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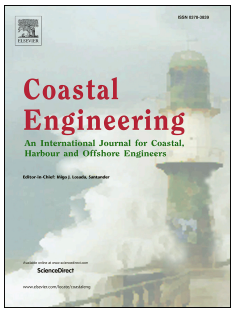

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Experimental investigation of local scour around submerged piles in steady current

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ABSTRACT

Submerged vertical piles are an analogue for a range of subsea structures. In this paper scour around submerged piles with both circular and square cross-section are explored experimentally in steady currents. A wide range of cylinder height to diameter ratio (h/D =0.1-8) is considered for flow intensities spanning clear-water to sheet flow conditions. Results are presented in terms of the equilibrium scour depth and the time-scale of the scour process. For the cross-sectional shapes considered the experimental results indicate that the equilibrium scour depth reduces with aspect ratio when $h/D < \sim 4$, whilst for larger aspect ratio the scour depth is similar to that for an infinitely tall cylinder. The amount of reduction in scour depth with aspect ratio for short piles is found to be dependent on the flow intensity, such that the effects of aspect ratio and flow intensity on scour depth are not separable. With respect to the time-scale, the experiments indicate that for a flow intensity corresponding to live-bed conditions, a maximum time-scale occurs for an intermediate aspect ratio; for aspect ratios below this value the time-scale reduces because the equilibrium scour depth reduces, whilst for larger aspect ratios the time-scale reduces because the local transport rate is increased. Alternatively, in clear-water conditions the time-scale reduces continuously with increasing aspect ratio. Empirical equations are derived based on the experimental results so as to better account for aspect ratio in scour design.

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