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The Mozambican national sea level report

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I. Introduction

There is a growing concern about the rise in mean sea level around the world, to face with this, the IOC (International Oceanographic Commission), have developed a Global Seal Level Observing System (GLOSS), which among other goals; the GLOSS aims to standardize the sea level data, for usage in global, regional, and national level. Mozambique as member of the GLOSS has benefited of a number of supports, since the provision of equipments to participation in training courses.

This report was prepared for the "GLOSS/ODINAfrica Training Course on Sea Level Observation and Interpretation" and related fields which will be held in Ostende-Belgium, from 13-23 November 2006; at the IODE-project office.

The National Institute for Hydrograph and Navigation (INAHINA) is the Mozambican Institute (under the ministry of transports), responsible for the installation, and maintenance of the tide gauge stations, as well as, for the acquisition, processing, archiving and dissemination of the sea level data. The data processing is been doing according to the international standards. With this report we would like to present an overview of the extents to which sea level have been monitored in Mozambique by tide gauge to date.

II. Maps of tide gauges Network

The network of sea level stations in Mozambique consists of thirteen stations from which, only three (Maputo, Nacala and Pemba) are nowadays operational. To overcome this actual tide network state of affairs, in 2005, Mozambique has upgraded two GLOSS stations in Mozambique (Pemba and Inhambane), during the ODINAFRICA III project in collaboration between INAHINA, SANHO and POL. The project was funded by IOC, and the main propose of this upgrade was to records Sea Level for Monitoring Coastal Zones and Impacts of Global Change in Africa providing near real-time observations of sea level. These two GLOSS stations were operational, since 2005 to the beginning of 2006. Bearing in mind the difficult on maintenance (all the spares come from U.K.), as well as, the absence of a regular careful by a local operator, these two stations, are nowadays partially operating. To face with this, the INAHINA has started with the procedures to contract, two local operators, who are supposed to perform the basic maintenance of this equipment.

Apart from this, the INAHINA has acquired two other digital tide gauges, which are intended to be installed in Maputo and Beira Harbors in the next couple of months.

To give an elucidatory vision of the Mozambican tide gauge network, the figure 1 illustrates the map of Mozambique, as well as all the gauge stations, including those which are still not operational. It is also important to mention the tide gauge network, were primarily installed to provide aids to navigation to the vessels sailing to and from the harbors, and not for scientific proposes. Presently there are a need (a part from the need to establish the previous network full operational), of installing the new tide gauge, in places that can bring more conclusive results in the research fields.

III. List of tide gauge sites

All of the thirteen tide gauge stations in Mozambique previously installed, only three which are located in main harbors are operational, and these are: Maputo, Nacala and Pemba. All the gauges are of float type; more details of all gauges are provided in the table 1. The remains stations are still no operational; a list of this stations and the corresponding coordinates, are provided in the table 2.

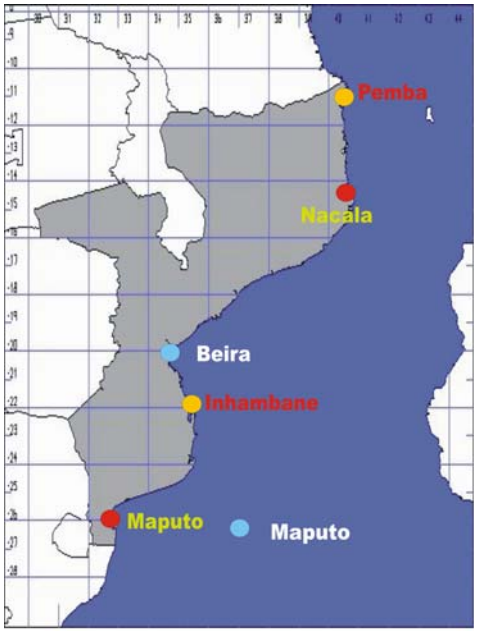

Figure 1: The Mozambique map, the red circle show the locations where the OTT R20 tide type were installed; the yellow circles show the locations where the radar tide gauges were installed (GLOSS stations), and the Blue circles show the stations where INAHINA will install the radar tide gauges.

Table1: List of the operational tide gauges.

Station Name	Location latitude; longitude	Tide gauge model-SN	Year of Installation	Responsible
Maputo	25°58.5' S; 32°34.2'E	OTT R20 - 20102	1994	INAHINA
Nacala	14°27.8' S; 40°40.8'E	OTT R20 - 20102	1995	INAHINA
Pemba	12°58.' S; 40°29.3'E	OTT R20- 20102	1992	INAHINA

Table 2: The stations where the tide gauges were installed previously and are not currently working

Station	Location (Latitude; Longitude)
Inhambane	(-25.87 ; 35.38)
Chinde,	(-18.57 ; 36.45)
Macuse,	(-17.43 ; 37.11)
Moma,	(-16.47 ; 39.16)
Ilha de Moçambique	(-15.03 ; 40.74)
Beira	(-19.82 ; 34.83)
Quelimane,	(-18.00 ; 36.97)
Pebane,	(-17.27 ; 38.13)
Angoche,	(-16.23 ; 39.90)
Mocímboa da Praia	(-11.34 ; 40.37)

The main reason for the non-operation of the tide gauges can be mentioned as:

The absence of adequate equipment
Lack of qualified person (a local operator), to maintain the tide gauges.
The difficult to access the remote village; due to the poor transport network.

IV. Gauge technologies employed in the network

The Maputo and Nacala stations are equipped with floating gauges of model OTT R20; in which the recording pen is driven by float which moves vertically in the well connected to the sea through a relative small hole or narrow pipe.

Since 2005, in Inhambane and Pemba stations were installed the digital (radar sensors) tide gauges of type Kalesto. The data collected from these stations were been sent from 2005 to 2006 March to PSLM (Permanent Sea Level Measurement) site. Due to the lack of local qualified persons to maintain these stations, the data delivery was temporary interrupted.

Inahina has acquired more two Kalesto radar sensors, and is planning to install them in Beira and Maputo harbors,

V. Other technologies employed in the network

For both GLOSS stations, was coupled a GPS antenna which enable the ORBCOMM unit to rapidly obtain accurate time and position information, so that logging occurs in a accurate time, in relation to other tide stations none of them have a tide gauge along with GPS receiver.

VI. Web, e-Mail, address of data banks and sources of further information

The tide gauge data are recorded hourly for those stations which are equipped with floating gauges. These data are available in both digital and hardy copy format at INAHINA. A copy of the data is sent to Portuguese Hydrographic Institute, in Lisbon and till 2005, it was used to produce a tide table for several harbors in Mozambique. The tide table is available in INAHINA in printed version.

Data from GLOSS stations (those stations which are equipped with digital radar tide gauges) are recorded in every fifteen minutes. These data are sent to the world data center through the following address sites:

http://www.pol.ac.uk/ntslf/sadata_african_ntslf_radar.php?code=1001&span=1 for Pemba station and

http://www.pol.ac.uk/ntslf/sadata_african_ntslf_radar.php?code=1002&span=1 for Inhambane station