Time scale of scour around a pile in combined waves and current

The time scale of the scour process around a circular vertical pile is studied in combined waves and current. A series of tests were carried out in a flume with pile diameters 40 mm and 75 mm, in both steady current, waves and combined waves and current. In the combined wave and current flow regime the waves and the current were co-directional. All the tests were conducted in the live bed regime.

The time scale of scour in combined waves and current is governed by three parameters, namely the current-velocity-to-wave-velocity ratio (\( U_{cw} \)), the Keulegan–Carpenter number (\( KC \)) and Shields parameter (\( \Theta_w \)). The time scale of scour increases significantly when even a slight current is superimposing on a wave. The \( KC \) dependence of the time scale \( T \) is mainly observed for low values of \( U_{cw} \) in the wave dominated regime. For \( U_{cw} \) values larger than 0.4 no clear \( KC \) dependency was observed. The time scale decreases with increasing \( \Theta_w \) over the entire range of \( U_{cw} \).

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