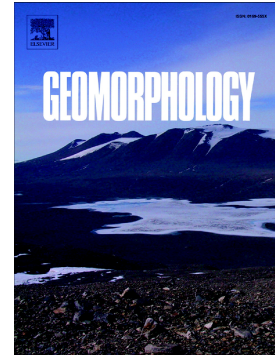


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Short- and medium-term response to storms on three Mediterranean coarse-grained beaches.**Edoardo Grottoli^{a*}, Duccio Bertoni^b, Paolo Ciavola^a**^aDepartment of Physics and Earth Sciences, University of Ferrara, Ferrara, Italy^bDepartment of Earth Sciences, University of Pisa, Pisa, Italy

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Abstract

The storm response of three Italian coarse-grained beaches was investigated to better understand the morphodynamics of coarse-clastic beaches in a microtidal context. Two of the studied sites are located on the eastern side of the country (Portonovo and Sirolo) and the third one (Marina di Pisa) is on the western side. Portonovo and Sirolo are mixed sand and gravel beaches where the storms approach from two main directions, SE and NE. Marina di Pisa is a coarse-grained, gravel-dominated beach, exposed to storms driven by SW winds. Gravel nourishments were undertaken in recent years on the three sites. Beach topography was monitored measuring the same network of cross sections at a monthly (i.e. short-term) to seasonal frequency (i.e. medium-term). Geomorphic changes were examined before and after storm occurrences by means of profile analyses and shoreline position evaluations. The beach orientation and the influence of hard structures are the main factors controlling the transport and accumulation of significant amount of sediments and the consequent high variability of beach morphology over the medium-term. For Marina di Pisa, storms tend to accumulate material towards the upper part of the beach with no shoreline rotation and no chance to recover the initial configuration. Sirolo and Portonovo showed a similar behaviour that is more typical of pocket beaches. Both beaches show shoreline rotation after storms in a clockwise or counter-clockwise direction according to the incoming wave direction. The wider and longer beach at Sirolo allows the accumulation of a thin layer of sediment during storms, rather than at Portonovo where, given its longshore and landward boundaries, the beach material tends to accumulate in greater thickness. After storms, Sirolo

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