

Velocity Distribution in Density Currents Flowing over Rough Beds

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Abstract : Density currents are generated when the fluid of one density is released into another fluid with a different density. These currents occur in a variety of natural and man-made environments, and this emphasises the importance of studying them. In most practical cases, the density currents flow over the surfaces which are not plane; however, there have been limited investigations in this regard. This study uses laboratory experiments to analyse the influence of bottom roughness on the velocity distribution within these dense underflows. The currents are analysed over a plane surface and three different configurations of beam-roughened beds. The velocity profiles are collected using Acoustic Doppler Velocimetry technique, and the distribution of velocity within these currents is formulated for the tested beds. The results indicate that the empirical power and Gaussian relations can describe the velocity distribution in the inner and outer regions of the profiles, respectively. Moreover, it is found that the bottom roughness is the primary controlling parameter in the inner region.

Keywords : density currents, velocity profiles, Acoustic Doppler Velocimeter, bed roughness

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