

Geliniv for Windows – An Integrated Software for Snow Data Analysis

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ABSTRACT

For more than twelve years, the CEN (Snow Study Center) has been developing operational software for snow data analysis. Various applications are available, depending on the geographical scale : the national data base located at the CEN, regional software for avalanche forecasters and local applications for snow weather patrollers in ski resorts.

GELINIV is the day-to-day work station of the local avalanche forecaster. All nivo-meteorological data (snow weather observations and snowpits) can be processed and displayed on various screens to help in snow cover analysis. It manages up to nine measurement points and several years of data are available on-line. In 1993, the first version under the DOS system was available.

The version V2 is a new one developed by the computing division of the CEN to work on IBM Compatible under the Windows interface. It is free software for French ski resorts of the snow weather network. In March 1996, more than fifty programs were installed for data processing about eighty measurement points in the French Alps and Pyrénées. A new version, V2.2, has been announced for November; one of the innovations will be the multi-language support for an international broadcast. In the future, the data transmission by modem between ski resorts and regional centers of Météo-France will be examined.

INTRODUCTION

In France, the avalanche hazard forecasting is founded on collaboration between the ski resorts (belonging to the snow and weather station network) and Météo-France (regional forecasting). A protocol was signed in 1992; the two obligations of Météo-France were to supply free software for local snow data analysis and all data of the station extracted from the National Snow Database (BDNIV).

This has been a logical continuation of an important effort made by the CEN for more than ten years to produce software for snow data analysis; some achievements are listed below:

- In 1983/1984, AIPRA was the first national software allowing direct and real-time access to all the data [Castets et al. 84].
- In 1985/1986, the avalanche hazard forecasting was transferred to ten regional stations, and new software, ADIPRA, became the day-to-day work station of avalanche forecasters [Dumas 91].
- In 1986/1987, a first local version, based on ADIPRA, PRELA was given to some ski resorts. It was developed by CEN and adapted to each station by a private company.
- In 1989, the National Snow Database (BDNIV) was created at CEN. It is the heart of all applications such as modelisation, climatology and so on.

THE V2 FOR WINDOWS, A GREATER EVOLUTION

The first version of GELINIV was distributed during the winter 1992/1993 [Bolognesi-Dumas 94]. Having been directly derived from ADIPRA, it was running under DOS and was available to store data on weather and snowpack information. One of the uses was to graph the data for easier visualization. This software was available to run on the most basic computer, a PC 8086, which allowed a wide distribution. However the interface was not very attractive for the user. Now, in 1996, most of them are using the graphical interface Windows and only need to click on the mouse to have results.

Therefore we decided, during the summer of 1994, to develop, for the winter of 1995/1996, a new modern version of this program, with powerful functions and user-friendly (we hope !): the version V2.0.

MAINSPRINGS

Many software are specialized either in process of snowpits, or snowpack database or modelisation [Tremper 92]. The most important feature of GELINIV is the integration of these three functions in the same software with a common interface.

We had five main objectives for the development:

First, some internal objectives:

- New graphic intuitive user interface with the Windows look.
- Improvements of the functions in all the programs of the DOS version.
- Simplification of the installation, updating and configuration process.
- Introduction of a didactic aspect for recently trained ski patrollers.
- The fifth and very significant objective:
- Allow processing of new measurements to be defined by users.

This last objective shows the CEN's wish to make an "open" software and so answer private developers' and users' aspirations.

WHAT DOES GELINIV DO?

The GELINIV's main screen (fig. 1) shows a toolbar which allows access to all the functions, grouped by data type. Most useful functions can be reached by several buttons with self explicit icons. By a special button, the user can change the year of data and so work as easily in the past as in the present.

Data entry

The conception of these modules is the most difficult. Each user has different methods and preferences and opinions may often be conflicting. The use of the application is also

variable: after each observation, once a day or each week. Moreover, the user may be a ski patroller who knows meteorological codification well, or a secretary who may not. So the developer has to make a personal choice which will not be approved by all users.

The didactic aspect has been intensified ; a parameter may be entered directly like a code or selected in a drop down list box with precise details. Many verifications are made to ensure good quality of the local database. At the present time the database allows storage of observations all year long (for summer skiing), and not especially during the winter as in the DOS version, and have nine locations for very large ski resorts. Two examples of screens for weather observations (fig. 2) and snowpits entry (fig. 3) are shown.

Visualization of snowpits

Three screens are available:

- One detailed snowpit (fig. 4)
- Four chronological snowpits for the same location (fig. 5)
- Four snowpits for different locations (fig. 6)

During selection of the location and the date, the user can see a little ram profile to help him in his choice. Many precise details can be visualized such as gradient of temperature, details of thin layers, ratio between shear-stress and shear-strength [Coléou 90], and a full legend describing codification. It is easy with the chronological screen to follow snowpack evolution or compare four locations with different altitudes or expositions with the multi-site screen.

Visualization of weather observations

Three time scales are available : three weeks (for forecasting), one month [fig. 7] and one year (for climatology) [fig 8]. These different representations can be activated by the same interface. Some computed data are produced, such as the sum of precipitations or fresh snow over a period of three or five days. A special climactical graph regroups averaged and extreme values of parameters for a period of ten days and a month [fig. 9].

Utilities

The configuration of the application is easy. Many options for the user can be defined with check boxes and option buttons. A special password allows the local head to protect against bad modifications of important parameters of configuration. As the data are stored in files with a special format, a utility can export them in a ASCII file, to be processed by an common program (for example, Excel). GELINIV is also connected with two external software:

- NXLOG (Ifena Davos) : all common and special data such as driftometer's measurements for example can be entered in GELINIV.
- OASIS [Gilet 95]: this application can directly process the files of GELINIV and especially the results of Astral (as defined in the next paragraph) to display the avalanche activity (list, map, scanned pictures) corresponding to the analog days.

Last but not least, on line help provides the user all information to help him.

THE NEAREST NEIGHBOR'S PROGRAM ASTRAL

This program [Guyomarc'h 94] is totally integrated in GELINIV for Windows, and so it has a fine looking interface. When a ski patroller is processing the model with estimated data, it is very easy and fast to make changes of these estimations and have new results (fig. 10).

DEVELOPMENT, BROADCASTING OF THE APPLICATION

GELINIV was developed by the computing division of CEN (Météo-France). It is written in Visual Basic V4 Pro, and the first version under Windows has taken two people nine months of work.

In 1994/1995, fifty-five DOS versions had been broadcasted in ski resorts.

The first installation of the version V2.0a under Windows was made on 01 December 1995.

In April 1996, fifty-one software were installed, forty-one in the French Alps and ten in the Pyrénées. Because many large ski resorts like La Plagne, Val d'Isère, Tignes, Les Arcs, Courchevel, Les Arcs, L'Alpe d'Huez, Serre Chevalier have GELINIV, this application is now processing more than eighty locations of measurement.

There is a constant dialog between ski patrollers and developers thanks to the use of checking forms. In March, a survey was made to know users' opinions and wishes.

WHAT GELINIV WILL DO IN FUTURE VERSIONS ?

A new version, V2.2, has been announced for November; one of the innovations will be the multi-language support for international broadcasts (broadcasting in Andorra and Spain is forecasted). Many other improvements will be available in answer to the remarks of the users.

In the future, the data transmission by modem between ski resorts and regional center of Météo-France will be considered. We hope that in the near future, most of the process of weather observations and snowpit data in France will be computer-based. So, the forecaster in a ski resort or in a regional station will be able to make more precise judgements with the help of results of data analysis, statistical and determinist models.

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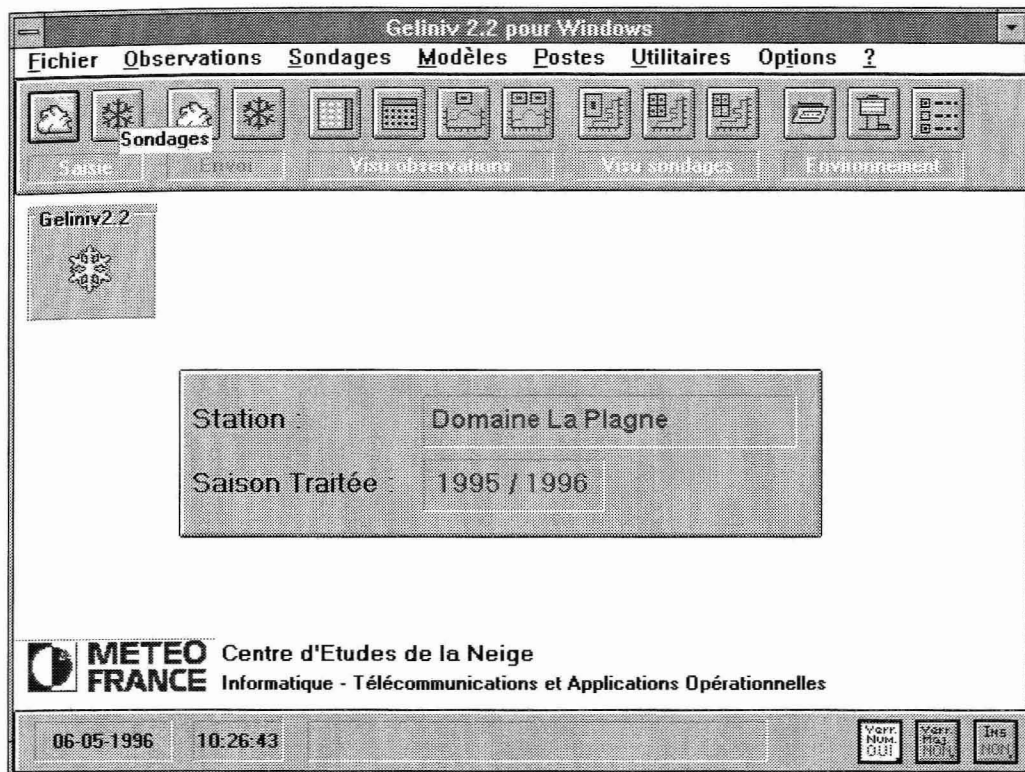


Figure 1: Main screen

Saisie d'une observation

Saisie

Catégorie du point de mesure : Nivo (MF)

h :	stn :	L4 :
VV :	stn :	L5 :
N :	sss :	ddh :
dd :	ss :	ffh :
ff :	ss :	sss :
stta :	stts :	ss :
WW :	En :	UU :
W1 :	PsPs :	TITI :
W2 :	Nv :	F1 :
Nh :	Cn :	F2 :
Cl :	L1 :	DmDm :
Cm :	L2 :	I :
Ch :	L3 :	MVV :

Teneur en eau liquide volumique de la neige
%vol sur 3 car. maxi (Saisir en pourcents et dixièmes ex : 2.5)

Type

☒ Saisie observation
☐ Modification observation

Choix

Poste : Date :

Réseau : ☐ Matin ☒ Midi ☐ Soir

Réseau

Heure exacte :

Nom du poste
LA PLAGNE

Figure 2: Weather observations entry screen

Geliniv : Modification d'un sondage par battage

Sondage traité

Poste : 895 LA PLAGNE 19-03-1996 11 H

Site : SITE VERONIQUE

Module stratigraphique (50 niveaux max)

Modification

N°	HHH	F1	F2	DD	d	U	MVV	TL	Ø	C	cis	mc
11	50	4	4	1.0	3	1	350					
12	39	4	4	1.0	4	1	390					
13	22	5	5	3.0	1	1	280					
14												

Saisie groupée

N° HHHFFDDdUMVVTLCCIS

H hauteur en cm : saisie obligatoire
ce sont les niveaux entre lesquels les cristaux de neige sont examinés

OK

Gestion d'un niveau

Insérer au dessus

Déplacer

Insérer au dessous

Détruire

Type

☐ Saisie d'un sondage

☒ Modification d'un sondage

Choix

Poste : 895 1996 1

Date : 1704 1

195 1903 1

893 1203 1

Modules

Descriptif

Résistance

Stratigraphie

Température

Annotation

Pre-visualisation

Afficher

Effacer

Enregistrer

Figure 3: Snowpit entry screen

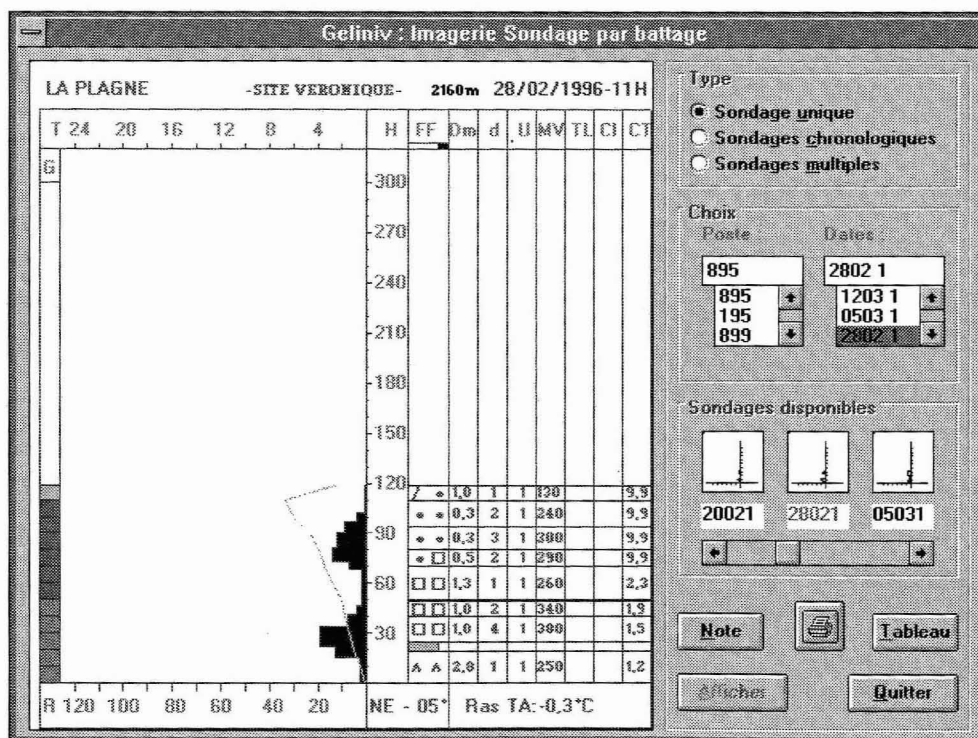


Figure 4: Detailed visualization of one snowpit

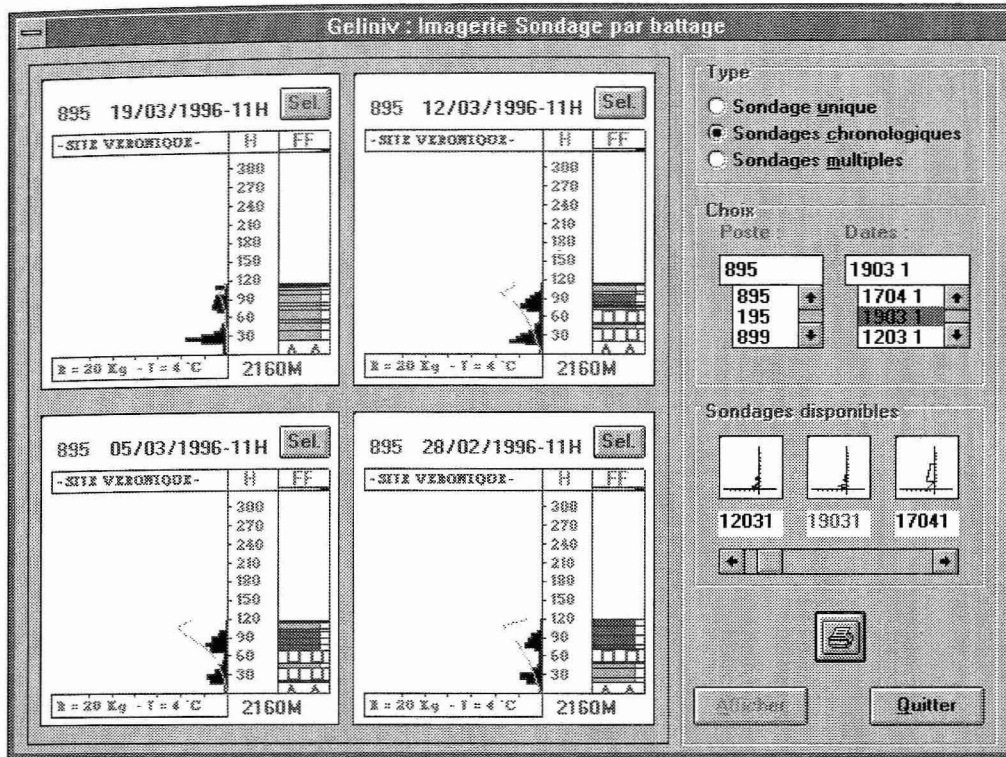


Figure 5: Visualization of four chronological snowpits

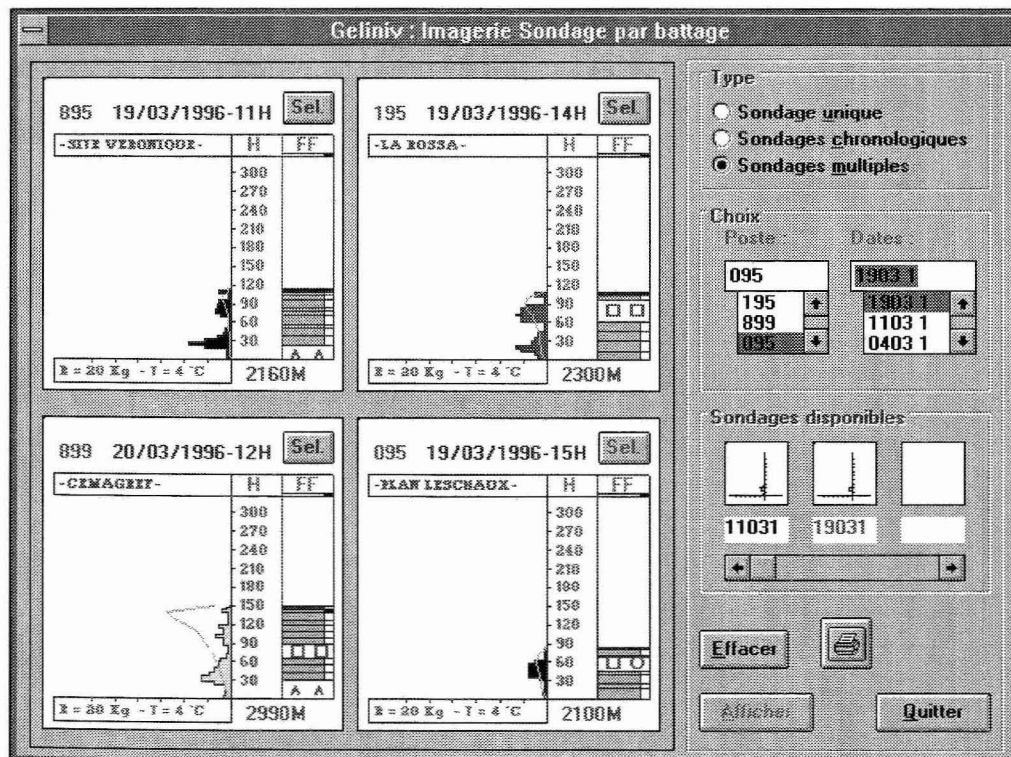


Figure 6: Visualization of snowpits on four different locations

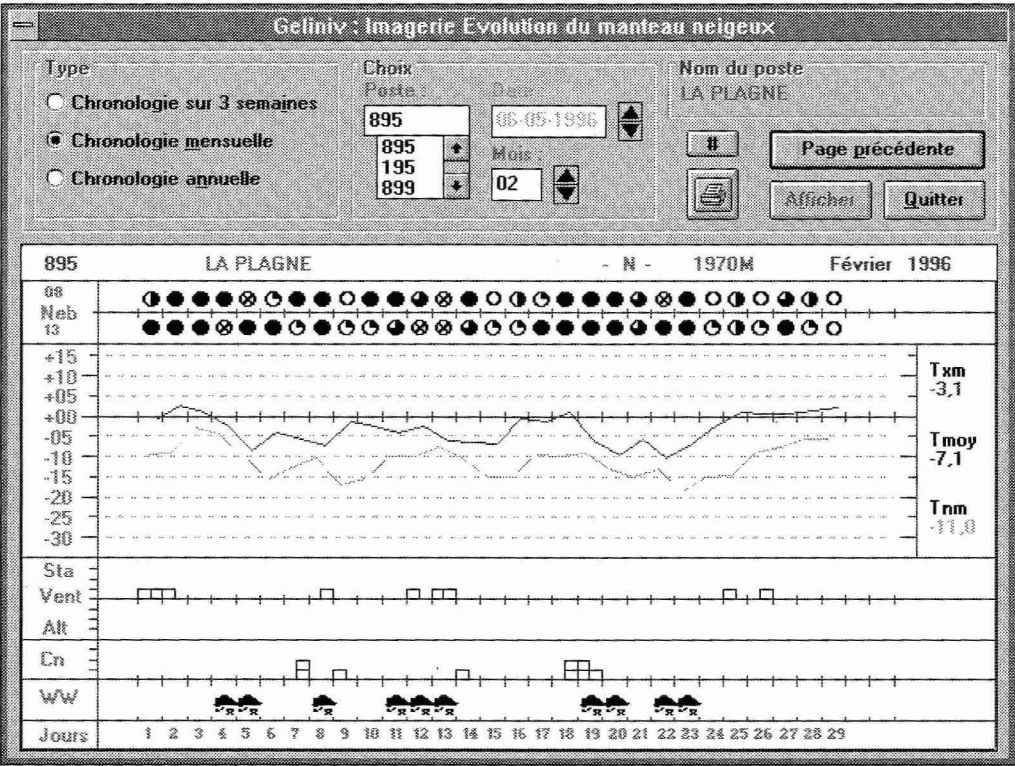


Figure 7: Monthly evolution of meteorological parameters

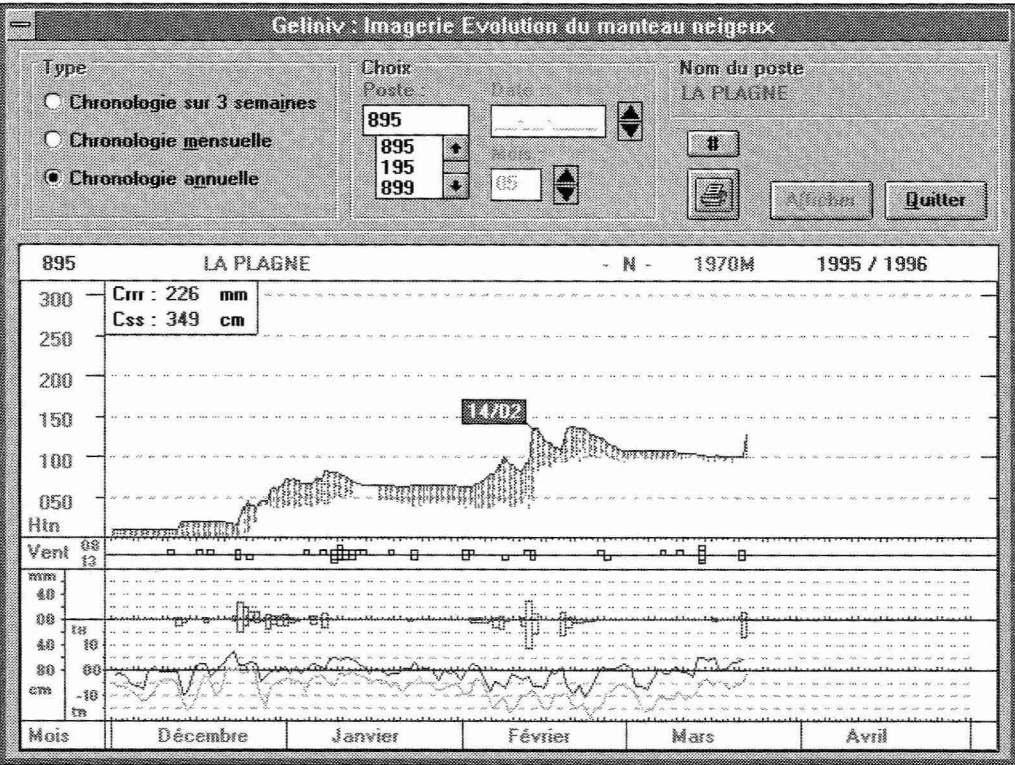


Figure 8: Yearly snowpack evolution

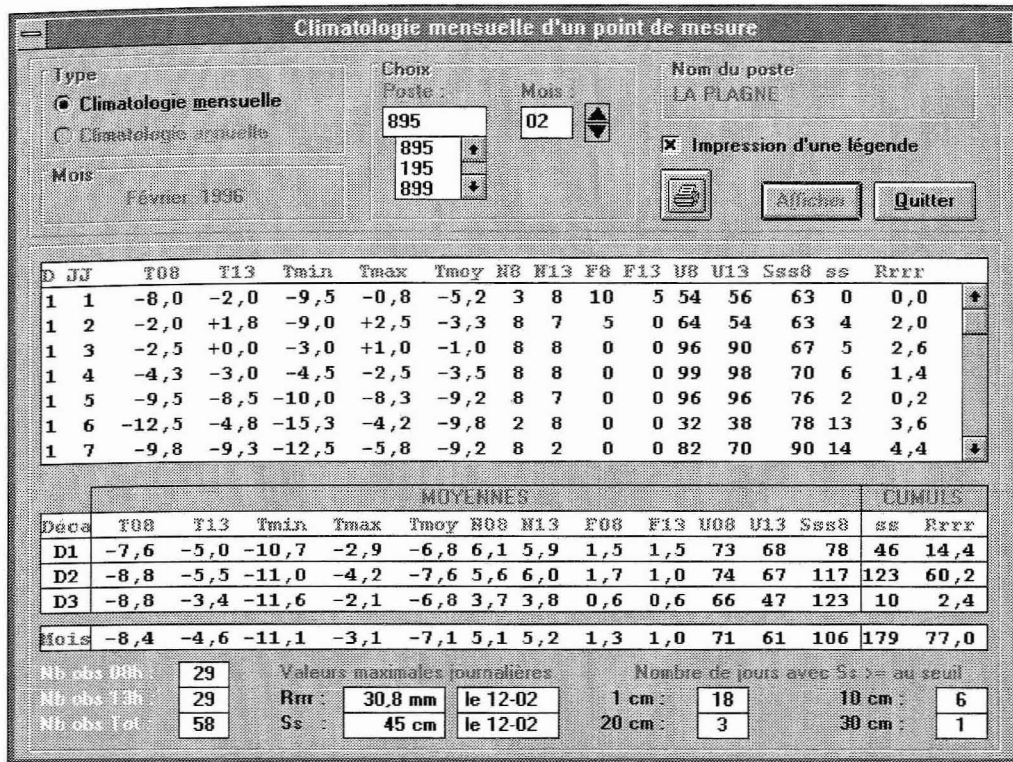


Figure 9: Climatological table

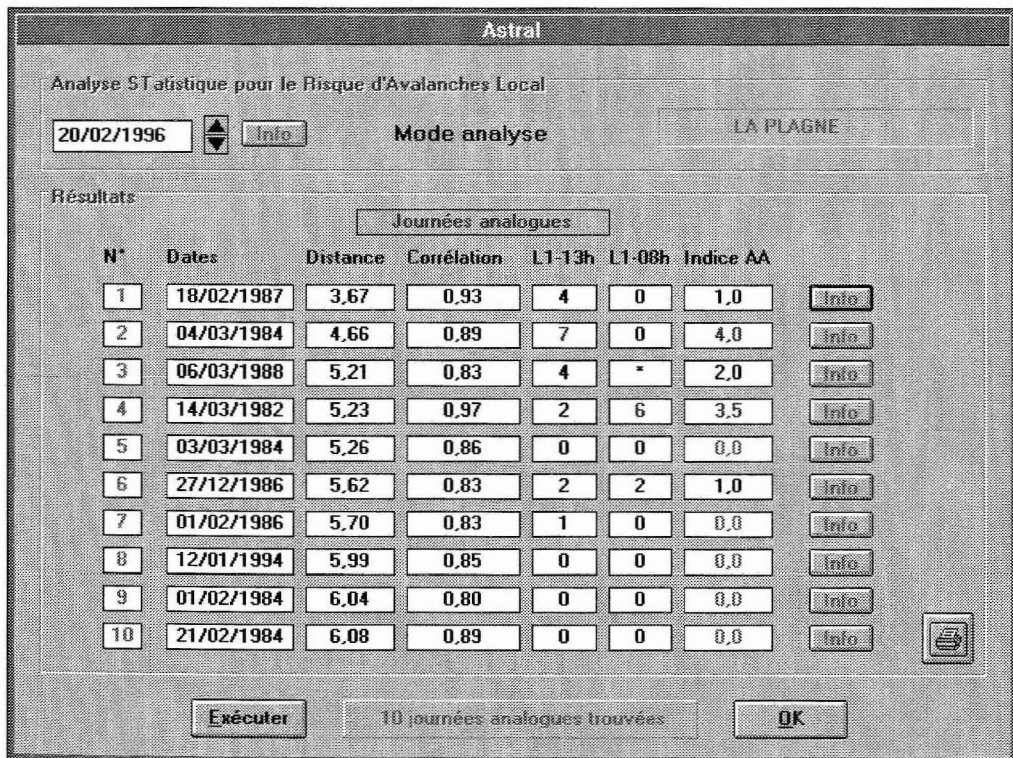


Figure 10: Astral results

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