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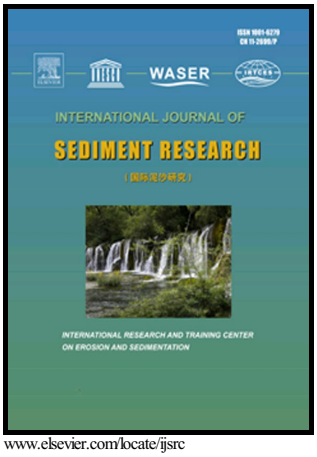

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Influence of reversing currents on the erosion stability and bed degradation of widely graded grain material

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ABSTRACT

Physical model tests were done in a recirculating flume to investigate the overall erosion stability of widely graded bed material in estuarine and coastal conditions by means of simulating tidal flow conditions with reversing currents. As a result of the reversing flow conditions, previously protected sediment eventually became exposed again, leading to bidirectional displacement processes depending on the flow direction. Furthermore, eroded sediment fractions were slightly finer due to flow in the initially applied direction rather than under the subsequently applied flow in the reverse direction. This indicates higher critical shear stresses, and, thus, erosion stability for the initial flow direction. In comparison to the erosional pattern found when subjecting the material to unidirectional currents, this study finds an even higher erosional stability for sediment fractions smaller than the median (d_{50}) diameter of the parent bed material under reversing current conditions. Overall, no significant damage or failure of the bed was observed after subjecting the material to reversing currents, indicating only a small amount of bed degradation, and, thus, high potential for scour and bed protection under the tested flow conditions.

Keywords