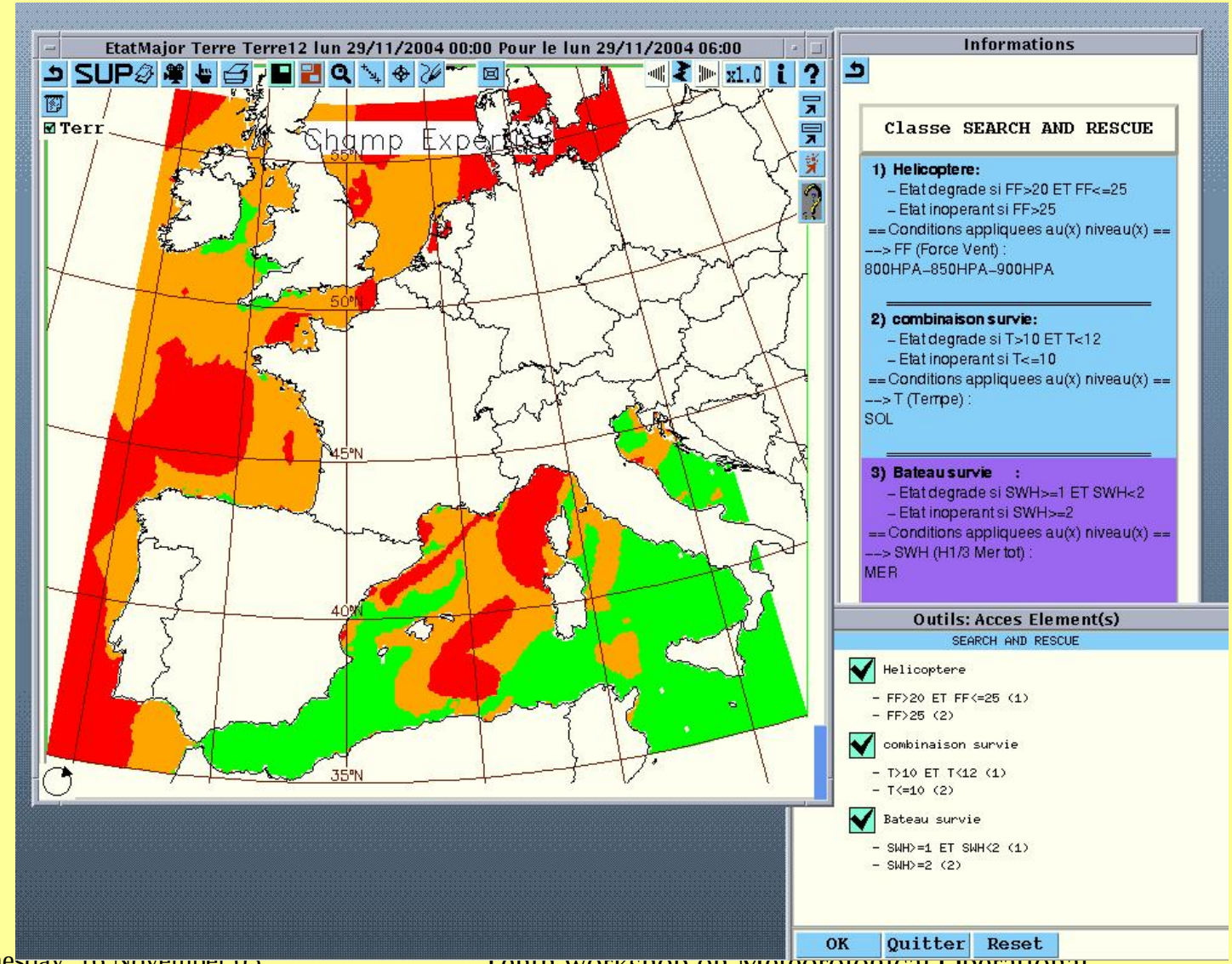
Multi-levels mono elements gauge



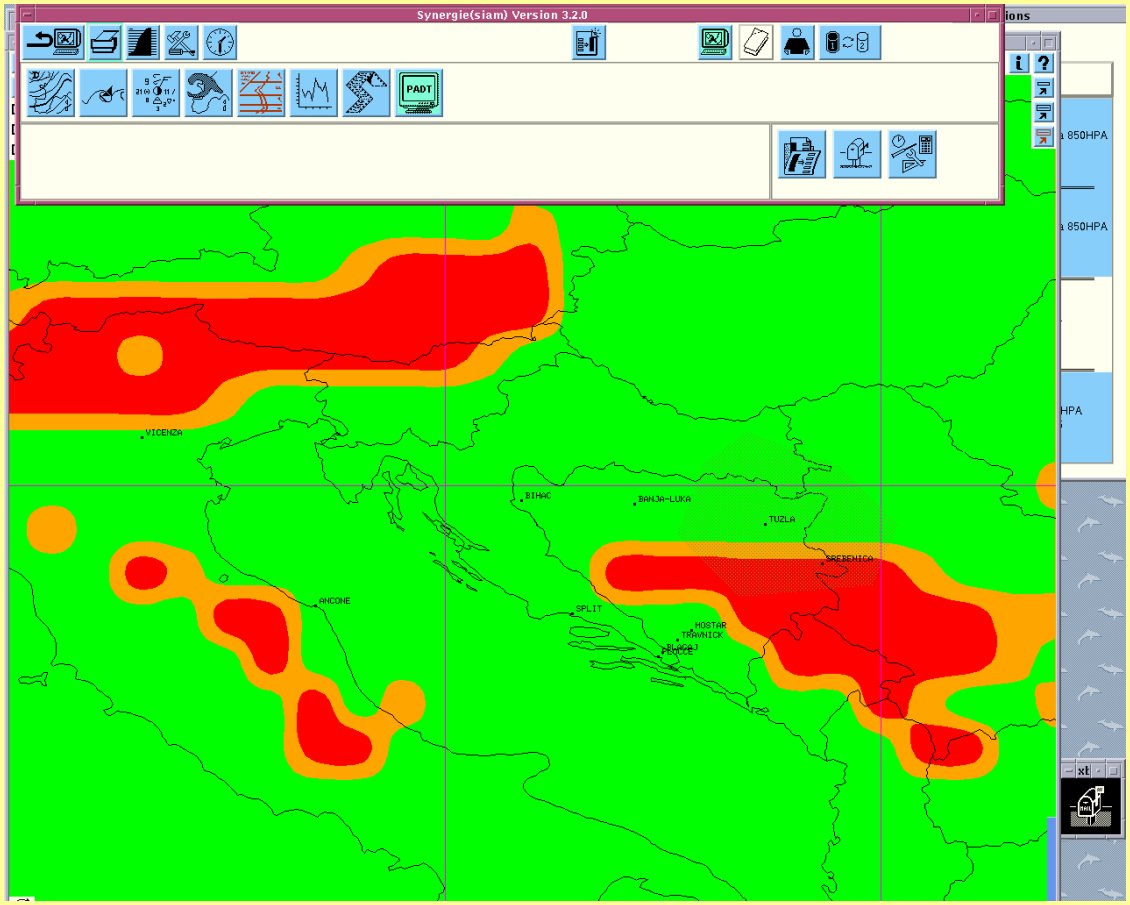
Edit TDA output



The expertise is taken into account into the synthesis without modifying the fields

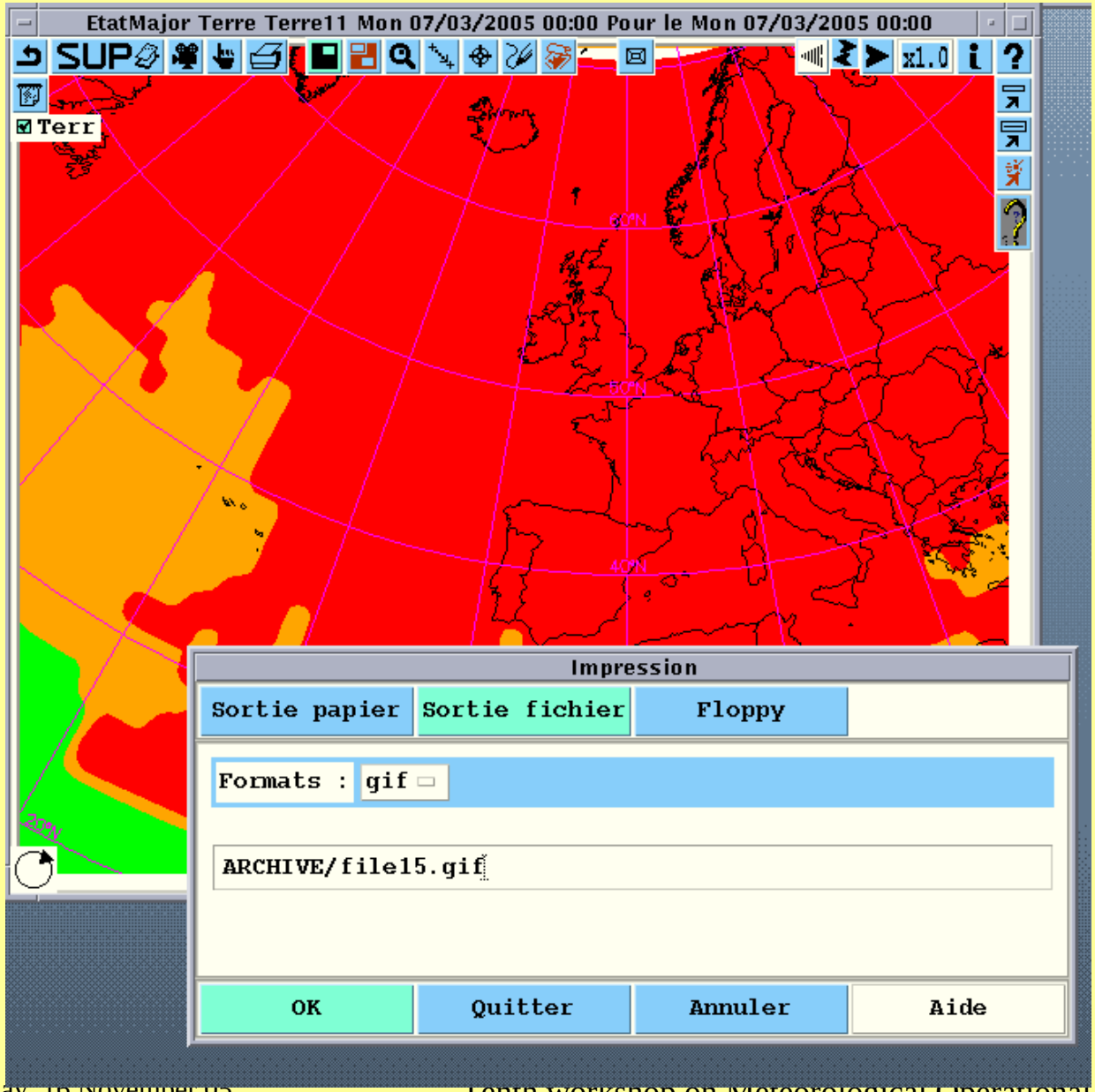


The TDA factory is integrated within Synergie



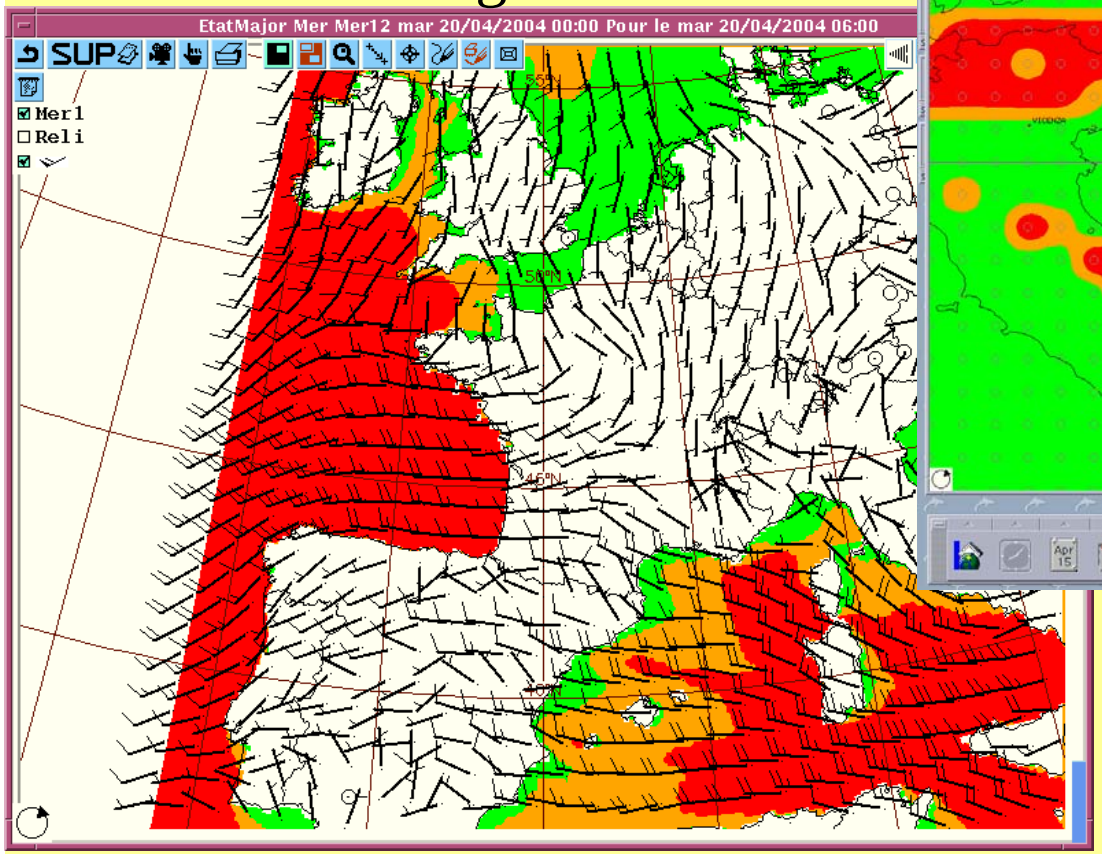
- Standart access in the Graphical User Interface
- Consistent GUI
- benefit from « basic services of the Synergie software » (zoom, overlay with all meteorological data, animations, user defined shortcuts…)

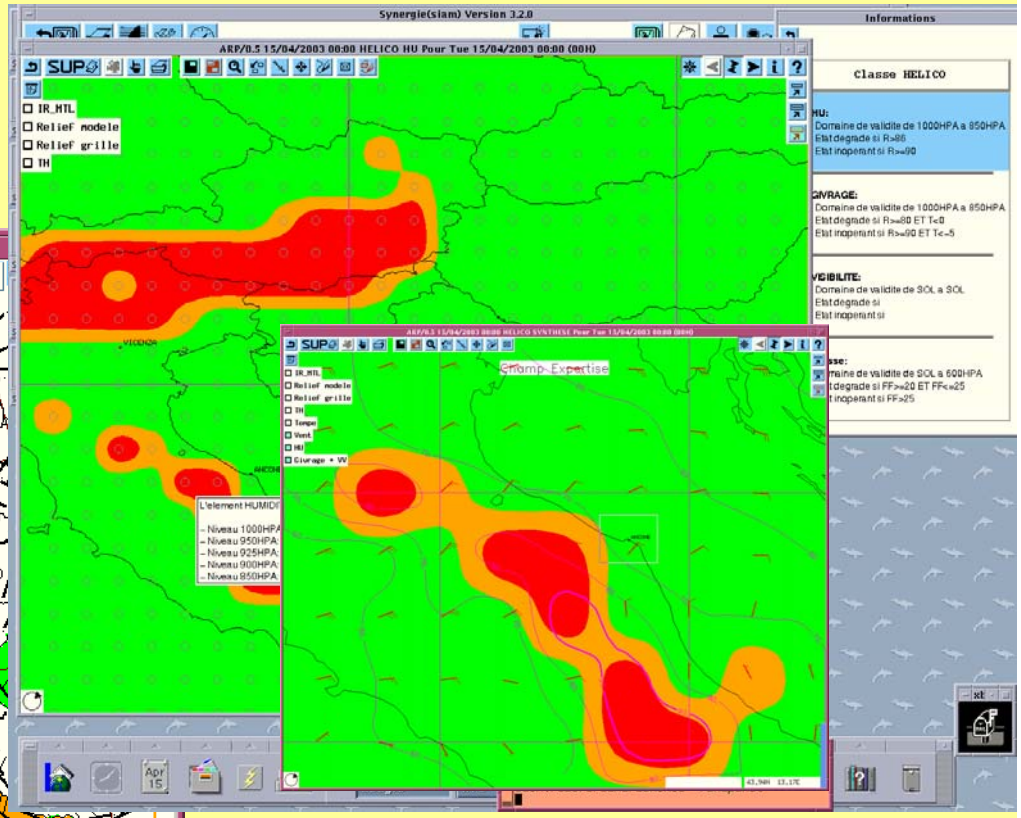
Output : georeferenced GIF, TIFF, JPEG



Use of the basic Synergie functions

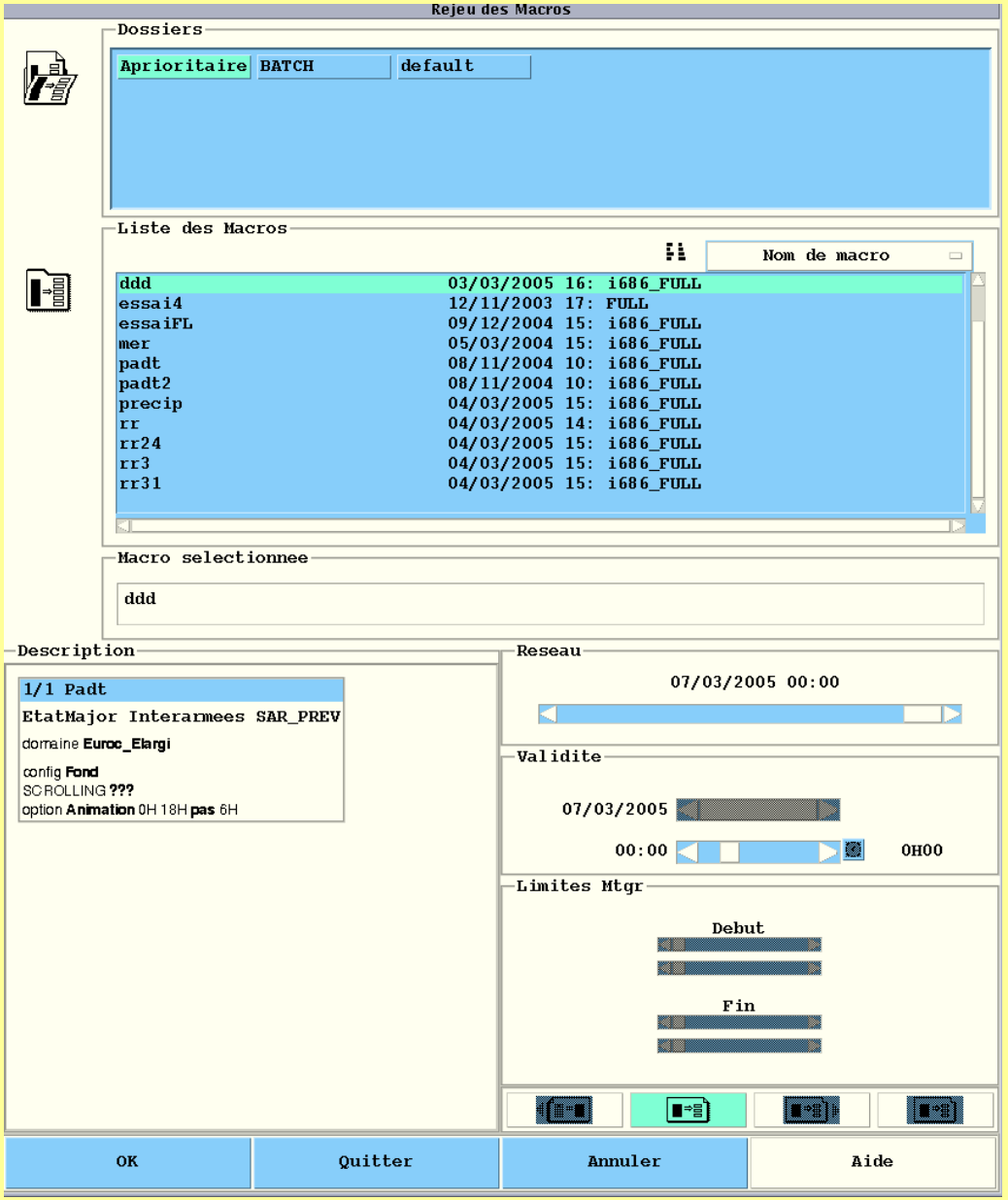
Overlay with meteorological data





Zoom over a theater, keeping a synoptic vue

Shortcuts


Rejeu des Macros
Dossiers
Aprioritaire
BATCH
default
Liste des Macros
Nom de macro
ddd 03/03/2005 16: i686_FULL
essai4 12/11/2003 17: FULL
essaiFL 09/12/2004 15: i686_FULL
mer 05/03/2004 15: i686_FULL
padt 08/11/2004 10: i686_FULL
padt2 08/11/2004 10: i686_FULL
precip 04/03/2005 15: i686_FULL
rr 04/03/2005 14: i686_FULL
rr24 04/03/2005 15: i686_FULL
rr3 04/03/2005 15: i686_FULL
rr31 04/03/2005 15: i686_FULL
Macro selectionnee
ddd
Description
1/1 Padt
EtatMajor Interarmees SAR_PREV
domaine Eurroc_Elargi
config Fond
SCROLLING ???
option Animation 0H 18H pas 6H
Reseau
07/03/2005 00:00
Validite
07/03/2005
00:00
0H00
Limites Mtgr
Debut
Fin
OK
Quitter
Annuler
Aide

TDAs production within a meteorological forecasting system

- Right now the development aims rather at fulfilling tactical aid (real time data flow)
- It could be enrich with the possibility to work on climatological reanalysis data in order to answer all time range decisions

Interfaces

- To other nations data if in WMO formats : Done
- To non WMO formats : To be done for NATO formats
- To standard civil telecommunications means : Done
- To other nations elementary TDAs : to be input into the rules base or import interface to be defined
- To other nations or non meteorological TDA factory : Format to be defined (necessity of metadata fully describing the product to be considered)

Web production process

Raw Data

Data

Interactive Synergie

MDB

Basic Data Base

Expertised Data Base

Productable Data Base

Images prototyping
Images generation planification

Images visualisation system

Synergie batch

Data

Images

WEB server

Other systems (today pollution models, later military models if output in WMO formats or Synergie updated to ingest other formats)

Brigitte Bénech, M-Françoise Voidrot

METEO FRANCE
Toujours un temps d'avance

Products worked out from Synergie

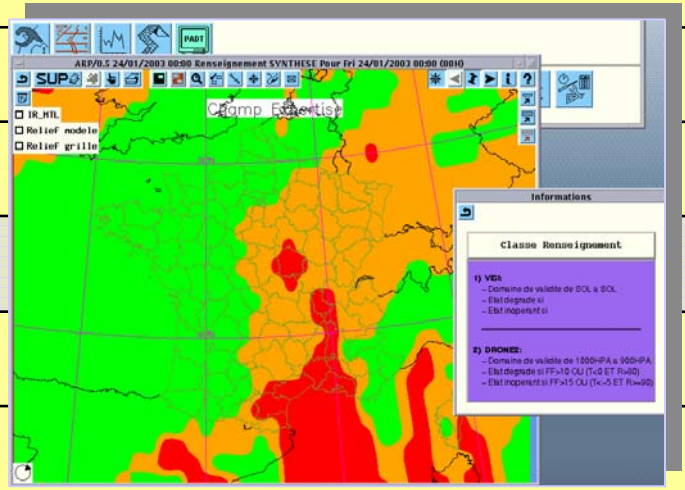
- Taverny, *(« Département DP » délocalisé)*
- Celenv,
- **Cemeter** *(Météo-France Sous traitant dans le cadre d'un marché DGA/Alcatel)*
- **Charles de Gaulle (Héraklès 2003, Agapanthe 2004)** *(Convention de MCO spécifique)*
- Expérimentation Otan Cometfire
- **Anniversaire du débarquement**
- CEL

Actions en cours ou en projet

- **Evaluation Armée de l'air (Bases et Théâtres)**
- **PEA Promethée LT**, *(Co-maîtrise d'ouvrage DGA Météo-France)*
- PEA Climat *(Météo-France Sous traitant dans le cadre d'un marché DGA/Tekelec)*
- Synergie-Océano en lien avec Guide Metoc et Calypso
- Participation au séminaire REP de la DGA
- PREDEM

Cemeter

Moyen	Mise en Œuvre (en 2 ans)
Données de bases	Retim 2000 puis Liaison spécialisée pour des données mondiales
Données spécifiques	Capacité à supporter des théâtres
Outils	Synergie, requêtes IAA
Expertise	
Consultance/Études	Développements spécifiques PADT
Personnels	*1 personne mise à disposition*
Formation	Formations synergie, prévisionniste et administrateur
Support opérationnel	MCO dans le cadre du marché



Porte Avions Charles de Gaulle

Means	Mise en Œuvre (en 3 mois)
Basic data	Catalogue spécifique issue de Celenv via SICMAR METOC et Syracuse
Specific data	Aladins atmosphériques transporté, vagues, mosaiques d'images, Produtis de moyenne echeance EPS
Tools	Synergie, requêtes IAA, mini site
Skill	Chef prévi (mission Agapanthe)
Consulting/research	Gestion de projet, conception configuration Synergie adaptée
people	*Working in Météo-France or in the Military Environment Cell in Toulouse*
Training	Synergie for forecasters and administrators of the system
Operational support	Convention de MCO

Websites for military support

- If necessary Meteo-France is now able to build rapidly dedicated web sites for the armies.
- Specifications are given by the special meteorological units depending on one of the three forces
- Those specifications are expertised and eventually completed by specialists in Meteo-France (on models, forecats, transmission…)
- Some special products can be issued from the operational units of Meteo-France (charts, Temsi, bulletins…)
- A special small unit is responsible for the construction and maintenance of the web site

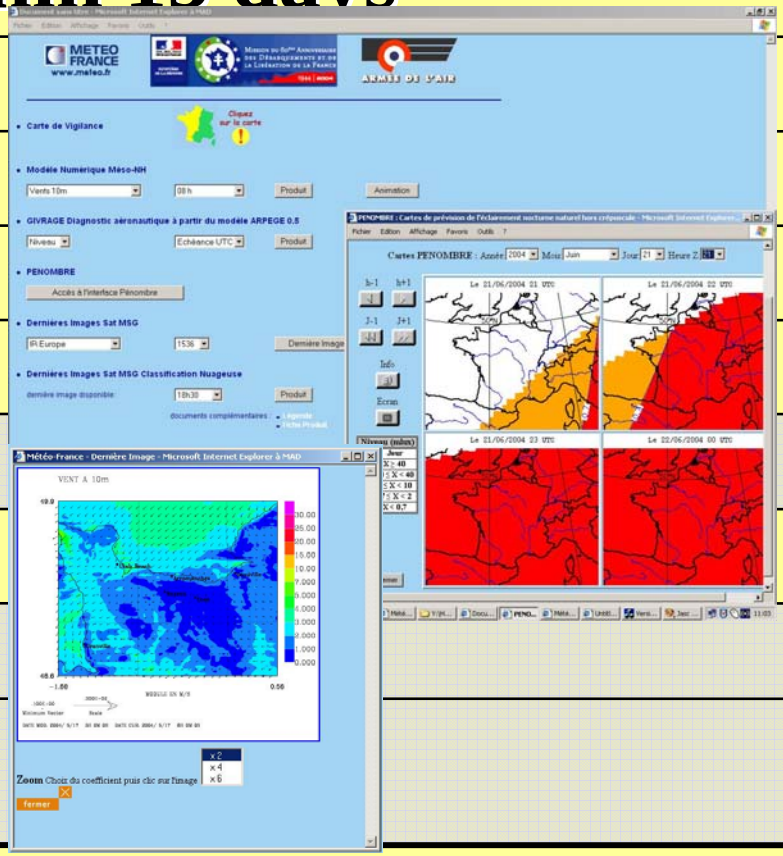
- Web site for the aircraft carrier "Clemenceau"

- **Websites for military support**

Websites for military support

60th birthday of military allied forces'landing (1944)

Means	Worked out within 15 days
Basic data	Specific Retim profile.
Specific data	Méso NH
Tools	Synergie, web site
Skill	
Consultancy/studies	
People	Support of the departemental meteorological center Caen
Training	
Operational Support	



Websites for military support
Mission of rescue to Pakistan (NATO action)

- See demonstration

Evaluation Armée de l'air

Moyen	Mise en Œuvre
Données de bases	Retim, Extractions IAA, PDUS
Données spécifiques	Aladins transportables,
Outils	Synergie
Expertise	Support (s) à l'évaluation
Consultance/Études	
Personnels	CDMA Toulouse, CMA Cazaux
Formation	Administrateur et installateur Synergie
Support opérationnel	

Prométhée LT

Moyen	Mise en Œuvre
Données de bases	Retim, Extractions IAA, PDUS, Acewex, Syracuse
Données spécifiques	Aladins transportables,
Outils	Synergie
Expertise	Flux d'informations Météo, Formats, Synergie …
Consultance/Études	Aide à l'Evaluation des architectures proposées par les industriels, Intégration de Synergie en Amont aux systèmes Acewex, Inmarsat, Réceptions directes, Syracuse,formats Otan…. En Aval, DSV, Balistique, IWEDA…
Personnels	
Formation	
Support opérationnel	

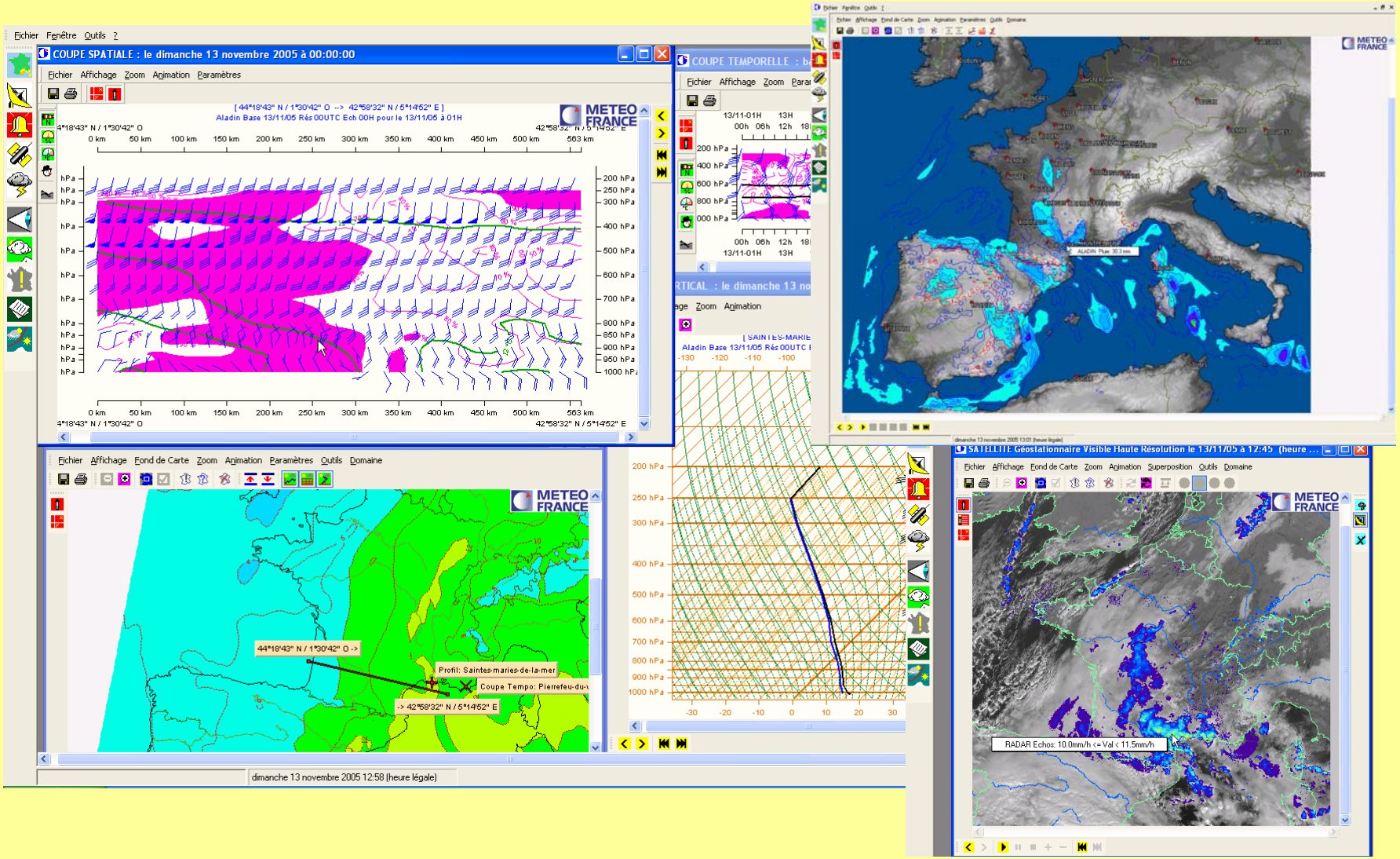
STORM, specific tool for the Navy

- Synergie is not the only visualisation system existing in Meteo-France.
- For local area forecasters, MF has developed a specific tool on windows PC, with a classic windows operating system (named PIC).
- It has been developed to transfer expertise from central forecast office and regional centres to local forecasters, and to supply local forecasters with the minimum data set allowing to follow up the meteorological situation

STORM, specific tool for the Navy

- Data and products are pre-processed with specific superimpositions: as composite charts of fields from NWP models…
- This tool is fitted for local area forecast with specific geographic information
- Data are transmitted via Retim
- Some of these systems have been settled in met services on naval bases

PIC, the visualisation system for local forecasters in Meteo-France



Wednesday, 16 November 05
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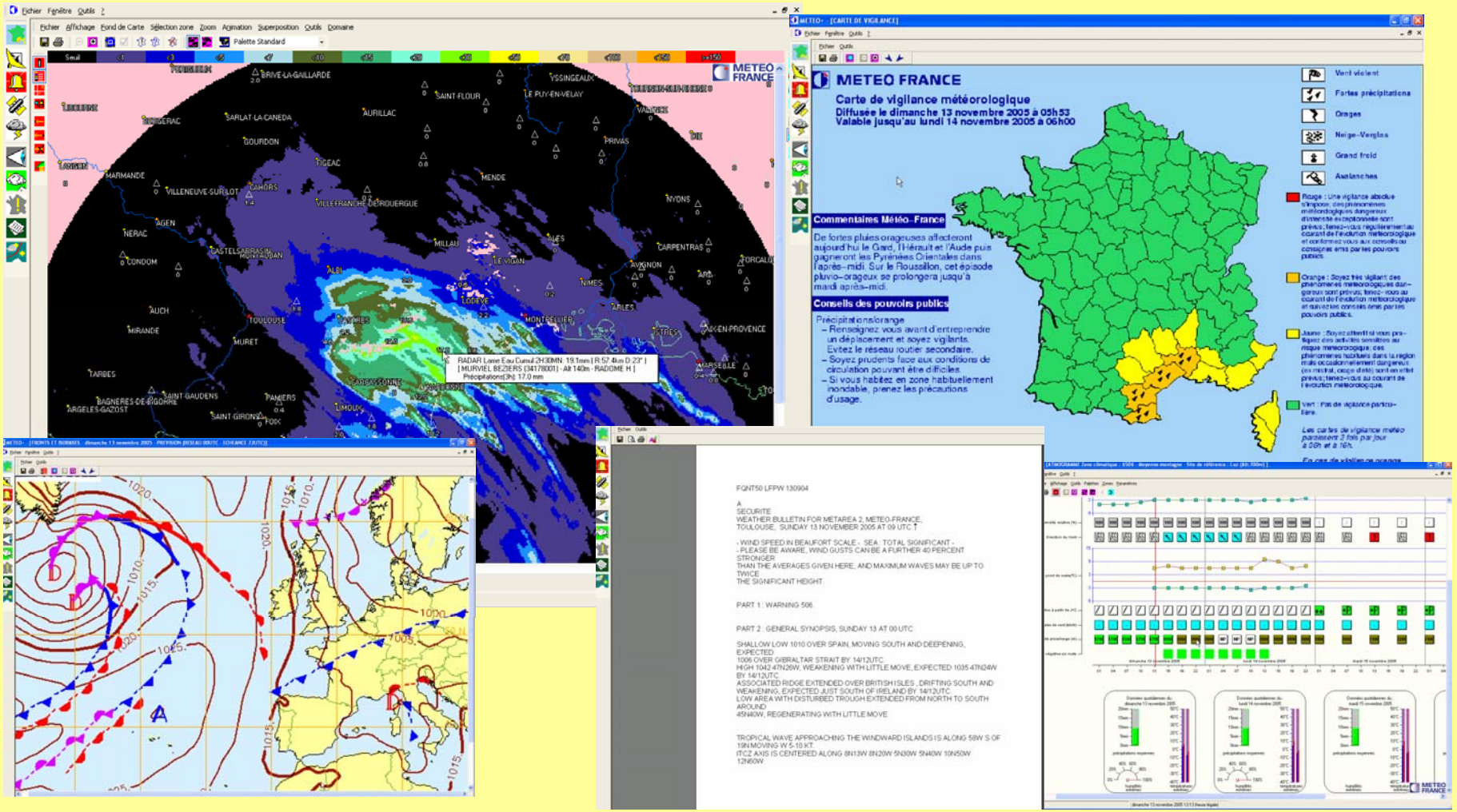
METEO FRANCE
Toujours un temps d'avance

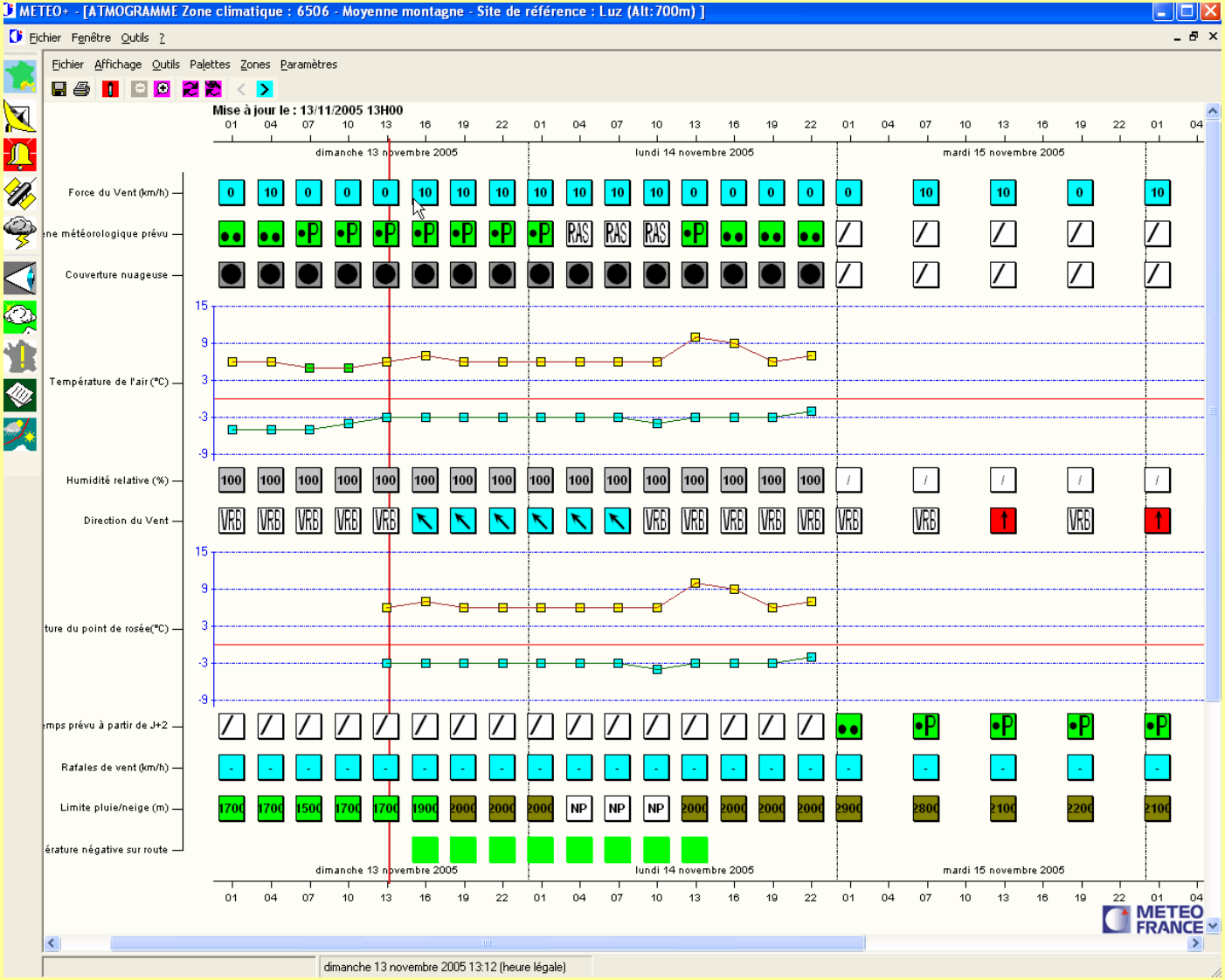
PIC, the visualisation system for local forecasters in Meteo-France



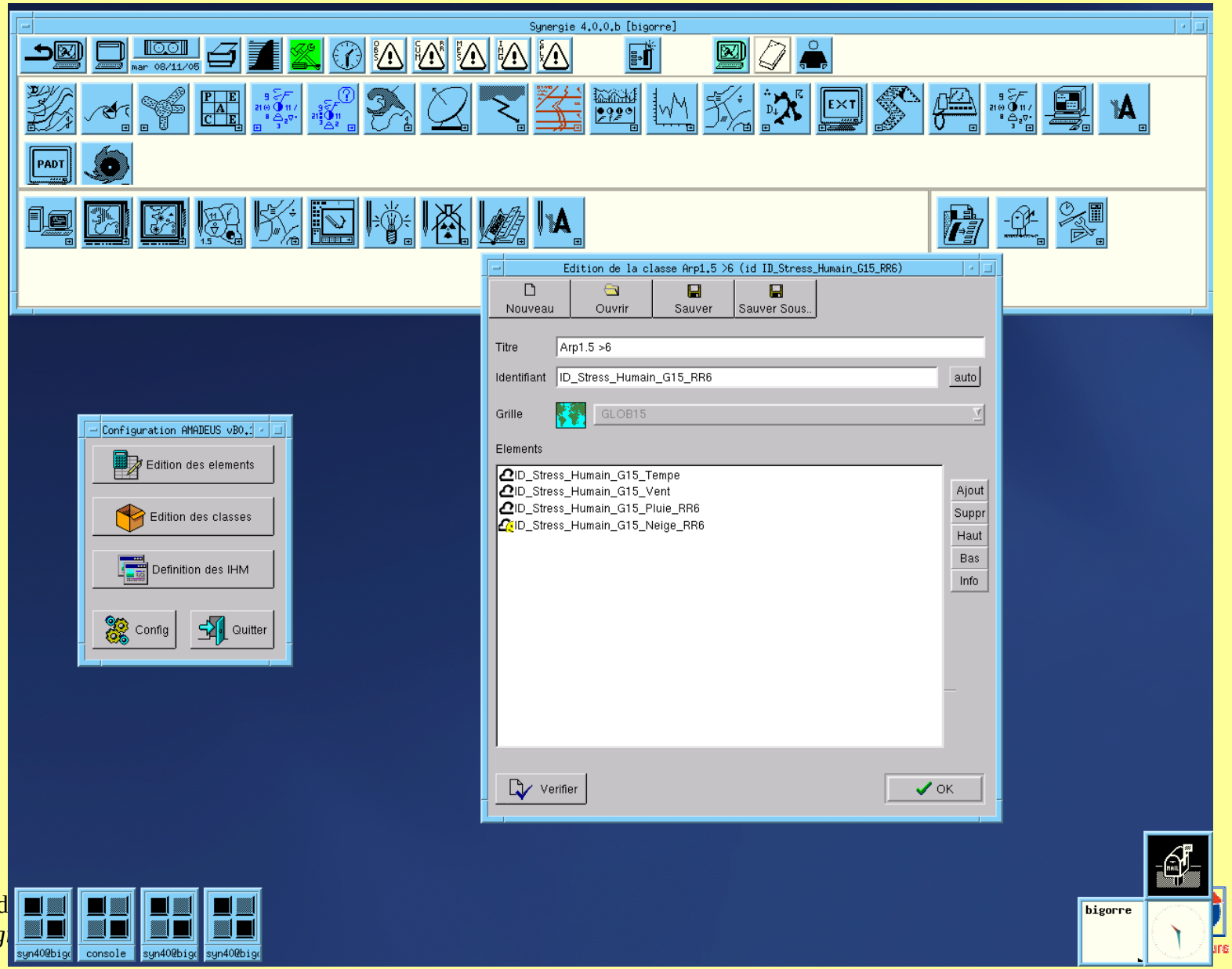
STORM, specific tool for the Navy

- For the needs of the Navy, new specifications have to be included in this tool “STORM”:

- An improved, complemented aeronautic level
- The access to ECMWF data (global model)

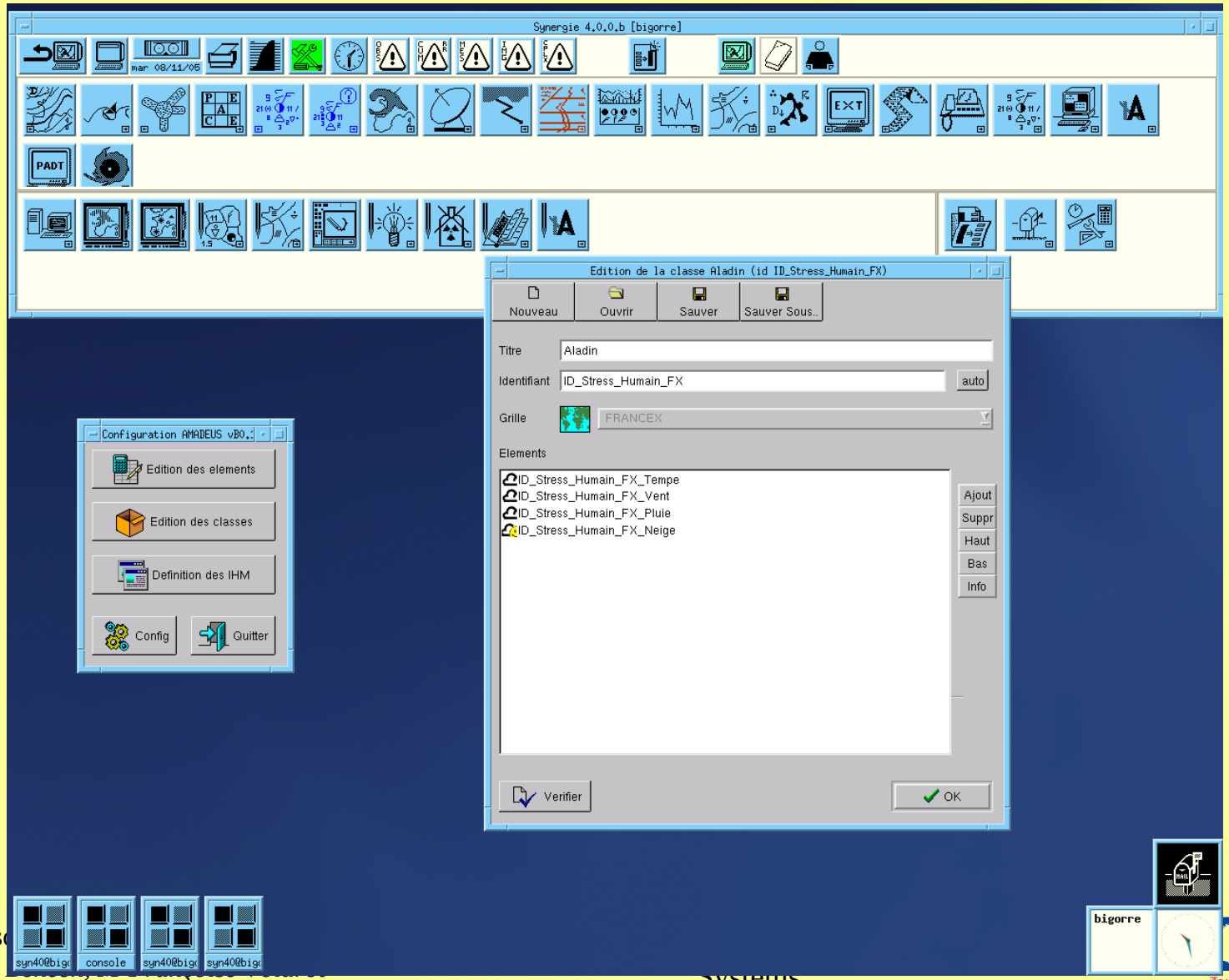

METEO+ - [ATMOGRAMME Zone climatique : 6506 - Moyenne montagne - Site de référence : Luz (Alt:700m)]
Fichier Fenêtre Outils ?
Fichier Affichage Outils Palettes Zones Paramètres
Mise à jour le : 13/11/2005 13H00
dimanche 13 novembre 2005
lundi 14 novembre 2005
mardi 15 novembre 2005
Force du Vent (km/h)
Couverture nuageuse
Température de l'air (°C)
Humidité relative (%)
Direction du Vent
Rafales de vent (km/h)
Limite pluie/neige (m)
METEO FRANCE
dimanche 13 novembre 2005 13:12 (heure légale)

Exemple d'applicatif suivant les règles de la CEMETER

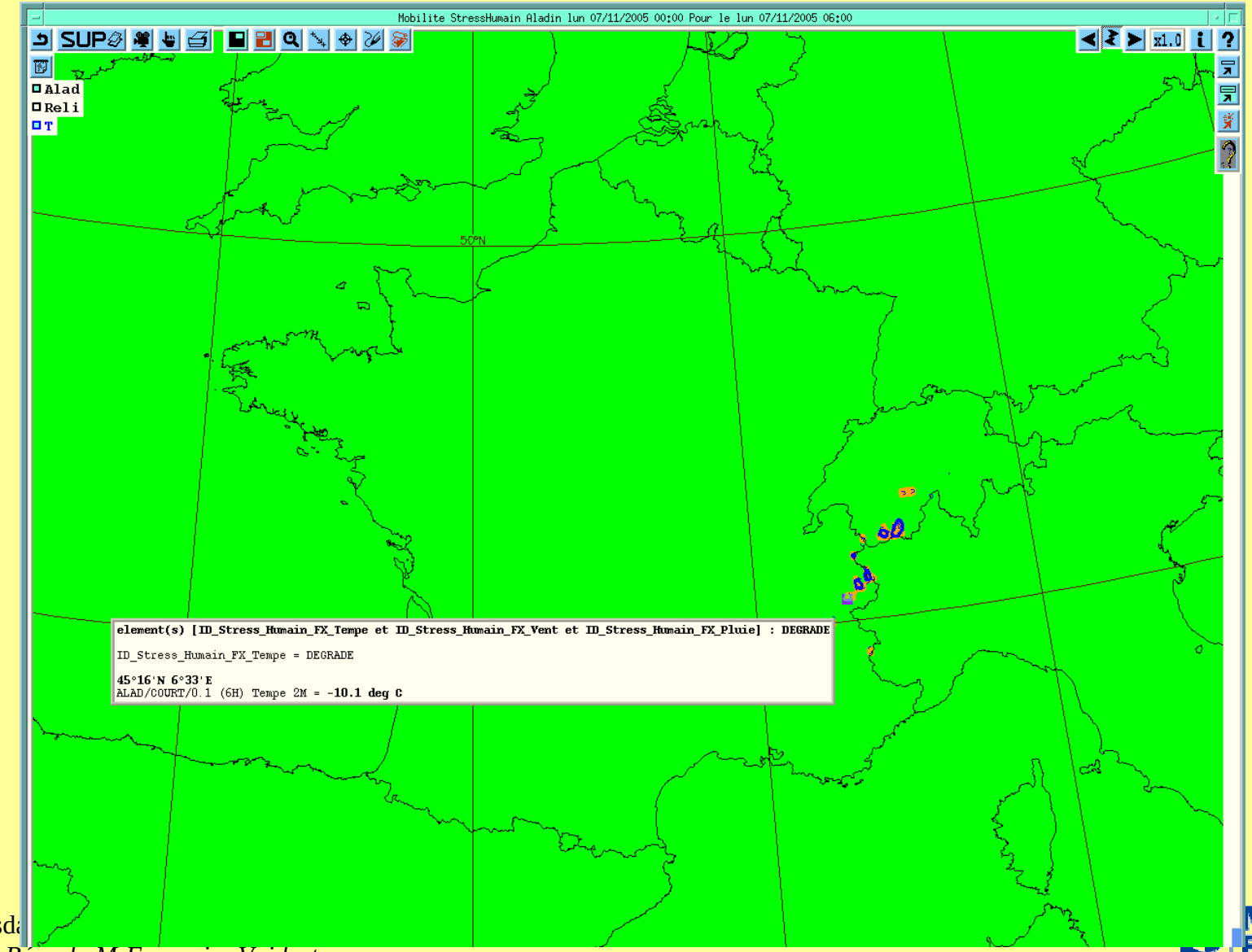


Wed
Brig

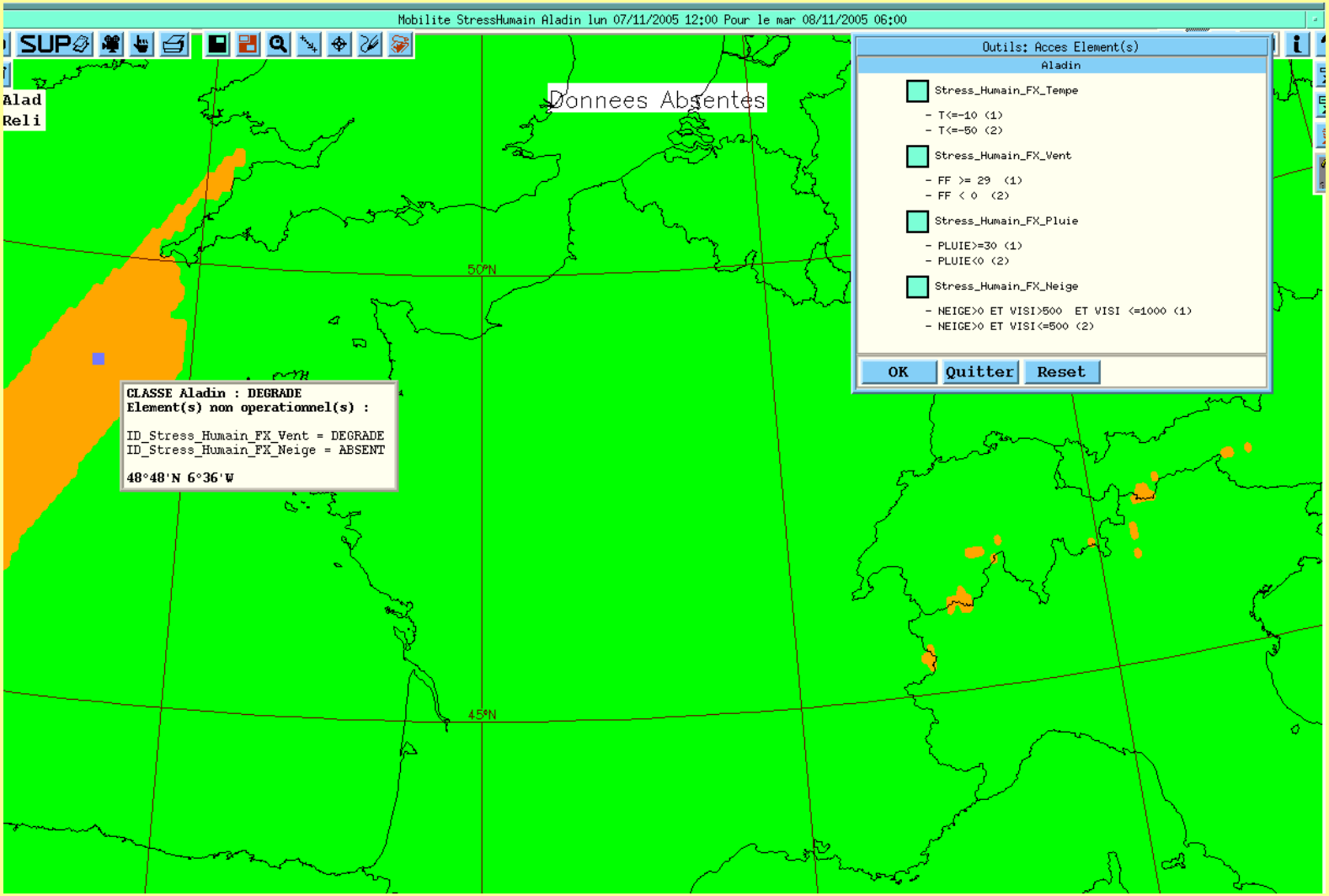
Exemple d'applicatif suivant les règles de la CEMETER



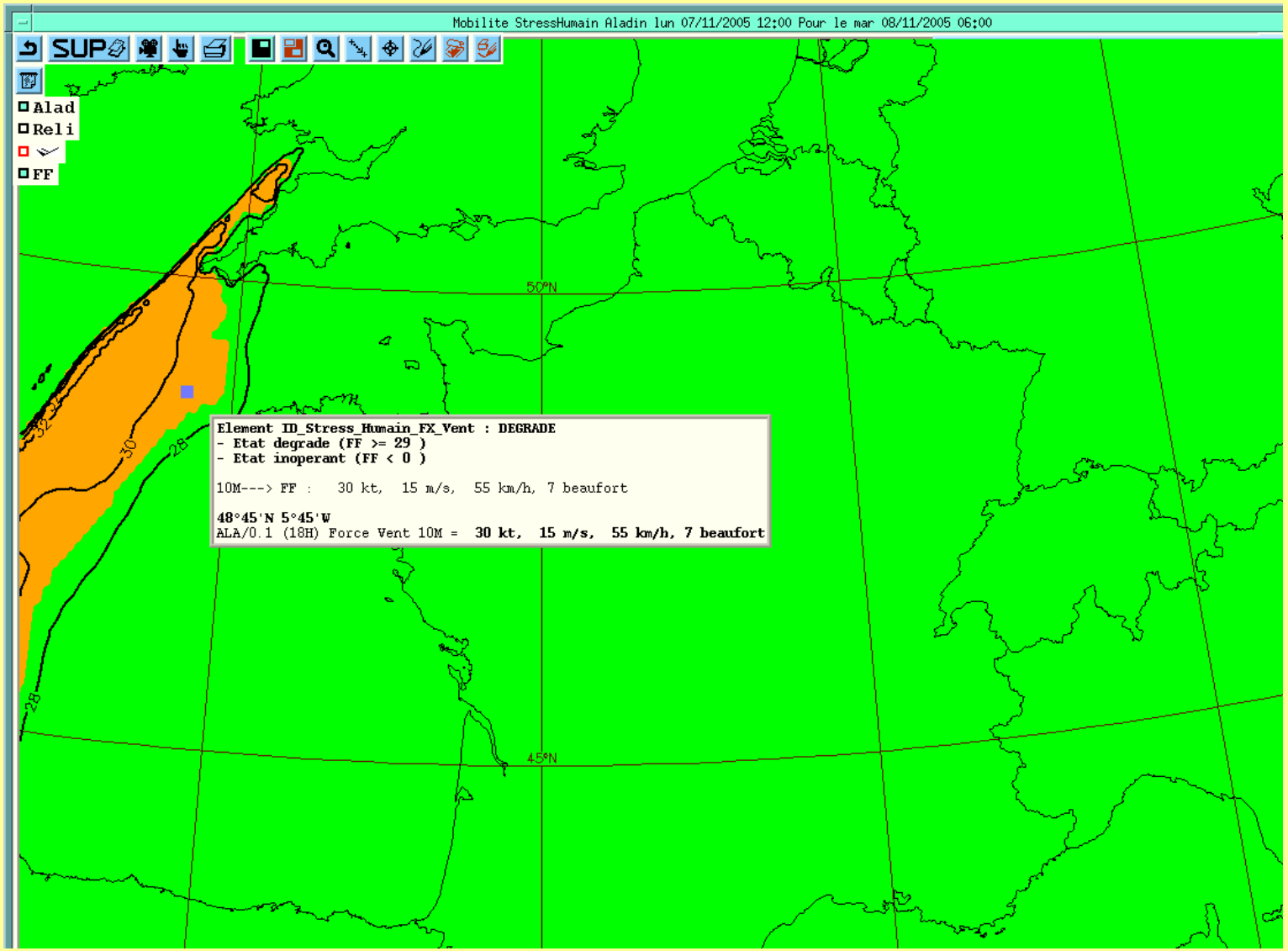
Exemple d'applicatif suivant les règles de la CEMETER



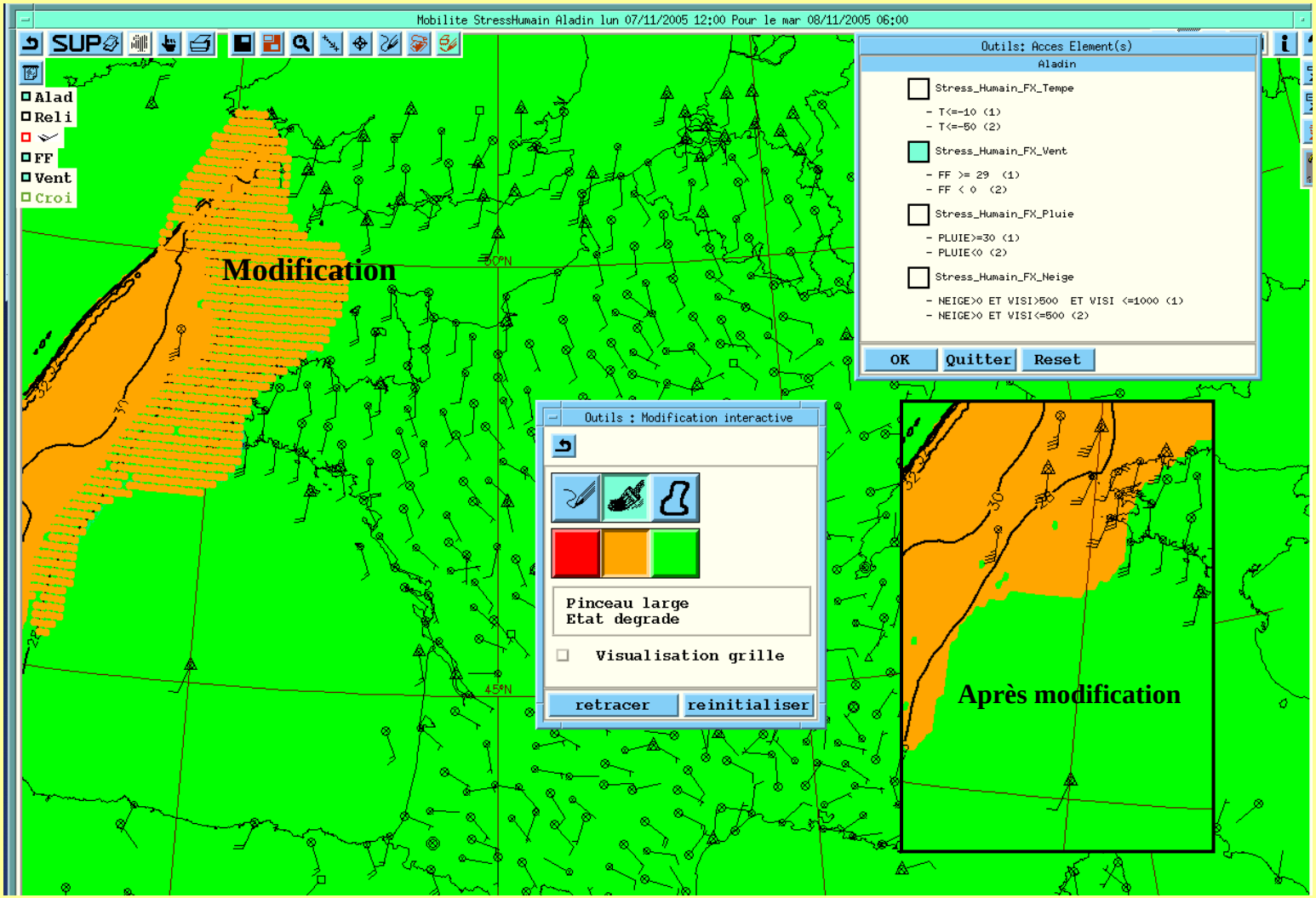
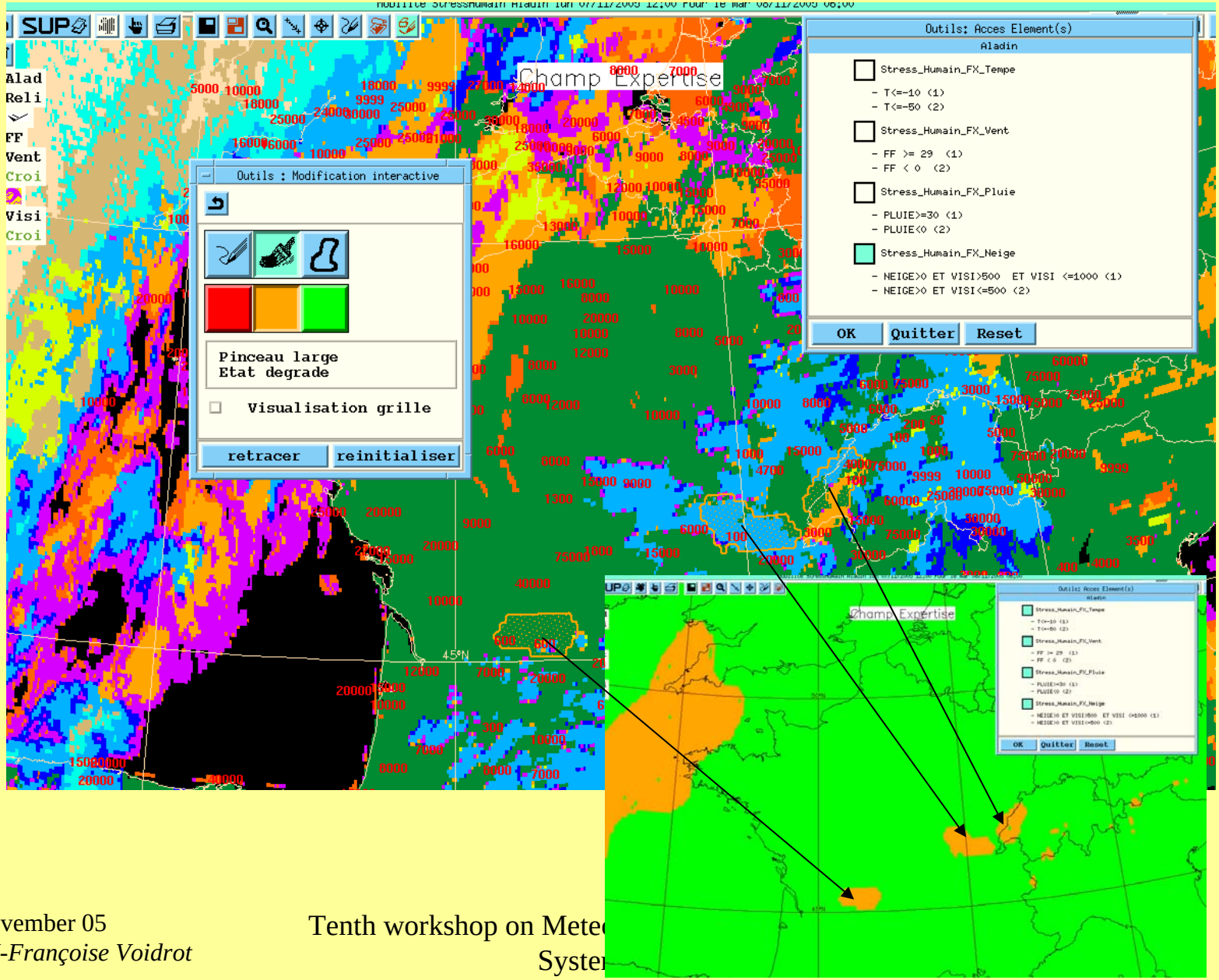
Exemple d'applicatif suivant les règles de la CEMETER



Exemple d'applicatif suivant les règles de la CEMETER



Exemple d'applicatif suivant les règles de la CEMETER



Exemple d'applicatif suivant les règles de la CEMETER