ASSESSMENT OF THE WAVE CHARACTERISTICS AT GALÉ BEACH, PORTUGAL, USING *IN-SITU* AND TRANSFERRED DATA

R. Reis[1], S. Gabriel[2], C.J. Fortes[1] and D. Moura[2]

Paper topic: Laboratory and field observations and techniques

1. Introduction

The research project *EROS – Erosion of Rocky Shores – differences in protection promoted by sandy beaches and shore platforms* – falls within the morphodynamics of rocky coasts and intends to be a helpful tool for coastal erosion processes assessment. The main goal of this project is to quantify and compare the relative role of sandy beaches and shore platforms on the rocky cliffs' protection against wave assailing force, by weighting: cliffs' efficacy on dissipating waves' energy and coastal sectors vulnerability concerning to cliffs' retreat rate.

The present paper is a contribution to learn more about the wave characteristics at Galé Beach, located in the Algarve rocky coast (southern Portugal) where cliffs are under dramatic recession. Therefore, this work integrates real data and numerical wave propagation modeling transferred data.

In order to collect and analyze real local data, a campaign was conducted, using several equipment and techniques. Those data were compared with numerical transferred data from the Hydrographic Institute (IH) buoy located at Faro, using numerical wave propagation models, SWAN (Booij *et al.*, 1999) and COULWAVE (Lynett and Liu, 2004), which enables the evaluation of models performance and the calibration of its parameters.

In short, this work describes and compares the wave characteristics at the Galé site based on *in-situ* and transferred data produced by two different models.

2. Methodology

The case-study of this work, Galé Beach, has both sandy and rocky bottoms (Figure 1). The field campaign was held from 6th to 12th March 2012. Figure 1 shows the study area (Figure 1 a) and the specific points where the equipment was installed (Figure 1 a) and b).

The instruments used to measure the wave characteristics were: Six Pressure Transducers (PT), three Electromagnetic Current Meters (ECM), one Acoustic Doppler Velocimeter (ADV) and one Acoustic Doppler Current Profiler (ADCP or ADP).

The ADP was installed in front of Galé beach, bottom-moored in approximate 4.50 m (Chart *Datum*) water depth, and it started to collect data on the 6th at 9:00 am. ADP was uninstalled and removed on the 12th early afternoon.

The other instruments were distributed and installed in different points of the study area, some on the sandy floor and some on rocky platform (Figure 1 b). These measuring equipment were programed to start data acquisition on the 8th at 8:30 am and were removed on the 9th midmorning. All of the measuring points were georeferenced (*Datum* 73) and its geographic coordinates were determined. Also, research was carried out on the local topography and bathymetry.

[1] LNEC – National Laboratory for Civil Engineering, Av. do Brasil, 101, 1700-066 Lisbon, Portugal. rreis@lnec.pt, jfortes@lnec.pt.

[2] CIMA – Marine and Environmental Research Centre, University of Algarve. Campus of Gambelas, Ed.7, 8005-139, Faro, Portugal. smgabriel@ualg.pt, dmoura@ualg.pt.

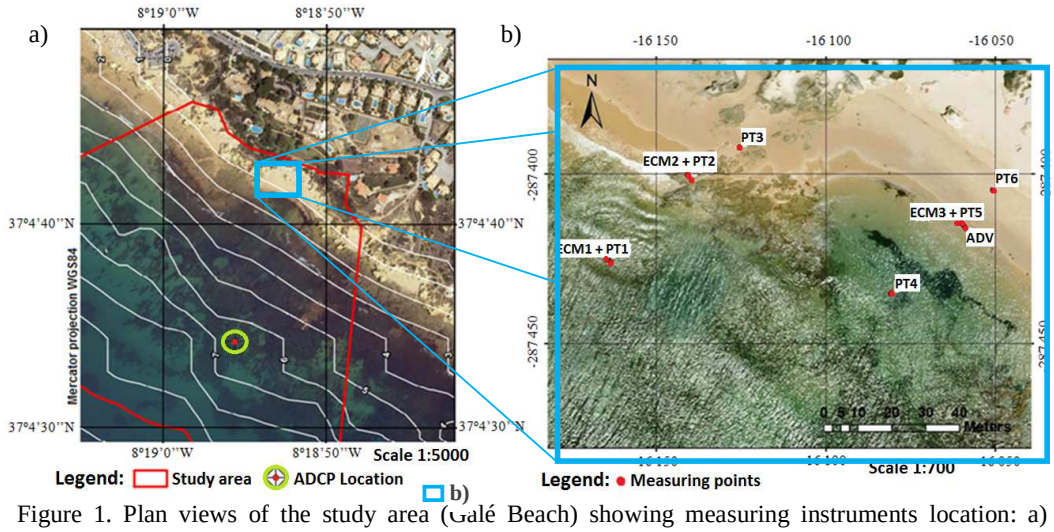

Figure 1. Plan views of the study area (Galé Beach) showing measuring instruments location: a) Isobaths (Mean Sea Level *Datum*) and ADCP location; b) Measuring equipment on both sandy and rocky bottoms (PT, ECM, and ADV).

Aiming to compare the *in-situ* measurements with numerical estimations using SWAN and COULWAVE propagation models, a general wave characterization was done by using transferred wave data from the IH buoy. In operational conditions, this buoy provides wave parameters, such as the significant height (Hs), the mean period (Tz), the peak period (Tp) and the mean direction (Dir), hourly, based on average values for ten-minute-duration acquisitions. The results from SWAN are compared with ADP measurements and discussed. Then, SWAN results are used as offshore boundary conditions of COULWAVE, and its results near the coastline are compared with PT and ECM measurements. A statistical and a spectral analysis are also performed.

3. Future work

The *in-situ* data will be analyzed in order to improve operations, as well as, numerical simulations will also be analyzed to calibrate and assess both numerical models performance. Results and possible errors will be discussed to improve each methodology.

Final paper will discuss and conclude about the results obtained through *in-situ* measurements for selected locations as compared with the results of the simulations with SWAN and COULWAVE models. The agreement between the different methods will be studied.

Acknowledgements

The financial support of the "Fundação para a Ciência e a Tecnologia", through project EROS, ref. PTDC/CTE-GIX/111230/2009 is acknowledged. The authors are also indebted to the **"**Instituto Hidrográfico", who provided the wave buoy data used in this work.

References

Booij, N., R.C. Ris and L.H. Holthuijsen. 1999. *A third-generation wave model for coastal regions, Part I, Model description and validation*, J. Geoph. Research, 104, C4, 7649-7666.

Lynett P., Liu P.L-F. 2004. *Modelling wave generation, evolution and interaction with Depth-Integrated, Dispersive Wave equations*. COULWAVE Code Manual, 2004. Cornell Univ. Long Inter.