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Modeling Continuous Flow in a Curved Channel Using Smoothed Particle Hydrodynamics

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Abstract : Smoothed particle hydrodynamics (SPH) was originally created to simulate nonaxisymmetric phenomena in astrophysics. However, this method still has several shortcomings, namely the high computational cost required to model values with high resolution and problems with boundary conditions. The difficulty of modeling boundary conditions occurs because the SPH method is influenced by particle deficiency due to the integral of the kernel function being truncated by boundary conditions. This research aims to answer if SPH modeling with a focus on boundary layer interactions and continuous flow can produce quantifiably accurate values with low computational cost. This research will combine algorithms and coding in the main program of meandering river, continuous flow algorithm, and solid-fluid algorithm with the aim of obtaining quantitatively accurate results on solid-fluid interactions with the continuous flow on a meandering channel using the SPH method. This study uses the Fortran programming language for modeling the SPH (Smoothed Particle Hydrodynamics) numerical method; the model is conducted in the form of a U-shaped meandering open channel in 3D, where the channel walls are soil particles and uses a continuous flow with a limited number of particles.

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