

Numerical Modeling of the Flow Separation Zone over Dunes under the Impact of Sediment Injection

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Abstract

Understanding flow behavior over bedforms is one of the most complex topics in sedimentary engineering. Despite numerous studies that have been conducted on river beds, the understanding of the interaction between flow and bed in turbid and clear waters is still impoverished. The present study mainly focused on simulating clear and turbid flows using SSIIM software. This study modeled the flow through a 12-meter channel with nine consecutive dunes of 1-meter length and 4 cm height. Nine simulations were performed to investigate the effects of flow velocity and flow separation zone in clear and turbid water. Finally, the results were compared with the experimental results of previous researchers using the PIV. The modeling results showed that the length of the flow separation zone increases with increasing velocity, and the highest probability of flow separation occurs at the highest velocity. In turbid flow, flow separation is less than the same flow condition in clear flow, and as fluid density increases, the length of the flow separation zone decreases. This study demonstrates the acceptable functionality of the SSIIM software and its accuracy in estimating flow behavior with and without sediment.

Keywords: SSIIM software, Flow separation zone, Dune, Flow with sediment

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