BOOK OF ABSTRACTS

high tech in the lowlands

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Storm erosion on a sandy beach

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1.- INTRODUCTION

As an answer to the combination of processes and conditions that interact on a sandy beach, a sedimentary dynamic is developed. Its understanding and knowledge is necessary for the planning and management of this type of environments.

In this work the erosion with regard to an specific storm is quantified. Characteristic parameters for this storm are analyced **and interpreted**. Additionally, the role of selected significant storms is evaluated in the generalized process of erosion through an annual cycle by means of certain coefficients.

The beach under study is located in the north coast of the Island of Gran Canaria (Spain), and it is sheltered from the prevailing NE wind and swell (fig. 1).
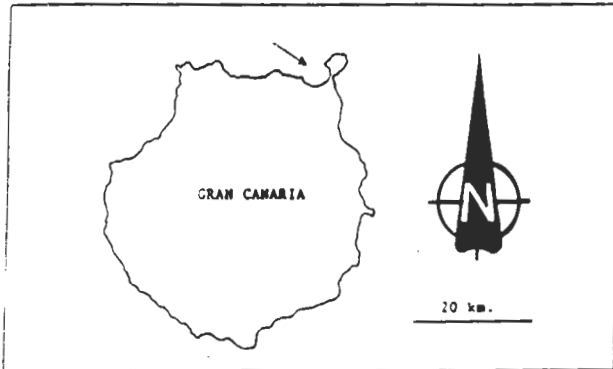

Fig. 1   Geographical location of the beach under study.

The beach under study has a total length of 3000 m. Sectorially, the width of the foreshore can reach 100 m. and that of the bachshore 50 m. The submerged beach is partially broken up by a fragmented rocky bar which emerges at low tide and affects the larger part of the beach.

In this beach, the major accretions take place during the spring-summer period, when the prevailing swell is from the NE. The major erosions show up during the fall-winter period, coinciding with the seasonal Northwestern storms.

This beach is divided into two principal sub-environments, according with the beach states proposed by Short (1978): Las Canteras North and Las Canteras South. The former behaves as a reflective beach and the last one as a dissipative beach (fig. 2).
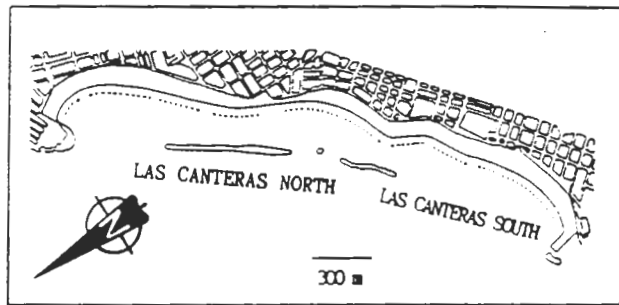

Fig. 2   Plan view of the beach under study.

2.- TECHNIQUES

The methodology takes into account:
- Carrying out of different surveys throughout the entire beach; before during and after the storm under study (Martínez et al, 1989).

- Calculation of the sand accretions and erosions on the foreshore, according with Kriebel et al, 1986.

- Analysis of the meteorological-oceanographical data, specially in relation to the studied storm.

- Analysis of the characteristics of sediments.

- And an estimation of the sedimentary indices: that of the variability and that of the sustaining capacity. The erosion and acrretion coefficients are deduced and proposed from the first of these indices.

3.- RESULTS, DISCUSION AND CONCLUSIONS

3.1 Storm characteristics

The selected storm took place between December 2 and 8, 1987. This storm corresponded to an strong atlantic squall centered over the Azores, that produced barometric lows of 1006 mb. in the Canary Islands, waves with significant wave heigths higher than 4 meters, and winds up to 75 km/h (fig. 3).

3.2 Repercussions of the storm on the beach as a whole

From this storm we estimate losses of about 2000 cubic meters of sand throughout the entire beach, in a 21 meters wide tidal stip. These losses asume an erosion coefficient of 15.55 % of a sedimentary variability index of 0.27 meters, corresponding to the erosive sub-cycle.

The above-mentioned erosion coefficient has a lower value in relation to the others of the same

sub-cycle; these others reach up to 44.5 % at monthly intervals, out of significant stormy situations.

3.3 Storm erosion in different sectors of the beach

There is a distinctly different behaviour in the two main sectors of the beach: while a significant erosion is taking place in Las Canteras South, a significant accretion is happening in Las Canteras North.

In Las Canteras South, the storm caused an erosion coefficient of 35.13 % of a sedimentary variability index of 0.41 meters, corresponding to the erosive sub-cycle. That is to say, the tidal topographical surface had a mean drop of 14 cm.

On the other hand, in Las Canteras North an accrettion coefficient of 61,82 % of a sedimentary variability index equal to 0.17 meters, calculated for the accretionary sub-cycle, was registered. This represents a mean gain of 10 cm. for the foreshore along this sector.

This tilt explains the low erosion coefficient for the whole beach.

Throughout the sedimentary cycle, the most important erosion coefficients are not precisely related to the significant storms, as it was deduced from the previous period of the studied storm. In the specific case of Las Canteras South, mean sedimentary losses were calculated previously to the storm larger than those measured during the storm.

An explanation for this conduct can be supported in the fact that a beach, immediately after having reached its maximun accretion is very susceptible to suffering great sand losses due to sligth increases in waves energy. In this case, these situations coincide with the first sporadic manifestations from the northwestern swell and with the fall of the dominant northeastern winds.
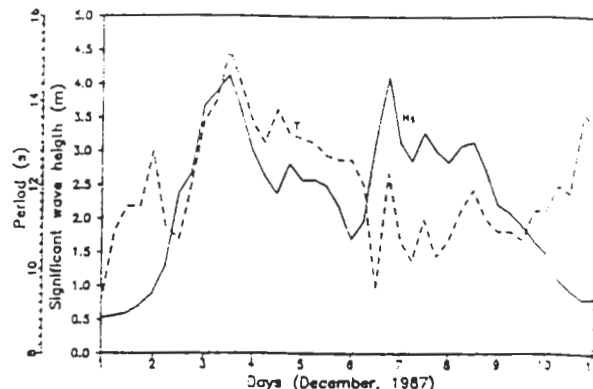

Fig. 3 Evolution of significant wave heigth (Hs) and period (T) for the selected storm. Data were obtained from a wave gauge placed 1800 m. offshore

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