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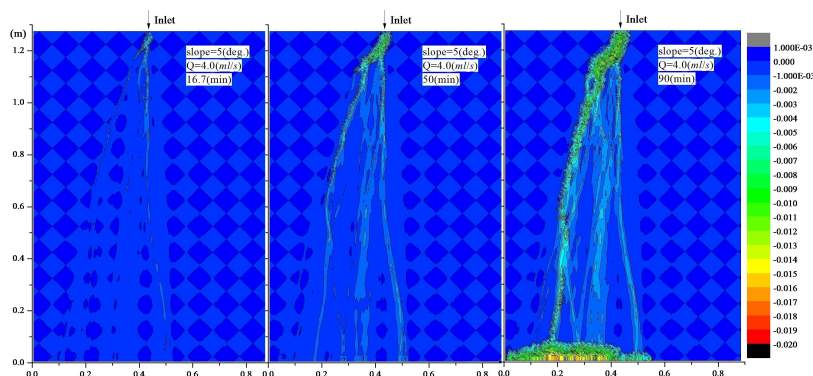
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Geographical evolution analysis using particle method based on shallow-water equation

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This study deals with a simple geographical evolution analysis using a particle method based on the shallow-water equation. Since it is a Lagrangian particle method, mass conservation naturally holds. Particle interaction is simply modeled by a two-body potential that is derived from the water head difference. The bottom shear stress is estimated by the Manning equation. Bed load transportation is modeled by Meyer-Peter-Muller relation with a retardation time. Slope failure due to erosion is also considered in the simulation. The figure shows an example of the simulation. The material is a poorly-graded sand whose diameter is about 0.2(mm). The length, width and the angle of the slope is 1.3(m), 0.8(m) and 5 degrees, respectively. Small surface unevenness is introduced at the initial slope. Water discharge from the inlet at the upstream is set to 4.0(ml/s) in this example. The simulation result shows the frequent jump of the flow channel at the initial stage of the simulation (up to 14 minutes), while the channel is fixed at the later stage (after 50 minutes). The final erosion depth at 90 minutes is about 5 to 20 (mm), which is in good agreement with the experiment.



Keywords: Sediment dynamics, Particle method, Geographical evolution