



Effect of opening geometry of sand fences on dune formation

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In coastal areas, sand fences are often used to trap sand to initiate dunes to protect the beach or inland structures. Fence deployment and design were often based on empiricism and there is little research on the effect of fence opening geometry on the initiation and development of the newly formed dunes. In this study, we deployed six fences with different geometries but similar porosity (50%), length (10.8m) and height (0.5m) at a flat beach of Pingtan Island, China to examine the effect of opening size, opening orientation, and porosity distribution. Topography of dunes was recorded by erosion pins and a 3D terrestrial scanner. Experimental results show that 1) Normally two dunes are initiated before and after each fence, respectively, and the rear dune has larger size than the front one. 2) Vertical slat fences have the dunes formed closer to the fence than the horizontal slats. 3) Morphology development of the newly formed dunes demonstrate little difference between fences with squared lattice and those with diamond lattice if the openings have the same size. 4) Fences with larger opening size have higher trapping capacity than those with smaller opening size. 4) Fences with decreasing upward porosity have lower trapping capacity than those with increasing upward porosity. This research provides a reference for designing sand fences and also enhances the understanding the coupling effect of fence-dune systems.