

OPERATIONAL WORKSTATIONS AT METEO-FRANCE :
RECENT PROGRESS OF THE SYNERGIE PROJECT

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1. INTRODUCTION

The SYNERGIE project is a METEO-FRANCE project of Meteorological Workstation for weather monitoring and forecasting, targeted to operational weather forecasters. This project has already been introduced during the 1992 IIPS Conference (*Voidrot et alii*, 1993). This paper will therefore emphasize its current state and future development.

Since the last AMS Conference, major improvements have been brought to the software :

- new type of data were introduced
- new basic features were added
- sophisticated features fitted to an operational environment were implemented
- major choice of going to NEONS for the DBM scheme was made

Synergie will be put into operations in the French national and regional meteorological centres between May and October 1994.

2. ANY KIND OF DATA IS IN SYNERGIE

A major purpose of the Synergie project was to integrate all the data into the same system in order to fasten the extraction of information and allow the user to use any type of data at any step of his work : understanding, forecasting, as well as producing.

To-day, Synergie can handle any classical type of data, such as :

- bulletins, messages
- ground observations
- satellite images
- radar imagery
- vertical soundings
- model outputs
- T4 formatted graphical documents
- static data (geographic contours...)

The software can also handle a special type of data Meteo-France is going to use operationally, which are values of sensible weather elements analysed or predicted by forecasters over any tiny homogeneous climatic area in France. These data are planned to constitute next year the official Meteo-France forecasters' output with respect to ground weather elements over France (*Landais, 1993*).

Later on, the system will be able to manage vocal messages. These messages will be use to make the communication faster and easier between operational forecasters working on remote centres. They will be mainly used as comments on models outputs from National Centre experts towards Regional Centres forecasters.

3. SYNERGIE CLASSIC FEATURES

By the end of 1993, Synergie offers any classic feature one operational forecaster may expect from a meteorological workstation. It can :

- visualize any type of data over any area for which data are available
- animate any type of data (if relevant) : radar, model fields, satellite images, lightning impacts,...
- draw 2D cross-sections anywhere in the models 4D fields
- overlay any types of data (radar, satellite, model, observations, ...)
- zoom in and zoom out cleverly
- give the position of the cursor in lat-lon and the corresponding relevant value of the visualised data (e.g. field value for model, cloud type for satellite, rain rate for radar,...)

As an example, Figure 1 shows a combination of four windows : cross-section of wind intensities (below left) field obtained as a pop-up window from a 2D vectorial wind field (up left); overlay of Humidity field and satellite IR picture over Europe (up right); radar composite image over France together with lightning impacts (below right).

4. TAILORED SYNERGIE FEATURES FITTED TO AN OPERATIONAL ENVIRONMENT

4.1 Synergie is a tailorable software

It was desirable to make Synergie a general software able to meet most of the - various- needs of the forecasters. On the other hand, almost every forecaster within a national or regional Centre has a specific duty to perform. Hence the idea of providing any forecaster with a specific Synergie software tailored for his actual duty. The concept of Synergie family, as a set of preset softwares designed for specialised forecasters was born.

In a more general point of view, any Synergie software may be seen as a set of general purpose and specific data and features, with a fitted "universal" user interface. This software is then implemented for any forecasting activity.

Besides, once the set of data and fonctionnalités is defined and selected, the user can tailor the software to its own preferences or needs.

He can also very easily define personal macro commands in order to save mouse clicks and go faster to the specific view of the data he uses to look at.

At last, the forecaster may define himself, if necessary, the geographical area he will work on.

4.2 "Scrolling" facility

Many forecasters use to work on very large documents (ground or upper-air observations over oceans or continents, global or hemispheric model fields, satellite images). For them was implemented the so-called scrolling facility : it enables to visualize within a physical window of the screen the part of a much larger full resolution virtual window the forecaster is interested in. Moving inside this virtual window is made very easily through the mouse. In spite of the limited surface of the workstations screens, this feature should meet the needs of a larger part of forecasters in regard to handling very large documents in full resolution.

Figure 2 gives an example of scrolling over an Atlantic-Europe area. The window on the left shows the initial visualization (1000hPa temperature and geopotential together with ground observations). Once the scrolling facility is asked by the user, the mouse movement makes the user easily and instantaneously focus on any region, with full information (right windows).

4.3 Tools for forecast production

An interactive system such as Synergie could not be really efficient and fully accepted by duty forecasters if it does not offer facilities for meteorological production. In fact, a forecaster expects from any system of this kind not only a tool for data visualization and manipulation. He must find in the software all the relevant features he needs, especially for graphical production.

As a matter of fact, a large part of the added value brought by a forecaster can be summarized by maps. These maps are currently used (and currently hand-drawn) for professional users as well as for public users. Besides, graphical expert work is widely used within Météo-France to exchange informations between National and Regional Centres. That is why a high priority has been given to the development of tools helping the forecasting in this kind of production.

All the tools being developed are based on a graphical editor that should be able to :

- suggest to the forecaster a first guess of a final product by using informations contained in the local database (e.g. direct model outputs);
- handle graphical meteorological objects (pictograms, fronts, cyclones,...)

The first products Synergie will offer next year will be :

- an editor for final text/charts products (such as for newspapers) using the weather elements database filled by the forecasters (see §2);
- an editor for forecast maps containing both mslp and meteorological objects (fronts).

Later on Synergie will make possible the graphical annotation of any Synergie document (e.g. model fields, ...).

5. TECHNICAL ASPECTS

5.1 Move to Neons

In each Centre where Synergie will be installed, the data will be stored in a unique database which will be the contact point between the external world (transmissions, models, soundings, satellites) and the forecaster. The DBM system has been chosen in June 93 and is the same for both Synergie and Diapason (operational heart of Meteo-France). It was also decided to use the Neons software package (developed by the US-Navy) above the RDBMS layer (*Stein et al.*, 1993). Neons is expected to save time for the developments and seems to offer a good data scheme.

5.2 Kernel architecture and developing framework

After the developing team has been dramatically enriched (from 2 up to 10 members working now on the project), it was necessary to bring deep changes to the software kernel. Now, these changes enable any developer to add a new feature, a new type of data very easily and make the basic features (animation, zoom, scrolling,...) readily usable for any new type of data.

The Synergie project is being developed inside Météo-France. Hence it is advisable that not only the team developing Synergie but also any people working in the French weather centres should be able to integrate new features (for local needs for instance). This is the reason why the project has published a "*Synergie developing guide*" giving recommendations for development of features and of their user interface. It is expected that from now, all the features to be developed for forecasters should be developed within the Synergie framework.

6. IMPLEMENTATION STRATEGY

6.1 Architecture

Synergie will be implemented at the National and at the seven Regional weather centres. At these sites, the selected architecture is a server/client type architecture : one (or two) server is the interface between outside and the forecasters; each forecaster will work on a separate workstation, with its own power dedicated only to visualization. The workstation make requests to the server by SQLnet. There will be about ten stations at the National Centre, and three or four at each Regional Centre.

6.2 Implementation

The servers will be installed by the beginning of 1994. The stations will be implemented progressively, from winter to summer 1994. The first Synergie stations to be put into operation (May 94) will be the ten stations devoted to the prediction of weather elements over France.

Later on will come the equipment and software tailored to the overseas territories (1995).

7. CONCLUSION

The first version of Synergie is now ready to be operational. It offers a wide variety of functionalities to the forecaster, together with a fast access to any meteorological data.

The Synergie project has taken into account the specificities of every forecaster's job and offers (or will soon offer) sophisticated features.

Synergie is transportable : an "Export" version of Synergie is under development. It will then be run at any place in the world wherever data are available in a WMO format. This version will be commercialized by the end of 1994.

8. REFERENCES

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Figure.1 : cross-section of wind intensities (below left) field obtained as a pop-up window from a 2D vectorial wind field (up left); overlay of Humidity field and satellite IR picture over Europe (up right); radar composite image over France together with lightning impacts (below right).

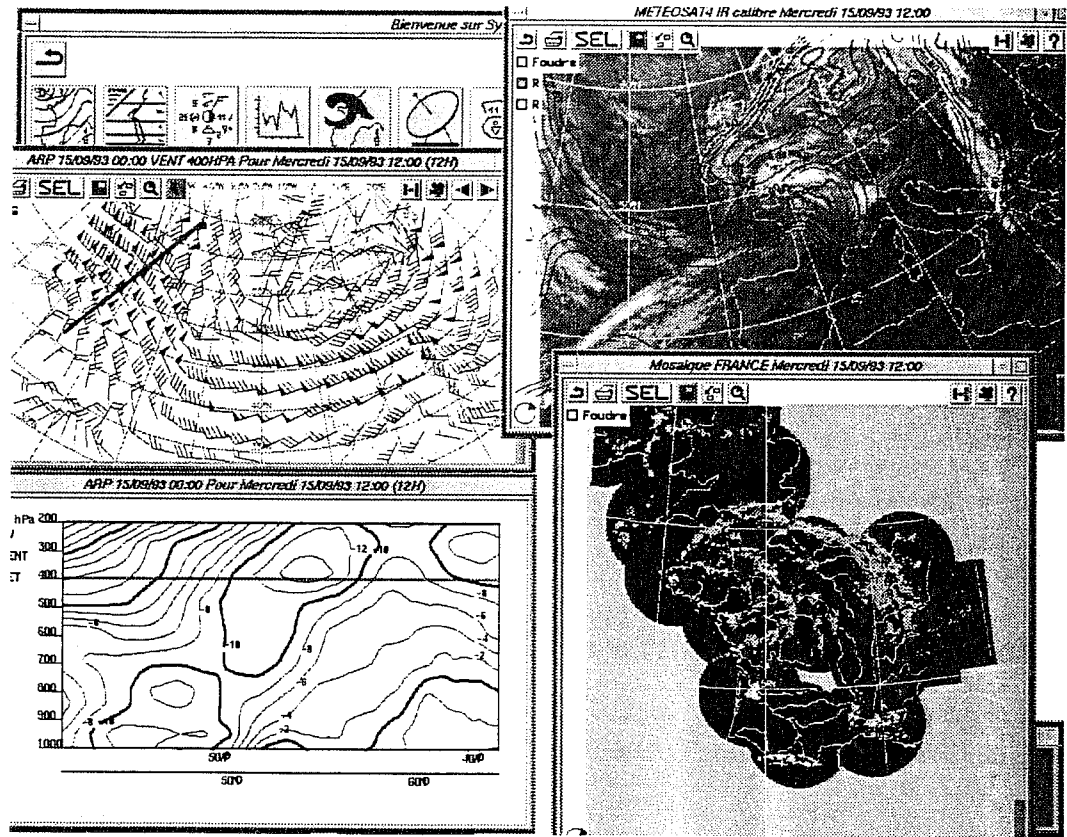


Figure.2 : example of scrolling (panning) over an Atlantic-Europe area. The window on the left shows the initial visualization (1000hPa temperature and geopotential together with ground observations). Once the scrolling facility is asked by the user, the mouse movement makes the user easily and instantaneously focus on any region, with full information (right windows).

