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Numerical Simulation of Scouring in Overtopping Dam-break Flow

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Overtopping dam-break flow has great harm to the earthen embankments due to the hydraulic erosion. Some researchers have carried out relevant model experiments, but it is difficult to achieve the experimental conditions for the actual situation. The common numerical simulation is to express the scouring process through the empirical relationship, which obviously could not reflect the real scouring process. In this paper, a new overtopping erosion model using Smoothed Particle Hydrodynamics (SPH) is proposed. When the shear stress on the sediment SPH particle exceeds the critical stress, the erosion process begins. Then, when a sediment SPH particle is completely eroded, it will begin to move and is described as a non-Newtonian fluid. The unincipient sediment particles are treated as boundary. This model is well validated with plane dike-breach experiment, and has also achieved a good agreement with erodible bed dam-break experiment.