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TITLE: Morphodynamic evolution of a sand extraction excavation offshore Vale do Lobo, Algarve, Portugal

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ABSTRACT:

Abstract Offshore sand and gravel extraction for aggregates and beach nourishment is an important economic activity and has been a common practice in various countries worldwide for many years. The evolution of a sandpit, in particular its migration and rate of replenishment, depends strongly on the type of sediments involved, and on the physical and hydrodynamic characteristics of the surrounding area. In order to fully assess the associated impacts on local ecosystems and on the neighboring coastline morphology it is essential to make accurate predictions of the excavation recovery times. For this purpose it is fundamental to investigate areas where there is an adequate observational control of the evolution of the sandpit, prior and after the excavation, to properly calibrate existing numerical models with observations and fully evaluate their prediction adequacy. The present work investigates the evolution of an offshore sandpit located off Vale do Lobo, Algarve, Portugal, within a time span of four years (2006?2010), based on 4 bathymetric surveys, prior to and after the dredging operations, complemented with the analysis of wave data and numerical modeling simulations. The bathymetric data were used to evaluate the morpho-sedimentary evolution and to calculate the sediment volume changes. The results show an infill of approximately 17% of the initial exploration pit in the first 4 years, with an overall smoothing of the initial excavation bottom topography. Observations combined with modeling results demonstrate that the pit evolution depends mainly on storm events, since it is essentially during these periods that there is a significant sediment movement at the site water depth. Based on (1) the predicted number of stormy days for the forthcoming years, assuming that (2) the yearly average of such events in the past 57 years is representative, and considering (3) a decrease of the sandpit recovery rate in time, predicted by models and observations, it was possible to estimate that the Vale do Lobo sandpit recovery period is of ca. 38 years for its full, or near full, replenishment.

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