

**BRAZILIAN NAVY
HYDROGRAPHIC CENTRE OF THE NAVY**

National Report of Brasil: The GLOSS-Brasil 2003 Program

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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 (swell and storm-surge). 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 Navegação (DHN), 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.

2.0 The Implementation Plan for the GLOSS-Brasil Program

The main objective of this Program (PIG) is to join efforts of the most relevant Brazilian Institutions that depend on sea level observations for monitoring, research and application activities. The intention with PIG idea is to install and maintain 12 (twelve) tide gauges on an operational basis along the Brazilian coast and oceanic islands.

In this program 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- Gerência Geral do Porto de Ponta da Madeira (Companhia do Vale do Rio Doce -CVRD)

9- Terminal Especializado de Barra do Riacho - PORTOCEL

The Brazilian National Oceanographic Data center (Banco Nacional de Dados Oceanográficos - BNDO, operated by CHM) will also receive all data. BNDO already maintains a computer-ready data archive, a technical library as well as a warehouse of analog charts and paper documents.

Contact: Banco Nacional de Dados Oceanograficos

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3.0 Local Sea level Network:

Sea level data has systematically been collected in Brasil since the 1940s. Within this period, there have been over 300 tide gauge sites in Brasil, although the majority of the data sets were for very short periods and did not have tide staff readings or regular geodetic leveling. Only Ilha Fiscal (maintained by CHM) and Cananea (maintained by IOUSP) sites can be assumed as GLOSS sites with a fairly continuous long record. Table 1 lists, according to the Implementation Plan, the principal and secondary stations of the GLOSS-Brasil 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:

- (a) to avoid regions of rough surf or strong currents;
- (b) to avoid fresh water runoff (rivers);
- (c) to be away from very active port operations that may damage the station;
- (d) to be in adequately deep water;
- (e) have a solid foundation (wharf, pier, jetty, etc) for supporting the station;
- (f) to be protected against vandalism;
- (g) ease access for the tide observer and station technicians; and
- (h) gauge site spacing of roughly 1000 km.

Salvador site was established on December 2002 in a joint action between CHM/DHN and IBGE. For this site, the same data collecting procedure used in Ilha Fiscal site was implemented, which is to install two gauges: a float/well analog and a digital gauge from which near-real time data are available via a telephone modem. This digital gauge, called

DIGILEVEL, was developed in Brasil and is under evaluation in order to verify if it meets GLOSS data accuracy requirements.

During the first semester of 2003, it was built a gauge basis in the oceanic island of Trindade for installing a DIGILEVEL gauge. For the future, it is planned to install an automated tide gauge, which could provide fast data for satellite altimeter calibration.

Imbituba and Macaé (both maintained by IBGE), Ponta da Madeira (maintained by CVRD) and Barra do Riacho (maintained by PORTOCEL) sites will have it's data analyzed in order to verify if they can became "effective" GLOSS stations.

The proposal of installing three new sites in Brazil: one in the northeast Brazilian coast, between Salvador and Fortaleza, one in Fernando de Noronha oceanic island and at Rio Grande (in the south of Brasil) will be addressed in the next GLOSS-Brasil meetings.

4.0 Conclusions and Future Work:

During the last twelve months, in spite of serious budget constraints, significant progress has been made:

- (a) Salvador site became operational on December 2002, as a result of a joint effort between CHM-IBGE, and its data is under evaluation regarding GLOSS standards;
- (b) In April 2003, DHN provided a course of tide gauge operation and maintenance for the Brazilian GLOSS community
- (c) During the first semester of 2003, 3 cruises funded by DHN prepared the gauge basis' for installing a new site in Trindade Island.

In accordance with GLOSS-Brasil Implementation Plan, which is in its final stage of preparation, the future work consists on:

- (a) install a gauge in Fortaleza;
- (b) install a gauge in Fernando de Noronha Island;
- (c) Imbituba, Macaé, Ponta da Madeira and Barra do Riacho sites are being prepared to become effective GLOSS stations, depending on the evaluation of the data quality;
- (d) location of the new site in the northeast coast, between Salvador and Fortaleza, will be discussed on the next GLOSS Brasil meetings;
- (e) DIGILEVEL system evaluation will continue and it is expected to became useful to the Brazilian community shortly.

Finally, it would be very useful if a data acquisition, processing and managing 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).