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Potential application of mesh-free SPH method in turbulent river flows

Ehsan KAZEMI¹, Simon TAIT, Songdong SHAO¹ and Andrew NICHOLS¹

¹ Department of Civil and Structural Engineering, University of Sheffield
Sheffield S1 3JD, UK
e-mail: s.shao@sheffield.ac.uk

ABSTRACT

A comprehensive review has been completed on the simulation of turbulent flow over rough beds using mesh-free particle models. Based on the outcomes of this review an improved Smoothed Particle Hydrodynamics (SPH) method has been developed for open channel flows over a rough bed, in which a mixing length model is used for modeling the 2D turbulence and a drag force equation is proposed for treating the boundary shear. The proposed model was applied to simulate a depth-limited open channel flow over a rough bed surface. The results of the velocity profile and shear stress distribution show a good agreement with the experimental data and existing analytical solutions. This work reveals that in order to correctly model turbulent open channel flow over a rough bed, the treatment of both flow turbulence and bed roughness effect is equally important.