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The Ebro Delta, located in the Spanish Mediterranean coast (fig.1) has experimented during the last decades a change in its evolution trend. Whereas in 1900 it behaved as a progradating coast it is eroding severely at present. This change is linked to a decrease of the solid discharge of the Ebro river while the transport capacity of the waves has remained much the same.

Under these conditions, the behaviour of the Delta can be assumed as independent of the river discharge and fully wave-dominated. This means that marine dynamics is responsible for the short-term and medium-term coastal responses.

The Delta coast has been monitored during the last four years to identify and quantify the processes that control the coastline evolution. From these measurements, two types of changes have been identified: medium-term and seasonal changes. The first ones are associated to longshore transport gradients along the coastline (JIMENEZ *et al.* 1991a, JIMENEZ *et al.*, 1992) while the second ones are due to the quasi-cyclic action of storm and post-storm waves. These changes are overlapped and can be seen in figure 2.

The existing of longshore transport gradients - due to changes in the wave characteristics at breaking and to differences in the shoreline alignment - produce erosive processes in some coastal stretches (figure 1). The main erosive areas are the Buda Island and the Trabucador Bar in the southern hemidelta, and the whole northern hemidelta. Their behaviour can be classified as a medium-term trend because of the time scale of the measurements (several years), but seems to be representative of the longer-term evolution trend (only from the wave action point of view, i.e. not considering other kind of effects like sea level rise or others).

The profile short-term changes are associated to the storm and post-storm wave attack on the coast and they are correlationed with the climatic seasons -heavy storms during the winter and mild waves during summer- (GARCIA *et al.*, 1992). These changes are mainly due to the cross-shore component of the transport and they are not uniform along the coast. The response of each profile depends on the coastal orientation with respect to the wave direction. Coastal stretches with a similar behaviour can be easily identified (JIMENEZ *et al.* 1992).

In the Trabucador Bar the most remarkable short-term changes are associated to storm events during which high waves coexist with an important surge. If overtopping is produced, a remarkable sediment transport towards the Alfacs Bay can exist. This transport can produce the failure of the Bar. The sediment removed from the littoral and deposited it in the Bay, will be no longer available for the littoral transport scheme (JIMENEZ *et al.*, 1991b).

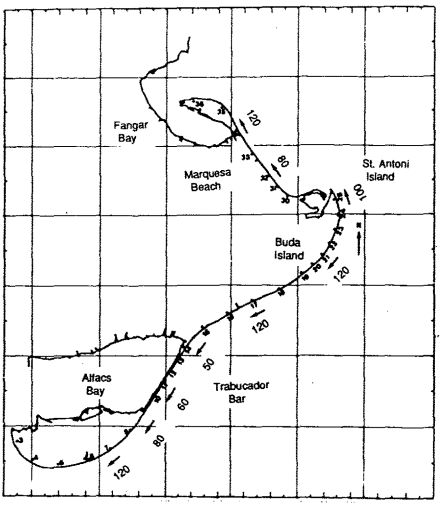

Figure 1. Net longshore transport rates in the Ebro Delta (transport in thousands of cubic meter per year)(modified from Jiménez *et al.* 1992)

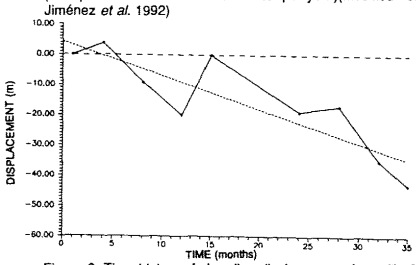

Figure 2. Time history of shoreline displacements in profile 22 (Buda Island).

REFERENCES

GARCIA M.A., SOSPEDRA J., SIERRA J.P., SANCHEZ-ARCILLA A. and GOMEZ J., 1992. - Wind waves off the Ebro Delta. Proc. of the 24th International Liège Colloquium on Ocean Hydrodynamics (to be published).

JIMENEZ J.A., SANCHEZ-ARCILLA A., GARCIA M.A., OVEREEM J. van and MALDONADO A., 1991a. - The Ebro Delta Project : a first sediment budget. *Coastal Sediments' 91*, ASCE, 2323-2334.

JIMENEZ J.A., SANCHEZ-ARCILLA A., GARCIA M.A., OVEREEM J. van and STEETZEL H. 1991b. - Trabucador Bar erosion during the october 1990 storm. (in spanish) *Revista de Obras Publicas*, febrero 1991, 23-30.

JIMENEZ J.A., GRACIA V., VALDEMORO H., GARCIA M.A. and SANCHEZ-ARCILLA A., 1992. - Analysis and proposal of solutions to stabilize the Ebro Delta : Litoral transport in the Ebro Delta (in spanish). *D.G.P.C. Generalitat de Catalunya.* (in press)