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Discussion

Comments on "Temporal assessment of sediment transport from beach nourishments by using foraminifera as natural tracers" [Coast. Eng. 52 (2005) 205–219]

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Benavente et al. (2005) have carried out a very interesting study of foraminifera shell distribution in a nourished beach for estimating sediment pathways. After a 3-year morphodynamic study, by monthly sediment sampling, a complex pattern of transport was identified though, regrettably, this methodology only accounts for the behaviour of fine fractions.

Nevertheless, as the chief engineer in charge of beach nourishments in the coast of Cadiz for the last 15 years, I consider that some items would have to be clarified; otherwise, they could lead to misinterpretations.

- Aculadero and La Puntilla beach nourishments were included in an important campaign undertaken by the Spanish Coastal Directorate, presently included in the structure of the Ministry of Environmental Protection, since 1990. An obvious objective was to protect the infrastructures located along the coastline. However, the primary target was to maintain the outstanding natural features of Spanish beaches, due to the enormous economic impact that the tourism has in our country (Muñoz-Perez et al., 2001) as well as in some others (King, 1999; Houston, 1996, 2002).
- In the paragraph about Methodology, the authors pointed out that "In the studied zone, complex wave shoaling processes introduce important wave height modifications and disable the application of traditional wave-propagation programs". Although the installation of the stake at the end of the groin was really ingenious and the wave data were stark accurate, it is necessary to emphasize that, actually, the Spanish Coastal Directorate use the Coastal Modeling System (SMC, developed by the Coastal an Oceanographical Engineering Group (GIOC) from the University of Cantabria), a software program that is sophisticated enough to solve the propagation along the shoaling rocky platform which exists in front of the study area (www.smc.unican.es). The application of this numerical model allowed identifying the paths of sand transport and the zones of sediment deposition supported on the breakwater of Puerto Sherry Harbour and the Guadalete River jetty (see Fig. 1a).
- When the authors suggest in the abstract that "…where several nourishments were carried out in order to recover an eroding beach", one could think that there were a lot of consecutive beach nourishment project failures, and that is not the case. As the authors indicated, the first nourishment operation of 172,448 m^3 (carried out between 1993 and 1994, taking advantage of the maintenance dredging of the entrance channel of the nearby Cadiz Harbour) had an erosion rate of 35,000 m^3/year. This rate of erosion was three times greater than the experimented by the nourishment operation (of 75,625 m^3) carried out in 1996, although the diameter of the sand was much coarser (390 μm in the first case and 250 μm in the second). The explanation, related to the fact that the beach is supported on a horizontal rocky platform, is given in Muñoz-Perez et al. (1999a, 2001).
- Moreover, the assertion about "The sand volume involved in these later nourishments was reduced as a consequence of a substantial decrease on the annual erosion rates" could be misunderstood. The decrease on the second nourishing

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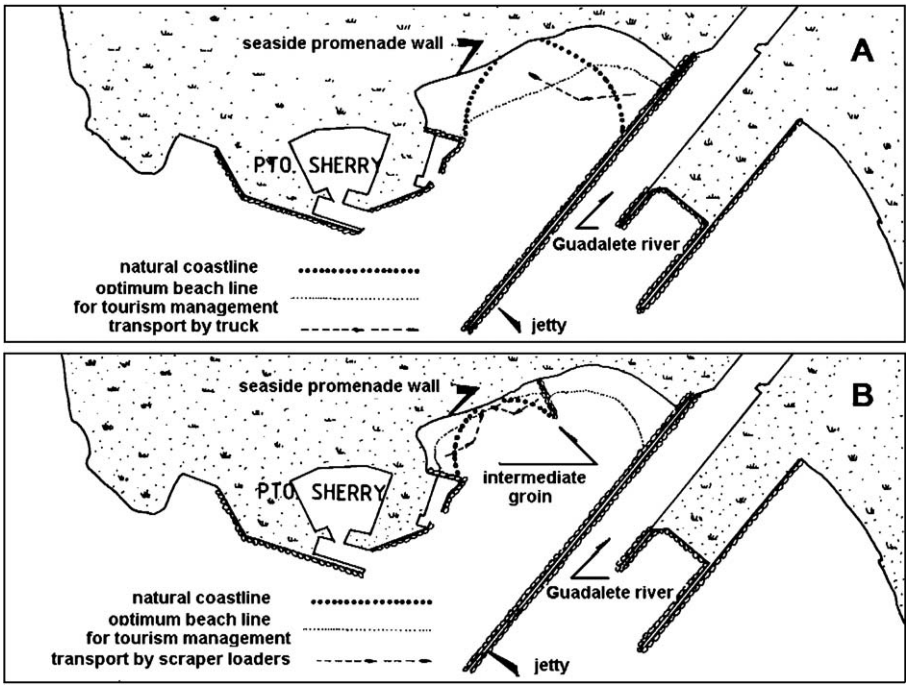

Fig. 1. (A) Terrestrial sand transport by using front end loaders and trucks (before 1993). (B) An intermediate groin was built and it was possible to use scraper loaders instead of trucks, diminishing the annual costs by half.

volume was decided "a priori", after studying the data from the monitoring of the first nourishment, in order to diminish the erosion rate.

– It is important to indicate that, some years before these renourishment operations were made, the possibility of constructing a detached breakwater that modified the energy of the incident waves and created a protected zone in the centre of the beach was studied. This solution was rejected due to the great visual impact of a rubble mound with crest elevation at +4 m, in spring low tides, in front of the beach. In addition, its cost (in excess of 400,000 EUR) was very high in comparison with the solution that finally was adopted and that consisted of transporting 10,000 m^3 of sand every year from the both accretion zones to the centre. With these "maintenance tasks", a homogenous width of the beach, optimal for touristic management, was obtained. Obviously, it was known in advance that the winter storms would return the sand to the ends of the beach. The transport, which was made by means of a front-end loader and trucks 6 × 6 through the beach, had an annual cost of 40,000 EUR. The construction of a groin in the middle of the beach was decided taking advantage of the existing rocky platform. Therefore, the sand was accumulated on both sides of the groin and the transport distance was reduced (see Fig. 1b). In addition, it would be possible to use scraper loaders instead of trucks, diminishing the annual costs to one-half. This type of operations has continued to be performed to this day.
– Authors stated that "Nearshore circulation patterns are difficult to determine, specially on Aculadero Beach, owing to the complex bottom topography imposed by the shore platform". Perhaps, the by-pass operations carried out by Puerto Sherry Harbour should be considered as well. The sand, dredged at the harbour mouth and pumped to the beach, although of a relatively small volume, could modify the percentage of foraminifera.
– Finally, I completely agree with the authors as far as "The use of foraminifera shells there are demonstrated to be a very useful technique that supplied significant information about the most important transport paths". According to the experience acquired with others experiments carried out in the area (Muñoz-Perez et al., 1999b), another advantage of this method must be highlighted: its low cost related to other artificial tracers like fluorescent sands.

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