Numerical simulation of 2D hydraulic jumps using SPH method

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ABSTRACT

A hydraulic jump that generally occurs in river or spillway is a rapid transition from supercritical to subcritical flow characterized by the development of large-scale turbulence, surface waves, energy dissipation and considerable air entrainment. The hydraulic jump is widely used as energy dissipaters in hydraulic engineering due to the high energy dissipation rate. In this study, a weakly compressible smoothed particle hydrodynamics model (WCSPH) is established to simulate the 2D hydraulic jump in open channel. To test the model, two hydraulic jump cases with different inflow Froude number are simulated. The comparison between numerical conjugate depths in the subcritical section with theoretical results show generally good agreement with theory. In addition, an aeration at the jump toe can be clearly observed in numerical results with only Single-phase flow. It is proved that SPH method has unique advantages dealing with the hydraulic jumps.

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