

BRAZILIAN NAVY

NAVY HYDROGRAPHIC CENTER

The GLOSS-Brasil 2003 Program, an Overview

1.0 Introduction

Brasil, the largest country in South America, is bordered by a coastline of more than 7.400 km in extent. Economic, scientific and other activities linked to the sea explain the need of an appropriate understanding of this complex environment. Among others, the study of sea level monitoring is a good example of a research activity which provides important and useful information.

The Brazilian coast, mostly its southern portion, is often under the influence of synoptic and meso-scale meteorological systems, which induce significant disturbances in the ocean. Such disturbances basically occur in two forms: mean sea level changes (know as meteorological tide) and the generation of surface waves (storms). Both effects can bring serious implications for human activity on the seashore. Port closings due to adverse meteorological conditions, coastal erosion, destruction of seaside buildings, and anomalous flooding are but a few of the direct implications found in the event of synoptic and sub-synoptic meteorological systems passing by the coastal zone. Added to the problems related to natural coastline variations, which are commonly seen in the Brazilian shore, is the anthropic vector. Due to the fact that many of the coastal cities base their economies on beach tourism or the use of certain areas for development of other activities (ports, industries), the coastal zone have felt the direct effects of the demographic growth for years, with the increase in coastal occupation and the multiplication of conflicts (Marone et al., 2001).

Recognizing the importance of the study of sea level, the Diretoria de Hidrografia e Navegacao (DHN) (Figure-1), the Brazilian institution designated as coordinator of ocean research in the country, started in 2002, to develop an Implementation Plan for the Gloss Brasil Program.



(Figure-1 Aerial view of DHN, in Rio de Janeiro)

2.0 The Implementation Plan for the Gloss Brasil Program

The main objective of this Plan is to join efforts of the most relevant Brazilian Institutions that carry out some kind of sea level monitoring, research and application activity. Each member will have it's own responsibilities in maintaining one or more sea level stations as well as in making available quality-controlled data for the international sea level centers. The complete group of Brazilian Institutions, which are taking part in this Implementation Plan, is composed by:

- 1 - Diretoria de Hidrografia e Navegação (DHN)- (coordinator)
- 2 - Centro de Hidrografia da Marinha (CHM)
- 3 - Instituto Brasileiro de Geografia e Estatística (IBGE)
- 4 - Instituto Oceanográfico da Universidade de São Paulo (IOUSP)
- 5 - Centro de Estudo do Mar da Universidade Federal do Paraná (CEM)
- 6 - Coordenação de Programas de Pós Graduação em Engenharia da Universidade Federal do Rio de Janeiro (COPPE)

- 7 - Fundação Universidade do Rio Grande (FURG)
- 8 - Instituto de Pesquisas Hidroviárias (INPH)
- 9 - Gerência Geral do Porto de Ponta da Madeira (Companhia do Vale do Rio Doce)
- 10 - Terminal Especializado de Barra do Riacho - PORTOCEL
- 11 - PETROBRAS

The Banco Nacional de Dados Oceanograficos (from the CHM) will also receive all obtained data and will work like the Brazilian National Oceanographic Data center. There is maintained a computer-ready data archive and a technical library as well as a huge warehouse of analog charts and paper documents.

3.0 Local Sea level Network:

Sea level data has systematically been collecting in Brasil starting in the 1940s. and now there have been over 300 tide gauge sites in Brasil, although a vast majority of those were for very short periods and many of those did not have tide staff readings or regular geodetic leveling. Only Ilha Fiscal (maintained by CHM) and Cananea (maintained by IO-USP) sites can be assumed as GLOSS sites with a fairly continuous long record.

Salvador station was established on December 2002 in a joint action between DHN and IBGE. Likely Ilha Fiscal, there is installed, together with a float/well analog gauge, a DIGILEVEL gauge from which near-real time data are available via a telephone modem. The same arrangement will be installed at the oceanic island of Trindade, which had, on February 2003, its structure prepared to receive the equipments that are expected to be installed by the second semester of 2003.

Imbituba and Macaé (both maintained by IBGE) , Ponta da Madeira (maintained by CVRD) and also Barra do Riacho (maintained by PORTOCEL) sites are being prepared to become effective GLOSS stations.

The choice of the site between Salvador and Fortaleza as well as the installation of a site in Fernando de Noronha oceanic island will be addressed in the next GLOSS-Brasil meetings, probably on the first semester of 2003.

Table 1 lists, according to the Implementation Plan, the principal and secondary stations of the Brazilian Sea Level network:

	Station	Responsible	Situation
Principal	Fortaleza	IBGE	To be installed
	Suape x Maceio x Natal	TBD	To be installed
	Fernando de Noronha	CHM	To be installed
	Salvador	IBGE - CHM	Active(*)
	Barra do Riacho	PORTOCEL	Active (*)
	Ilha Fiscal	CHM	Active
	Ilha Trindade	CHM	Being installed
	Cananéia	USP	Active
	Imbituba	IBGE	Active (*)
Secondary	Ponta da Madeira	CVRD	Active (*)
	Macaé (Imbetiba)	IBGE/Petrobras	Active (*)
	Rio Grande	FURG	To be re-installed

(*) These stations are still under evaluation to be considered GLOSS sites.

The criteria used to select these sites were:

- to avoid regions of rough surf or strong currents;
- to avoid fresh water runoff (rivers);
- to be away for very active port operations that may damage the station;
- to be in adequately deep water;
- have a solid foundation (wharf, pier, jetty, etc) for supporting the station;
- have insurance against vandalism; and
- ease access for the tide observer and station technicians.

The other GLOSS consideration is the placement of a gauge at roughly 1000 km intervals.

Figure-2 shows the principal and secondary stations of the Brazilian Sea Level network:



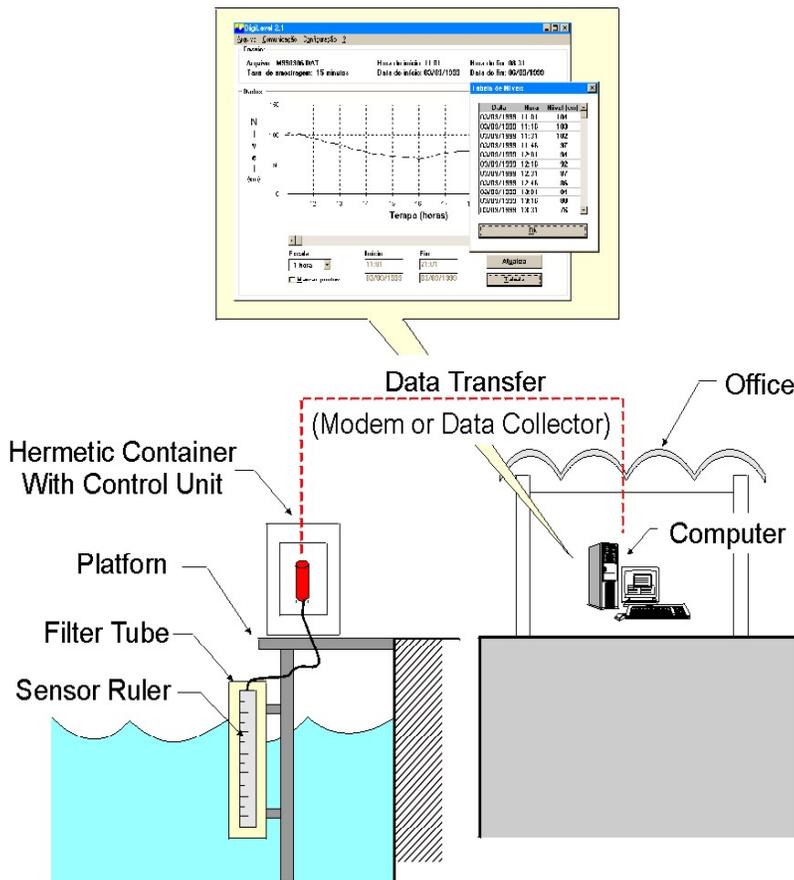
(Figure-2: Principal (black) and secondary(blue) stations of the Brazilian Sea Level network (SL stations on the Oceanic Islands of Fernando de Noronha-FN and Trindade are shown in yellow)

4.0 Data Acquisition and Processing Methodology:

In order to follow the GLOSS standards regarding data acquisition and processing, two systems, developed in Brasil, are being evaluated by DHN, UFRJ and IBGE. These systems, DIGILEVEL and MARESCAN, are described below.

4.1 DIGILEVEL

Ilha Fiscal, Barra do Riacho, Salvador and Macae sites have installed not only the float/well arrangement with an analog recorder but also a DIGILEVEL gauge. This is a result of a research work developed by UFRJ. It resembles an electronic tide staff with sensors spaced 1 cm apart along a staff that is housed in the stilling well. . A DIGILEVEL function diagram is shown in Figure-3.



(Figure-3, DIGILEVEL Function diagram)

Electronic readings are made at 15 minute intervals. The data are buffered into a data collection platform (DCP) in the tide station protective house. The DCP can be interrogated by telephone to directly download the data at the user's processing station. This operation is typically performed daily with the DCP buffer size well over a month. Figure 4 shows DIGILEVEL: Control Unit with Data collector

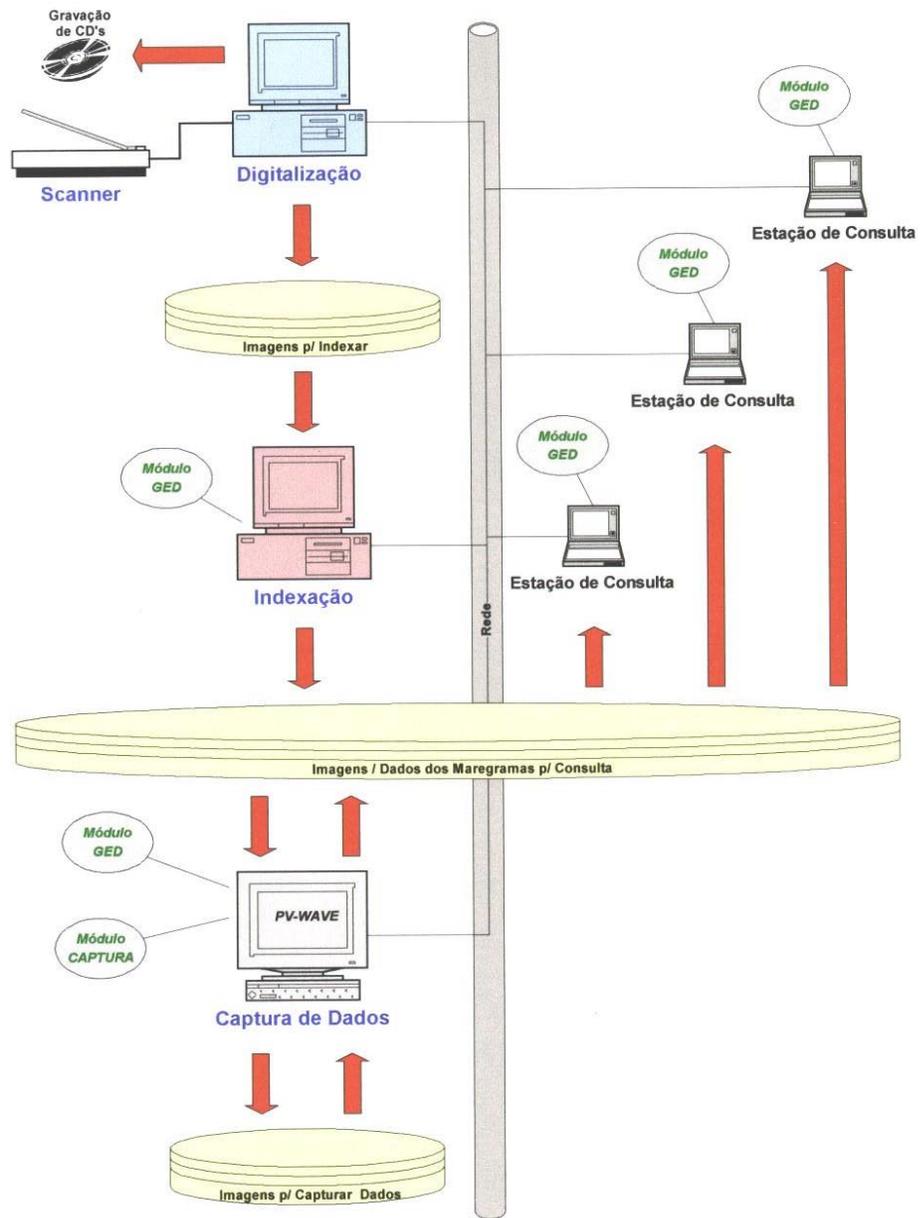


(Figure-4 DIGILEVEL: Control Unit with Data collector)

Time series comparisons between DIGILEVEL and analog series are being carried out and the appropriate feedback has been provided in order to correct minor problems still present in this new system.

4.2 MARESCAN

The CHM is evaluating the software MARESCAN as a tool for scanning analog rolls. This software is easy to use with and has built in quality control checks. Figure-5 shows an schematic representation of this method



(Figure-5, MARESCAN Function diagram)

5.0 Conclusions and Future Work:

During the last seven months, since the beginning of the Implementation Plan for the Gloss Brasil Program, some considerable efforts can be noticed. Salvador site became operational on December 2002 and its data is now under evaluation to be considered in GLOSS standards ; Field work was performed it the Oceanic Island of Trindade in order to prepare the structure to receive the equipments for installation of a sea level station. These equipments are expected to be installed by the second semester of 2003.

Also Imbituba, Macaé, Ponta da Madeira and also Barra do Riacho sites are being prepared to become effective GLOSS stations.

The site in the northeast coast, between Salvador and Fortaleza as well as Fernando de Noronha station will have its installation processes discussed by July, 2003 and are also depending on the acquisition/donation of new gauges.

The process of evaluation of MARESCAN and DIGILEVEL systems will continue and are these systems are expected to became useful to the Brazilian community shortly

The DHN will provide training courses to tide station observers and technicians of other Brazilian institutions.

It would be very useful if some data acquisition, processing and archiving course could be provided by the GLOSS community or by the PSMSL to the members of the Brazilian institutions that take part of the GLOSS-Brasil Program.

6.0 References

Marone et al., 2001. Quijote - a C-GOOS pilot project progressing to the operational stage. The Goos Data Products And Services Bulletin, Paris, France, v. 2, p. 1-8, 200.

The Gloss Brasil Implementation Plan, DHN, 2003 (in preparation).