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The Meteo-Climatological Observatory in Antarctica: an Overview, as Browseable on the Web.

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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 consits of a network of 15 Automatic Weather Stations, a Radiosounding Station 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 appropriate communication means.

A Web site http://meteo.pnra.it was developed in order to give information about the role and activities of the Observatory, and to give public access to the data.

Introduction

The scientific context of the meteorological observatories deals with the detection and characterization of global changes in Antarctica. Antarctic environment is thought to be particularly sensible to climatic changes: the mechanisms by which Antarctica might have a considerable importance for global changes include, e.g., the ice-albedo feedback and the modification of the mass balance of the Antarctic ice cap.
Numerical climatological models do not simulate correctly these phenomena, it is therefore essential to monitor the effects of climatic variations in Antarctica, by means (??) of time scales varying from a few years to several decades. This is necessary due to the considerable lack of measurement sites on the mainland and surrounding oceans, while satellite-based measurement need to be calibrated through surface observations. Amongst climatic variables to be monitored, surface temperature, cloud cover and precipitation amount are key parameters.
Generally speaking, the main goal that the meteorological observatory would like to reach, is the continuity and the accuracy of the measures, in order to produce a data set that might be used for meteo-climatological and atmospheric studies, to the local weather forecasting and for scientific activities using meteorological data as support.
Therefore, during Antarctic expeditions, the main job is to carry out the maintenance of the automatic data survey stations and the recovery of the data collected locally by solid state memories (ground data), the execution of the atmospheric soundings (in order to collect data from upper atmospheric layers), and the maintenance of equipment used in the Terra Nova Bay meteorological office.
Recently, stations located in the antarctic Plateau were equipped with sensors for the measurement of snow accumulation/ablation.
On 1987, an atmospheric radiosounding station was installed, at the meteorological laboratory of the Italian base: the system includes a meteorological station for data collection at ground level, a receiving ground station (VAISALA Marwin 12), which receives data transmitted via radio by the sonde and stores them in a computer with a dedicated software which shows, in real time, the trend of the measured parameters. The data received are stored in ASCII files, and then coded in the standard meteorological format "TEMP" to send them to the Global Communicatio System of the World Meteorological Organization (WMO-GTS).

During the presence of the expedition in Antarctica, two balloons are launched every day at 00:00 and 12:00 UTC to measure temperature, pressure relative humidity and wind.

The Web site was born in order to store climatological data from Aws and Radiosounding, and permit to researcher to use them obtaining real time charts; then, whith use, were added all data produced daily in Terra Nova Bay : TAF, METAR, SYNOP, Meteo bulletins, Satellite images, ecc..
User can view data, download them, obtain charts.

In figure 1 it is shown the homepage of the Web site

Figure 1

AWS stations

From "AWS Stations" you can have a look about the Automatic Weather Stations. They were installed in Antarctica during expeditions, starting from 1987. The years of operation and data logging for each of them starting from the first activation, are reported in red in the table of Figure 2.

Itase did not work continuosly but only in those years when antarctic plateau was crossed by the corresponding "International Trans-Antarctic Scientific Expedition".
Italica is activated for two months on the tender (??) during navigation.
Penguin collects data in Edmonson point remote camp only during base opening.

Alfa & Bravo collect wind data along C130 runway when intercontinental flights from New Zealand to Antarctica are operated (October-December); data are sent directly to the Operation Room and are not stored.
Minni collects wind data along Twinotter runway in Browning pass; it is mounted in november and disassembled at the end of the season (February); these data too are sent directly to the Operation Room and are not stored.
Sofia was moved on november 2002 ; since the name is bound to the site, it was re-named **Sofia-B;** argos code is the same.

ID is the Argos CLS identification number of the station through which the station transmits data collected to Europe. Stations not having it, record data only on the local memory (Flash card or Eprom).
Figure 3,4,5 show where AWS are located: it is a quadrilateral, one side of which is the coast of Ross Sea, and the other is 700 km towards the Antarctic Plateau
Aws stations are located on the most meaningful place for Terra Nova Bay Station.

Years of activity

Station	ID	87	88	89	90	91	92	93	94	95	96	97	98	99	00	01	02	03
Sofia	7350																	
Alessandra	7351																	
Zoraida	7352																	
Eneide	7353																	
Modesta	7355																	
Lola	7356																	
Arelis	7357																	
Silvia	7379																	
Rita	7354																	
Itase	1626																	
Italica	no																	
Maria	no																	
Giulia	1627																	
Penguin	no																	
Jennica	no																	
Irene	1218																	
Sofia-B	7350																	
Paola	no																	
Alfa e Bravo	no																	
Minni	no																	

Figure 2

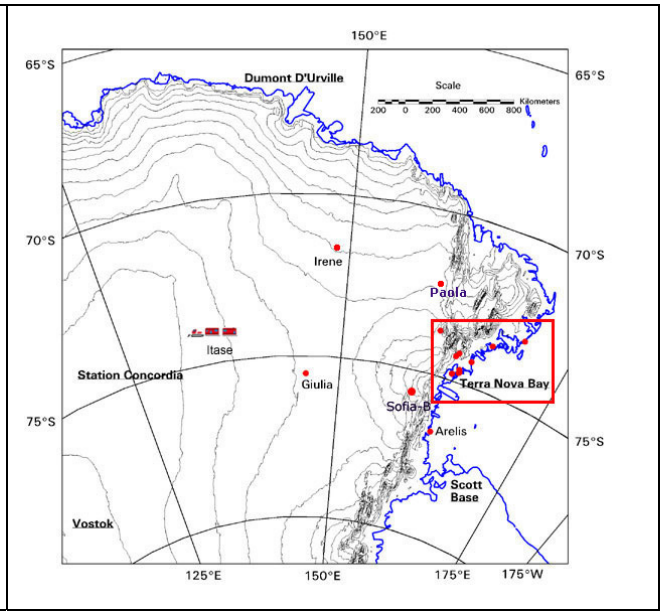
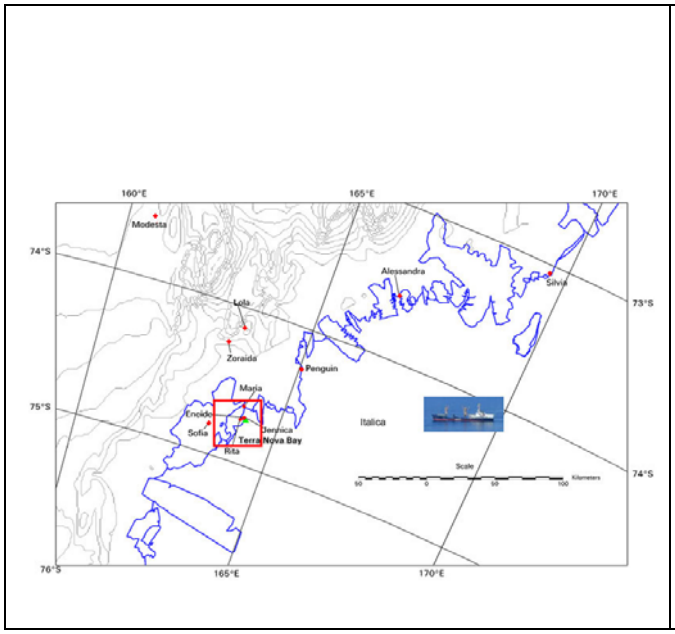


Figure 3



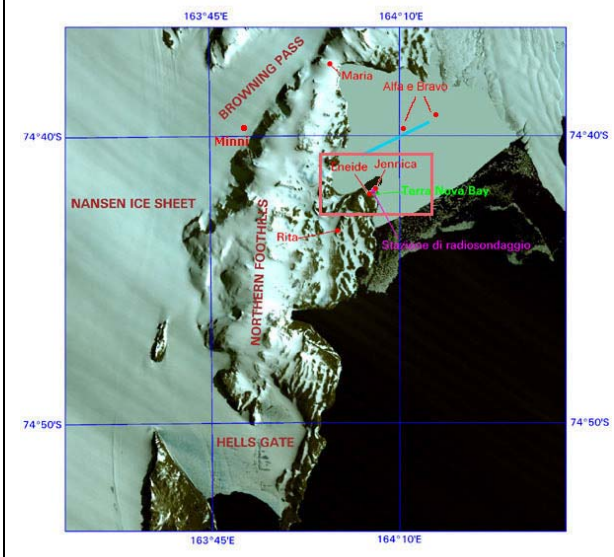


Figure 4 Figure 5

Radiosounding

An atmospheric radiosounding station was installed, on 1987 at the meteorological laboratory of the Italian base: the system includes a meteorological station for data collection at ground level, a receiving ground station (VAISALA Marwin 12), which receives data transmitted via radio by the sonde, and stores them in a computer with a dedicated software which shows, in real time, the trend of the measured parameters. The data received are stored in ASCII files, and coded in the standard meteorological format "TEMP" to send them to the WMO-GTS. The two daily files are obtained through the lauch of two balloons at 00:00 and 12:00 GMT, if the weather allows to do it, which contain, for each standard level, geopotential height, temperature, humidity and wind.
In Figure 6 the ballon and sonde: it raises and reaches altitudes between 25 and 30 Km, according to meteorological conditions.

Figure 6

With data collected from radiosounding it is possible with the function "Radiosounding charts" to obtain charts, examples of which are shown in Figure 7.

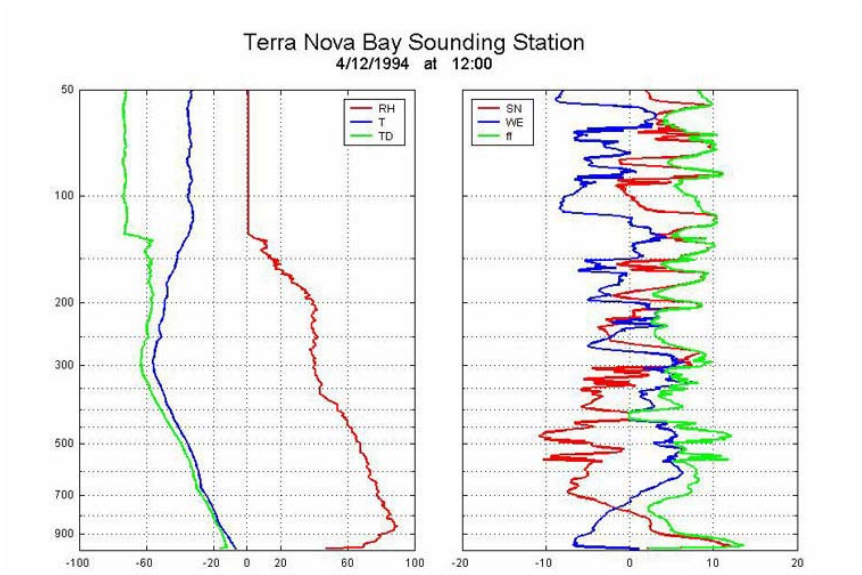


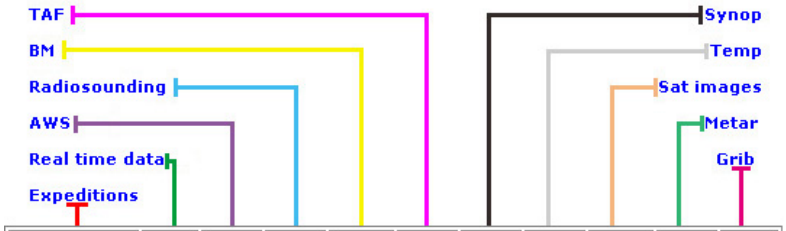
Figure 7

Access to data

Stored data are incomplete and not homogeneous for all expeditions both because not all of them were collected starting from the firts expeditions, and because they were collected and stored in different ways due to frequent changes of needs and personnel.

In recent years we tried to standardize all data. The table which follows (Figure 8) reports all existing data divided by type.

"x" indicates that data exist for subject expedition.



Expeditions	Real time data	AWS	Radiosounding	BM	TAF	Synop	Temp	Sat images	Metar	Grib
I		x	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	x			
XIII		x	x	x		x	x	x		
XIV		x	x	x		x	x	x		
XV		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

Figure 8

In Figure 9 the procedure to obtain data (in the example "Temp" data). It is possible to view data or download them; to view data choose the expedition and then month and day: they are presented in their own format. To download data choose the expedition, and a file in zip format, containing all data for the expedition, is saved on the computer.

Automatic weather station data can be view by year.

Choose "Automatic Weather Stanions" and "Year" and click on the interesting variables.

Then click on "View data" and obtain a data table that can be saved in .zip format.

Data are three-hourly till 1991, and hourly from 1992. (Figure 10)

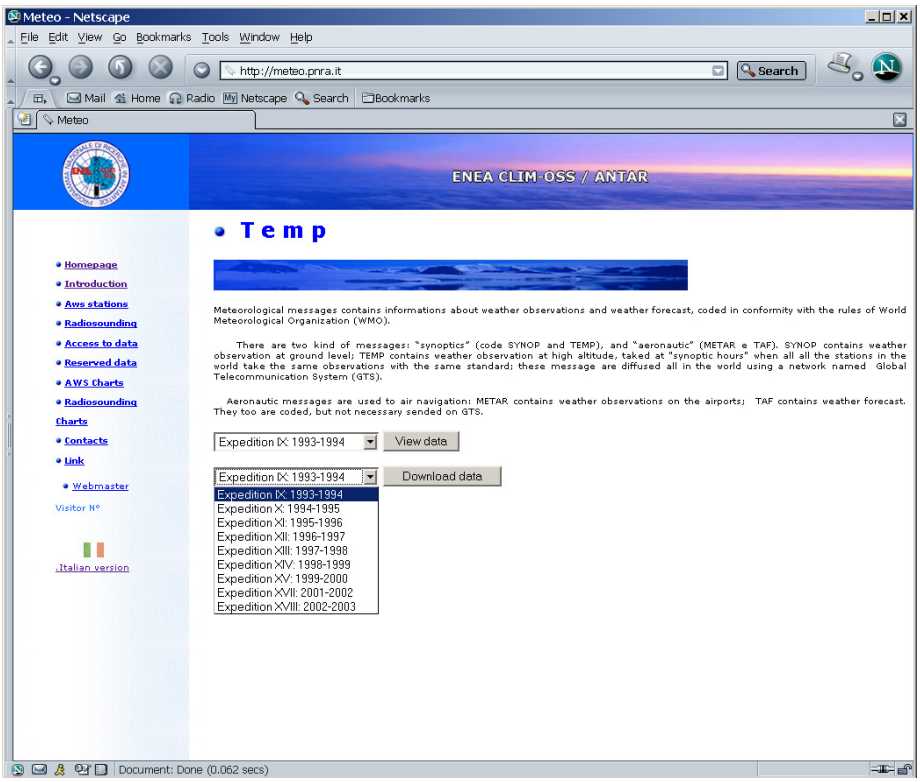


Figure 9

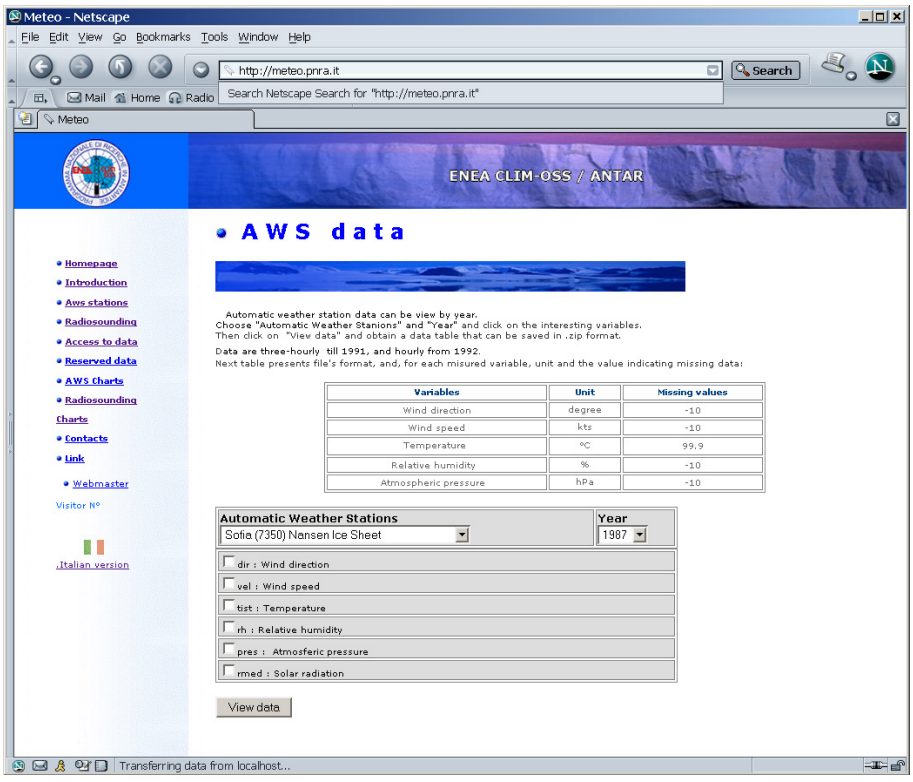


Figure 10

Aws charts

First of all, select the station desired from the field **"Automatic Weather Stations"**. and click on the name of the station. Stations are indicated by name, Argos number, and geographic site. Only stations working all year long are included: data surveyed by Itase, Italica and Penguin are not present because fragmentary and scarcely indicative.

Secondly, select the chart of the variable desired and the period, giving year, month, and starting and ending hour, and from **"Generate AWS Plot"** the chart can be obtained in a new Browser window.

N.B..: the processing of an on-line chart takes from 20 seconds to 2-3 minutes, according to the type of chart and time interval requested. If a slow modem is used, the display time may lengthen. (Figure 11)

In another windows is shown the chart. We report here two examples of charts (Figure 12 and 13).

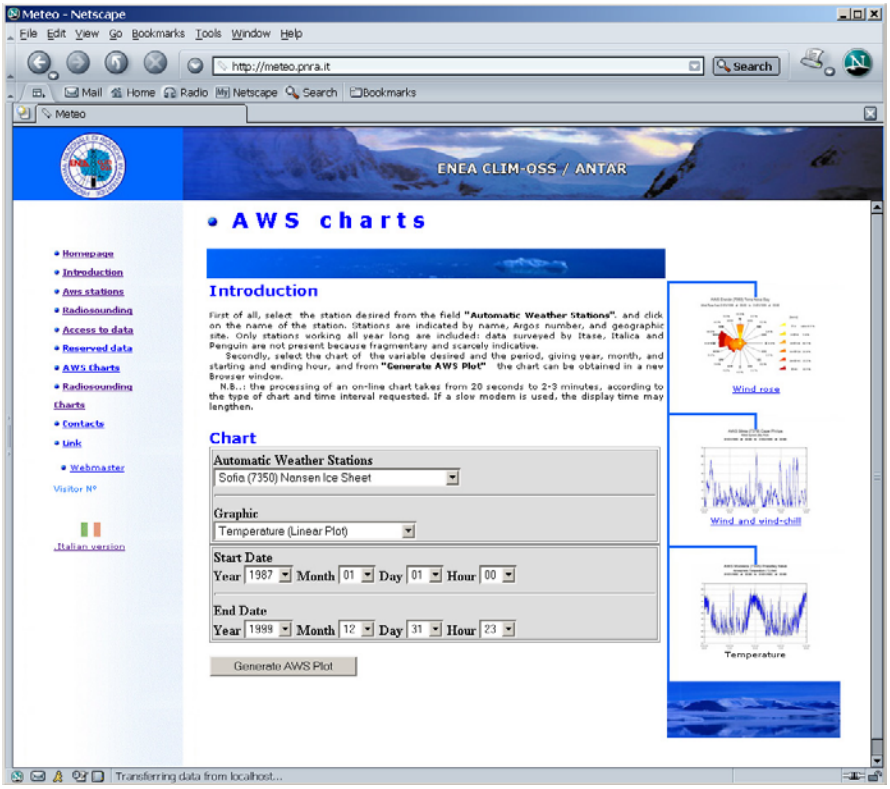
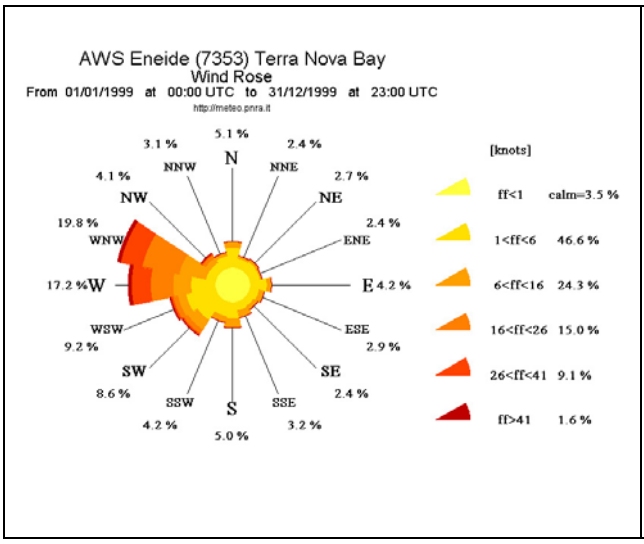


Figure 11

Not all AWS are included, but only the twelve stations for whom data are significant. Charts obtainable are:

Temperature (Linear Plot)
Relative Humidity (Linear Plot)
Atmospheric Pressure (Linear Plot)
Wind Speed (Linear plot)
Wind Direction (Linear Plot)
Wind (Wind Rose)
Wind (Mean Distribution)



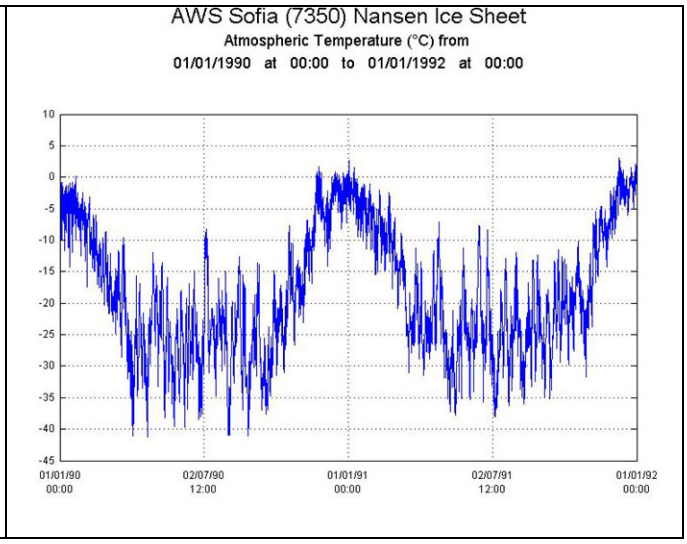


Figure 12

Figure 13

Radiosounding charts

In order to obtain a radiosounding chart,select the expedition and the month: choose the type of chart and click on the gray small rectangle in the selected day (Figure 14). If the rectangle is not presented, that day the Radiosoundig was not made, generally for the bad weather conditions.
N.B..: the processing of an on-line chart takes from 20 seconds to 2-3 minutes, according to the type of chart. If a slow modem is used, the display time may lengthen.

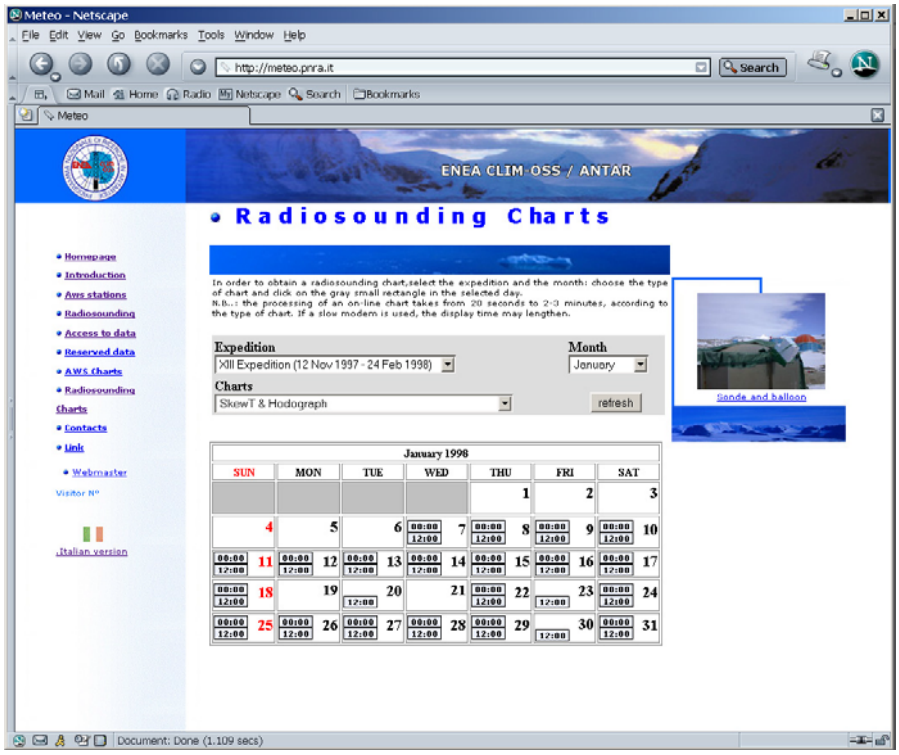


Figure 14

Charts obtainable are:

T, RH, TD, Wind Speed & Components (vertical plot)
Rel. Hum. (contour ±2days & vertical plot)
Temperature (contour ±2days & vertical plot)
Dew Point (contour ±2days & vertical plot)
Mixing Ratio (contour ±2days & vertical plot)
Wind Speed (contour ±2days & vertical plot)
Wind Direction (contour ±2days & vertical plot)
Wind SN Components (contour ±2days & vertical plot)
Wind WE Components (contour ±2days & vertical plot)

We report here two examples of charts (Figure 15 and 16).

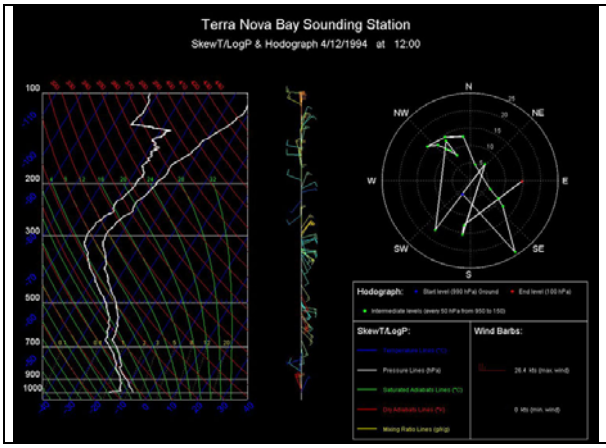


Figure 15

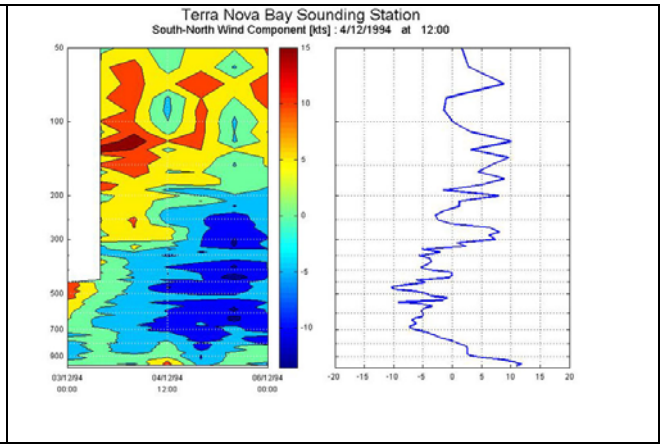


Figure 16

Reserved data

Access in this page is allowed only to that people that has a userid and a password. For obtanai a userid, please contact

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In this page is possible find the complete real time data transmitted through Argos CLS. They are stored every hour in text format files such as:
20010501.txt (2001: year, 05: month, 01: day) and contains data collected by weather stations, oneonce every six hours (sometime some data are missing).

Data are presented in the of tables, as shown below, and contain, besides station Argos number, the following data:

1)- Date-hour in the form: Year-month-day-hour
2)- d(deg): Wind direction (degree)
3)- f(kt): Wind speed (knots)
4)- fx(kt): Max wind speed (knots)

5)-	T(C):	Temperature (degrees)
6)-	Tx(C):	Max temperature (degrees)
7)-	Tn(C):	Min temperature (degrees)
8)-	UR(%):	Relative humidity (percentage)
9)-	P(hPa) :	Pressure (ettopascal)
10)-	(W/m2):	Solar radiation (Watts)
11)-	bat(V):	Bactery voltage (Volts)