

Dam-break flows as agents of sediment transport

Matthew Emmett
Math and Stats, University of Alberta
memmett@math.ualberta.ca

Abstract

A “dam-break” flow arises when a large body of fluid is suddenly released onto a horizontal bed by the removal of a retaining wall. When clear water flows over a dry bed and basal resistance (bed friction) is neglected, an exact solution to the equations governing the flow may be obtained on the basis of shallow-water theory. When particle laden water flows over a dry sediment bed and basal resistance is not neglected, an exact solution does not exist and the simple exact solution to the clear water case does not provide a reasonable description of the flow (especially near the front of the flow). In this talk we present dam-break flows as agents of sediment transport. We derive dam-break flow equations which include basal friction and particle concentration in the water which affect the flow dynamics. Particle concentrations in the water are influenced by erosion and deposition of particles caused by the interaction of the flow with the bed. We consider shallow water flows over sediment beds and investigate the effects of basal resistance, sediment deposition, and bed erosion using finite-volume methods to numerically solve the governing equations.