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Impacts on coastal processes at the mouth of the Guadiaro River (Cádiz, Spain)

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The mouth of Guadiaro River (Cadiz, south of Spain) opens to the Alboran basin of the Mediterranean Sea, between the Spanish and North African coasts, near the Strait of Gibraltar, where the Spanish coastal orientation is NNE-SSW so the area is affected by wind and wave action mainly from the eastern side ("Levante"). Although the Spanish Mediterranean facade is climatically dry and supports a very irregular rainfall regime, the rainfalls in the "Sierra de Grazalema, Cádiz" are among the highest and homogeneous throughout the year in Spain (The source of the river Guadiaro is placed there). Maybe that is why the Guadiaro estuary has remained until these years while in all other rivers estuaries became deltas in the eighteenth century. Recently the water of this river was transferred to the Atlantic basin through Guadalete River and before Guadiaro had suffered a major regulatory process, both reducing the flow of the mouth. The closure of its mouth, due to the reduced flow of the river, has been studied several times in the last years. This is caused by a bar that grows in the NNE direction when longshore transport occurs mainly in the opposite direction.
This paper has been mainly based on most of those documents, whose researches have used numerical models such as SMC and MIKE 21, obtaining relevant results on the refraction but not diffraction. In the environment of the mouth two elements that can modify coastal dynamics have been introduced: two jetties of which one was soon removed (built in 1973) and the harbour of Sotogrande (the breakwater was built in 1986). The influence of these elements is not well reflected in the numerical models.

In this paper the comparative evolution of the mouth from the Little Ice Age is analyzed and it also studies the most detailed recent changes and the works carried out on the beach embedded in the north of the jetty, now sheltered by the breakwater of the port of Sotogrande. This beach has suffered significant erosion and changes since the construction of this marina and harbour. The study of this beach can also induce new elements to understand the dynamical processes in the mouth and its littoral surroundings. The results of this study, which took information of earlier ones (Muñoz-Pérez et al., 2010), show the process of beach erosion and its relation to changes in the mouth, and are fundamental for the shore protection design along the whole coastal stretch.