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New functionalities and performances of the database accessible from the web, of Meteo-Climatological Observatory data in Antarctica.

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Summary

The Meteo-Climatological Observatory in Antarctica, is a research project funded by the P.N.R.A. It started an observing programme in 1987: now, it consist of a network of 21 Automatic Weather Stations, 2 Radiosounding Stations and several ancillary instruments; in addition, the Observatory manages all the meteorological instruments used for operational meteorological assistance. Data are acquired according to the WMO/ICAO standards, they are stored, processed, verified, and distributed through a data base.

The Web site "http://www.climantartide.it" was developed since 2001 in order to give information about the role and activities of the Observatory, and to give public access to the data base. During these five years the database has been implemented with a great number of data and the web site has been modified in order to render them accessible in the better way.

The present job describes in which way data are stored, the basic functions of the web site, the implementations done, and the projects for the future.

Introduction

The Italian Meteo-Climatologic Observatory in Antarctica is a research project funded by PNRA since 1987.
It consists nowadays in a net of 21 AWS scattered coast of the Ross sea , to the Italian-French station Concordia at Dome C as you can see from the map in Fig 1;
2 radiosounding stations, one in Concordia station in Dome C and one in Mario Zucchelli station in Terra Nova Bay;
a series of additional instruments (4 driftometers, 1 celiometer)
each instrument produces a series of data that are collected during Antarctic expeditions; other data are produced from the job of the Weatherman.

A considerable volume of data has been produced during the 21 italian expedition in Antarctica.
This presentation describes the data collected, how data are stored and on which supports, and how they are shared with users with proper data web interfaces.

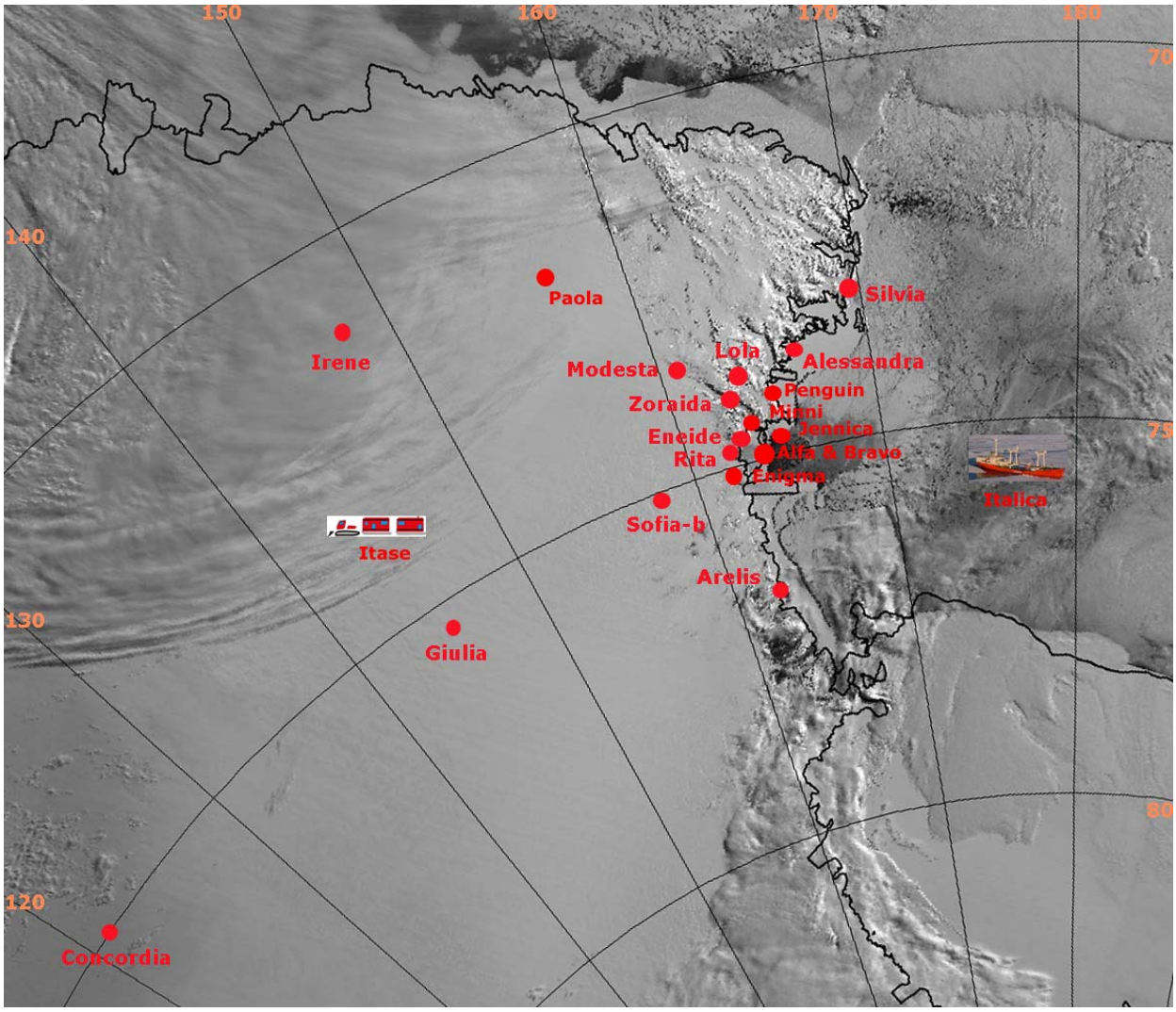


Fig. 1

Data and data dimension

AWS

The AWS's (Vaisala stations model 200, 500 and 520) are equipped with sensors of temperature, relative humidity, pressure, speed and direction of the wind, some has also the sensor of solar radiation and/or snow depth.
They store the data on solid state memory, every hour, and transmit data through the ARGOS system (13 AWS); some AWS go into the GTS as well (7 AWS); during the summery period (October-February) the reference station named Eneide stores data every minute, while Penguin stores data every 10 minutes.
Each AWS produces 30 Mb of data each year.
Data are stored on the server in one Access database each station.

RADIOSOUNDINGS

The Radiosoundings are made in two places; once a day in Dome C during all year, at 12,00 UTC, twice a day in Terra Nova Bay during summer period only from mid October to mid February.
The volume of produced data is:
7.5 Mb/month = 90 MB/Year for Dome C
7.5 Mb/month = 30 MB/Year for TNB.

Data are stored on the server in one Access database each year for radiosounding made in Dome C, and in one Access database each expedition for radiosounding made in TNB.

SINOTTIC AND AEREONAUTICAL DATA

During summer a large number of synottic and aereonautical message are produced at TerraNova Bay Bby the forecasters : Synop, Taf, Temp, Metar, Weather report.
The amount of data produced ranges from the 80 KB of the Synop to the 30 Mb of weather reports.
All these data are stored in directories.
In the following table the size and the number of files stored for each tipe of data, each year.

DATA	SIZE	FILES
Metar	250 Kb	120
Synop	80 Kb	120
Taf	80 Kb	120
Temp	130 Kb	120
Weather report	31 Mb	120

OTHER DATA

In addition we store and make available data produced outside antarctica, such as models produced by ECMWF (GRIB) and AMPS that are used for operations.
At TNB we receive data from the ECMWF by the Italian Air Force Weather Service; those data are stored in directories made available to users in grib format and as plotted products

In the following table the size and the number of files stored each year.

DATA	SIZE	FILES
Raw data	960 Mb	240
Plotted data	1.4 Gb	60.000
Image zip format	1.4 Gb	240

SATIMAGES

A choise of image and satellite derived products are accessible throught the web, as well : visible and infrared images from NOAA and DMSP, and sea ice maps.
Data are stored in directories; each year are produced 9000 files that need 1.6 Gb.

REAL TIME DATA

Some stations, 13 over 21 transmit data via ARGOS from Antarctica to Europe, data are received in near real time and stored for comparison with data from solid state memory.
Data are stored in directories; the data size is 60 MB / year

SATELLITE DATA

Last the satellite data; row data received to TNB from NOAA and DMSP satellites have been stored since 1989 on several magnetic supports. we have stored a data transfer on stadardized mass memory and plan to make them available in the near future. The size of these data is 700 Gb / expedition and the total is 5 Tb

Storing data

Until the 2001 data were stored on various supports: floppy 3" 1/2, magnetooptical discs, cdrom and tapes of various type and format.
With a job that needed several years (for some kind of data it is still in full development) we could transfer all data on a series of hard disk from 2 TB (Lacie), with raid 5 that avoids the losses of data due to breakdowns and avoids also weekly or daily backups.

During several years of operations many people from different organizations worked on this: there was no standard procedure for storing data and the result was a big confusion.
We did a big job to standardize directories and subdirectories with logical and standard names, that allow immediate identification of the data.
Also the names of the files have been standardize.

The meteo data, satellite images and GRIB, are stored in directories that are named with the number and the year of the expedition; example: 2003-04_XIX (nineteenth expedition of 2003-2004).
The names of each file is standard; by reading the name of file, is possible to know which data is stored in it, and when it was produced.

The convention is xxxxxx_yymmddhh.ext
where xxxxx it is the name of the data (metar, synop, etc);
yymmddhh gives year, month, day and hour
ext is the extension of the file

example: synop_991218.txt is the synop of 18 December 1999

For the AWS and the Radiosounding, Access and SQl data base have been created : procedures written in Mathlab and Php produce charts, visualization and allow to download data

Website

A website has been set up to access the data in simple way: www.climantartide.it (Fig 2)
The pages have been write in PHP, and it use mathlab procedures to plot the data.
As TNB is not connected to Internet the site has been duplicated In Antarctica, and moreover has been implemented with procedures written in Labview that allow the visualization of the data of the stations on the ice runway from the operations, in real time, and allows the call via iridium at some AWS on Antarctic Plateau Runway (Paola, Irene, Giulia) and the visualization of their data.

One of the available features of website is the possibility of accessing the database to obtain graphical products of AWS and Radiosounding

In Fig. 3 some examples of available charts.

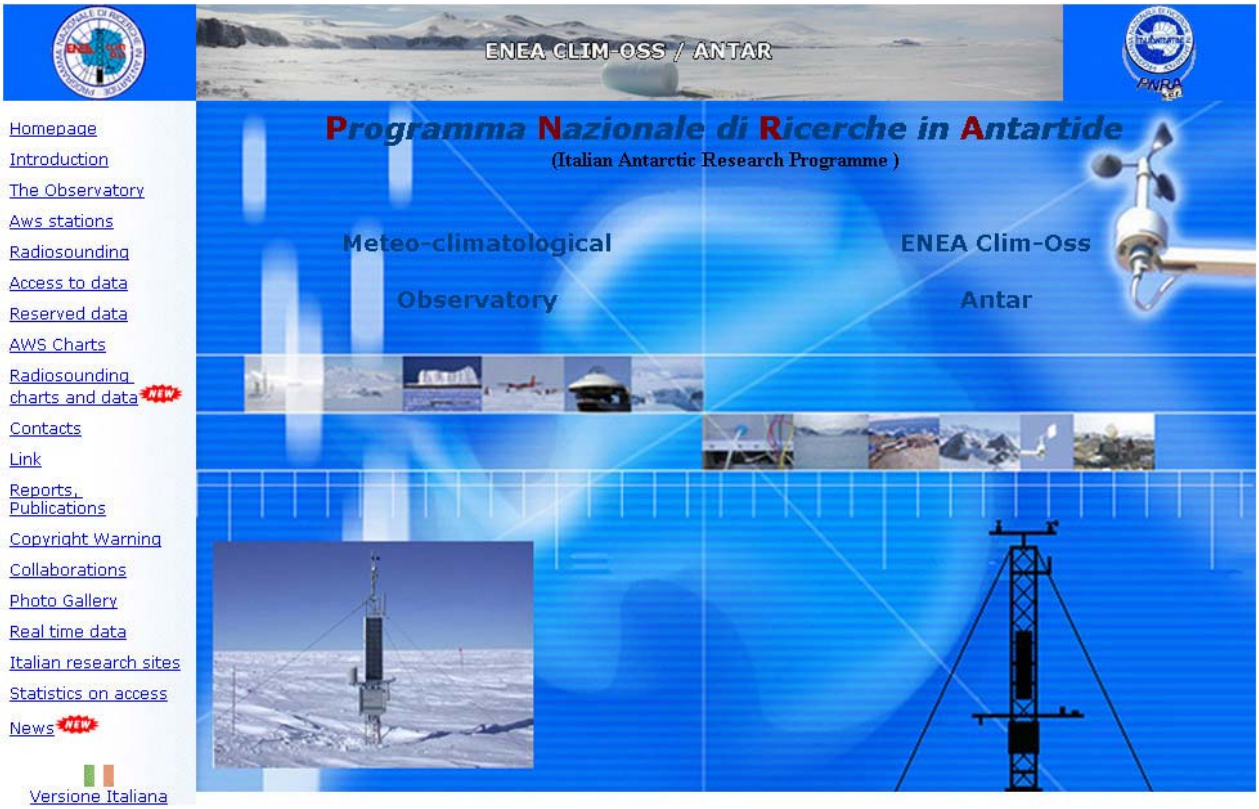
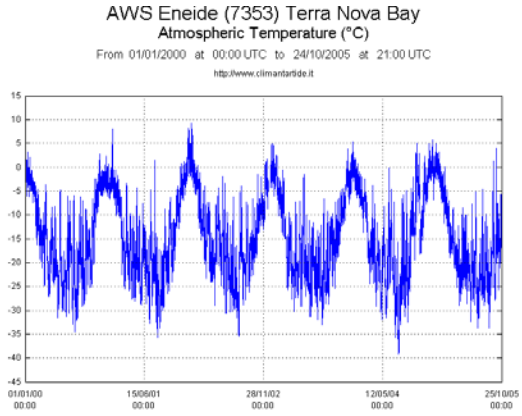


Fig. 2



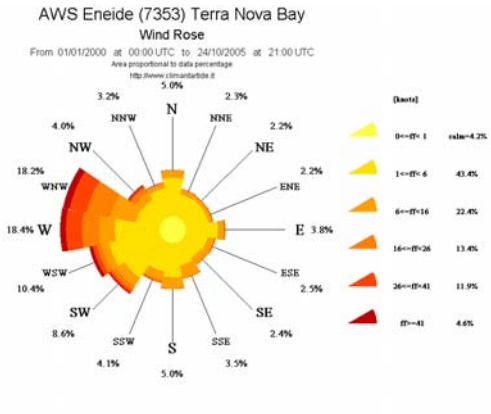


Fig. 3

View data

The website allows the visualization of the data as well.
From the page “access to data” you can chose the data and therefore choose wether to visualize it or to download it.
This can be done for all the satellite data , synop, taf, temp, grib, images.
Concerning the Dome C radiosoundings it is possible also the download of the raw data.

In Fig. 4 the page “access to data” ; the table indicate wich data are disponible for each expedition; in Fig 5 the example page concerning Synop.

- Homepage
- Introduction
- The Observatory
- Aws stations
- Radiosounding
- Access to data
- Reserved data
- AWS Charts
- Radiosounding charts and data
- Contacts
- Link
- Reports, Publications
- Copyright Warning
- Collaborations
- Photo Gallery
- Real time data
- Italian research sites
- Statistics on access
- News

Versione Italiana

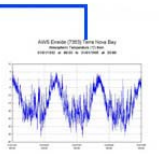
Access to data

Data description

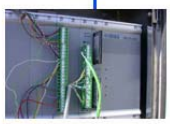
Stored data are incomplete and not homogeneous for all expeditions both because not all of them were collectedstarting from the firts expeditions, and because they were collected and stored in differentways due to frequent changes of needs and personnel, and only during recent years we tried to standardize all data.

The table which follows reports all existing data divided by type.
'x' indicates that data exist for subject expedition.

NOTE: During XX° expedition radiosounding was not done, due to Marwin failure. Are not included radiosoundig data, Temp data and Synop data.



Temperature graph



AWS data storage

Radiosounding data

TAF
Weather reports
Radiosounding
AWS
Eneide's minute data
Expeditions
Synop
Temp
Sat images
Metar
Grib

Expeditions	TAF	Weather reports	Radiosounding	AWS	Eneide's minute data	Synop	Temp	Sat images	Metar	Grib
I		x								
II		x	x							
III		x	x							
IV		x	x							
V		x	x							
VI		x	x							
VII		x	x							
VIII		x	x							
IX		x	x			x	x			
X		x	x			x	x	x		
XI		x	x	x		x	x			
XII		x	x			x	x			
XIII		x	x	x		x	x	x		
XIV		x	x	x		x	x	x		
XV	x	x	x	x		x	x	x		x
XVI	x	x	x	x		x	x	x		x
XVII	x	x	x	x	x	x	x	x	x	x
XVIII	x	x	x	x	x	x	x	x	x	x
XIX	x	x	x	x	x	x	x	x	x	x
XX	x	x		x	x			x	x	x
XXI	x	x	x					x		x

Fig. 4

- Homepage
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Versione Italiana

SYNOP

Introduction

Meteorological messages contain informations about weather observations and weather forecasts, coded according to specific rules issued by World Meteorological Organization (WMO).

First of all they are divided in 'synoptics' messages (code SYNOP and TEMP), and 'aeronautic' messages (METAR e TAF).

First ones contain meteorological observation at ground and altitude respectively, taken at synoptic hours or in hours during which in all the stations of the world synoptic network the same observations are made with the same formalities and are coded according to the same standards; these messages are diffused all over the world through a dedicated data transmission network called Global Telecommunication System (GTS so that all information contained in it can be used from meteorological centres, mainly to initialise numerical models.

On the contrary, aeronautic messages are used for assistance to air navigation: METAR contains weather observations about airports, while TAF contains weather forecasts. They too are coded, but not necessarily diffused on GTS.

Data

XVIII Expedition (14 Oct 2002 - 22 Feb 2003) View data
IX Expedition (23 Oct 1993 - 11 Feb 1994) Download data

Fig. 5

Also for the AWS , data can be visualized from the page in Fig. 6; choosing the parameters to be downloaded I obtain the tables like the table.

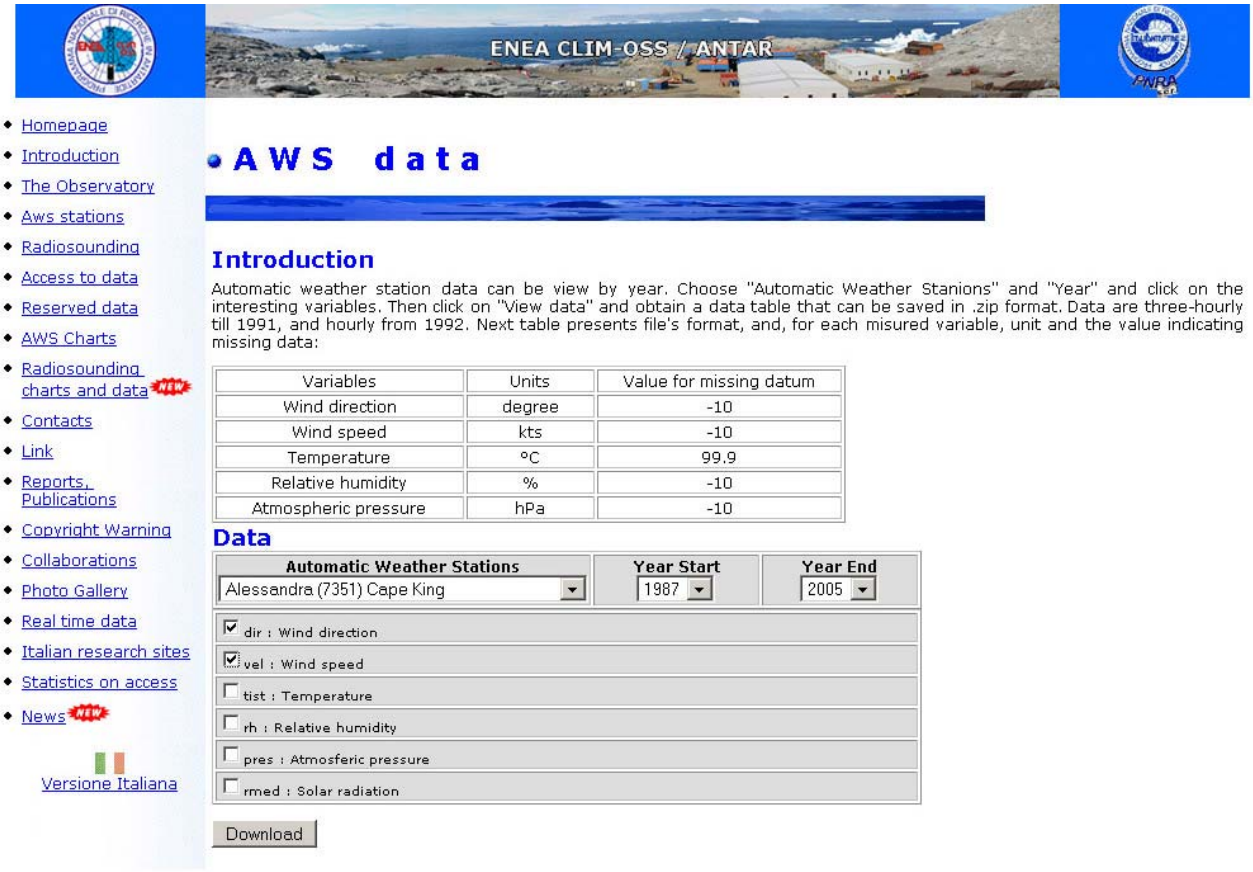


Fig. 6

Year	Month	Day	Hour	dir	vel
1987	2	1	6	250	4
1987	2	1	9	260	5
1987	2	1	12	280	5
1987	2	1	15	0	0
1987	2	1	18	100	1
1987	2	1	21	80	7
1987	2	2	0	310	3
1987	2	2	3	220	3
1987	2	2	6	230	3
1987	2	2	9	270	1
1987	2	2	12	0	0
1987	2	2	15	340	2
1987	2	2	18	270	1
1987	2	2	21	40	3
1987	2	3	0	20	1
1987	2	3	3	240	3
1987	2	3	6	210	3
1987	2	3	9	260	3
1987	2	3	12	0	0
1987	2	3	15	40	3
1987	2	3	18	320	1
1987	2	3	21	260	2
1987	2	4	0	270	13

For the radiosounding is the same: from the page "access to data" and "radiosounding" it is possible to obtain table like this:

Radiosounding of 2003-12-10 at 12					
Atmospheric pressure at *standard levels* (hPa)	ASL height (m)	Wind direction (degree)	Wind speed (m/s)	Temperature (°C)	Relative humidity (%)
925.0	592	168	1.52	-4.93	59
850.0	1250	236	5.97	-10.06	69
700.0	2719	254	7.86	-19.47	42
500.0	5168	258	15.70	-31.10	50
400.0	6723	257	26.12	-39.81	33
300.0	8635	256	30.02	-51.64	20
250.0	9813	248	23.19	-52.13	8
200.0	11269	233	13.53	-49.92	3
150.0	13163	209	5.08	-46.49	2
100.0	15849	135	5.72	-46.64	2
70.0	18196	162	11.30	-48.60	2
50.0	20444	181	9.17	-42.47	2
30.0	23951	163	4.70	-36.30	2
20.0	-999	-999	-999.00	-999.00	-999
10.0	-999	-999	-999.00	-999.00	-999

here are data at standard level.

Some reserved data need a userid and password to be accessed;
the access can be asked the persons whose address appears in the page “contacts” and it requires the accettance of some conditions concerning the use of data.
Full radiosounding and aws data as well as raw data from ECMWF are stored in this section.

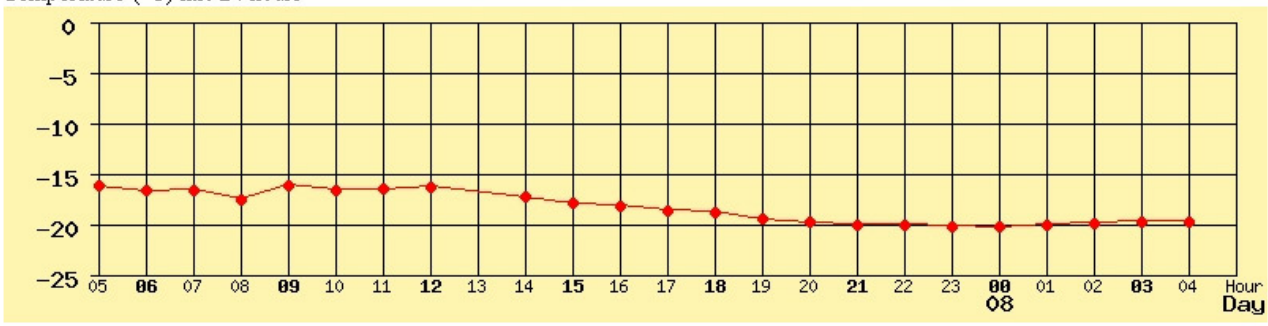
At last we have the real time data ; here data transmitted via Argos can be accessed in near real time.
The web server telnets the argos database in Toulose (FR) every three hours and show data in grafical and table form.

In Fig. 8 an example of a single AWS (it is accessible from the map or from the table). Data are shown in table and graphic form. Table shown only the last 4 data transmitted via Argos by AWS; graphics show Temperature, Pressure, Wind Speed and direction, and Solar radiation during the last 24 hours.

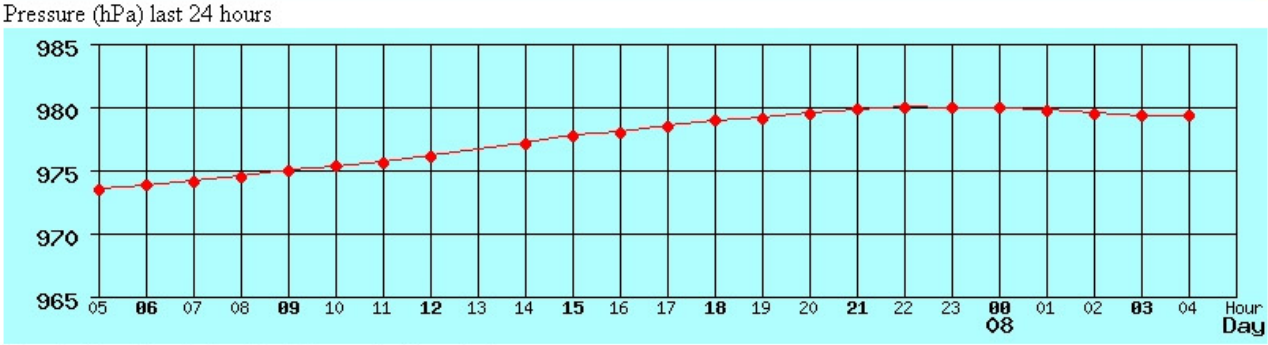
ID Argos 07353	Name Eneide	Site Terra Nova Bay								
date/time	Wind			Temperature (°C)			Humidity (%)	Pressure (hPa)	Solar Radiation (W/m2)	Batteries (V)
	Dir (deg)	Speed Inst (kt)	Speed Max (kt)	Inst	Max	Min				
2006-06-08 04:00:00	220	3	5	-19.7	-19.5	-19.9	55	979.3	0	13.0
2006-06-08 03:00:00	180	0	15	-19.7	-19.6	-20.3	59	979.3	0	13.0
2006-06-08 02:00:00	260	6	11	-19.9	-19.8	-20.1	69	979.5	0	13.0
2006-06-08 01:00:00	160	0	3	-20.0	-19.9	-20.4	80	979.7	0	13.0

Back to the list Back to the map Back to the menu

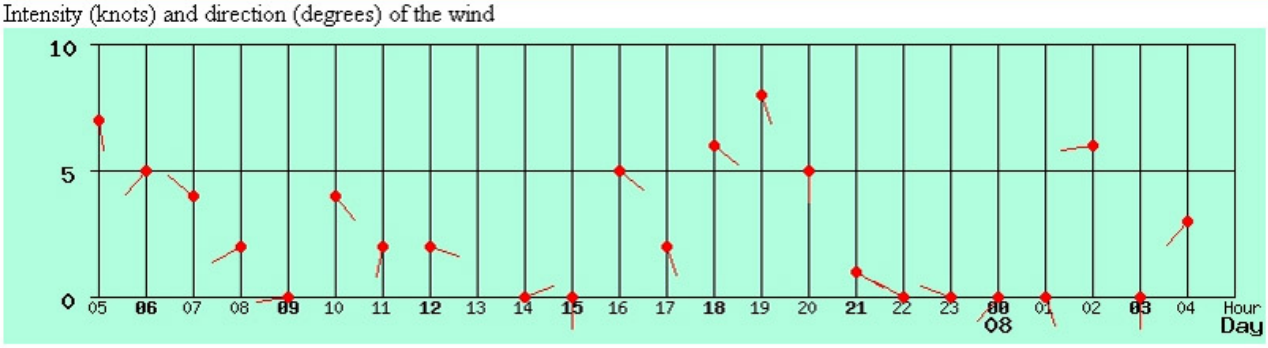
Temperature (°C) last 24 hours



Pressure (hPa) last 24 hours



Intensity (knots) and direction (degrees) of the wind



Solar Radiation (W/m2)

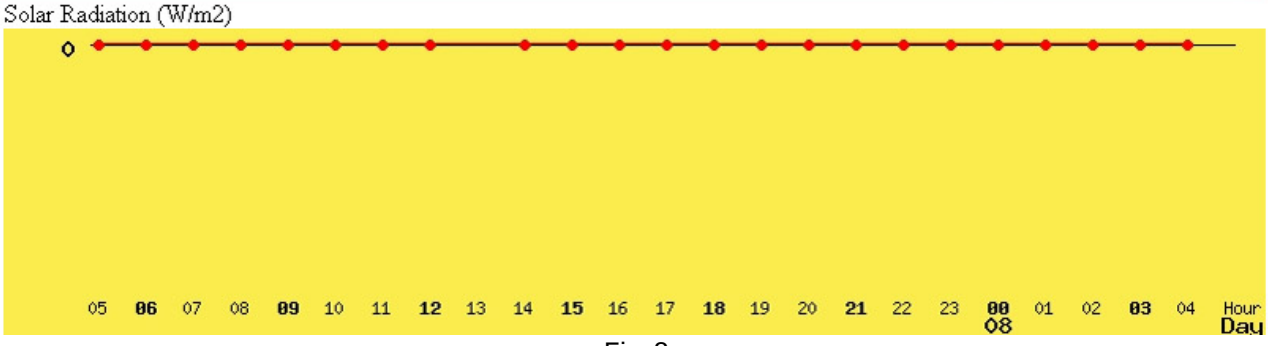


Fig 8

Hardware and software

The web site runs on two computer, the first one is the web server in wich are stored all database too;
the second one runs all mathlab application and and make real time charts.

There is a third computer as backup of the server web: if this fall down, the backup take its place.(Fig. 9)

The web server is a computer with a processor Pentium 4 3.6 Gzh, 1 Gb Ram, 120 Gb Hard disk ; the operative system is Linux Fedora version 5.
The plotting server is a computer with a processor Pentium 4 3.6 Gzh, 2 Gb Ram, 300 Gb Hard disk; the operative system is Windows 2000 service pack 4.
The backup PC is similar to the web server.

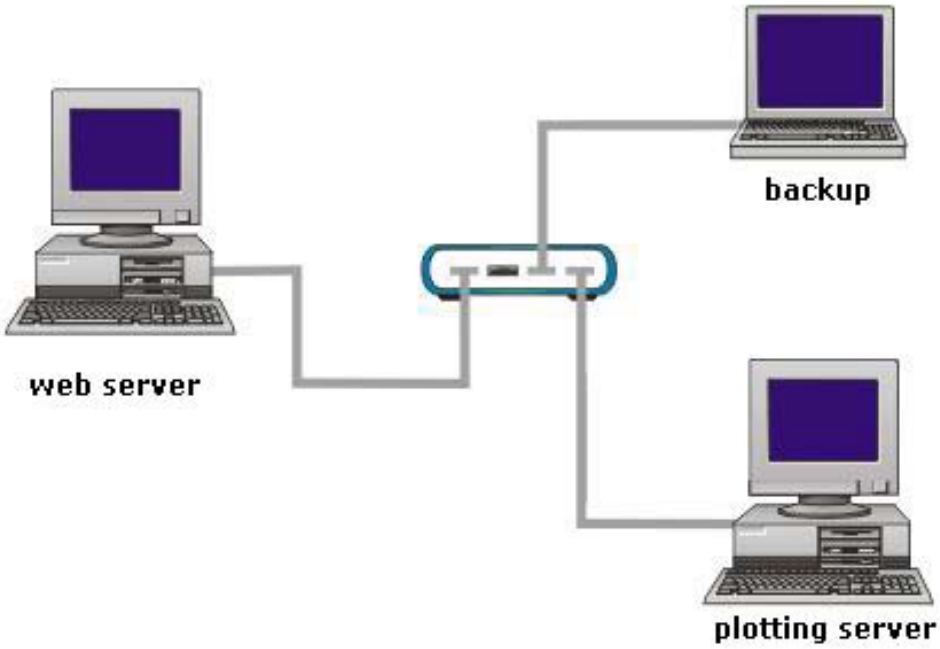


Fig. 9

The site is working approximately since one year; during this year the number of accesses has reached 5000/ month, from all the countries.

Conclusions

In conclusion the database and the web interfaceproved to be a valid instrument for storing and make the data accessible.
Future developments will be to provide some climatological products, such as averages, trends, extreme values.
Also satellite data will be downloadable.