

Date: November 3rd 2006

Time: 11:00 AM

Location: Maryland Hall 110

Speaker: Dr. Mark Schmeeckle
Arizona State University

Title: “Sediment Transport in Tight Spaces”

Abstract

Most physical models of sediment transport in rivers are based on relatively simple conditions in which the bed is relatively flat and bed particles are exposed to a time-averaged, logarithmic velocity profile. However, in many cases of interest, the near-bed, time-averaged flow is small in comparison to turbulent fluctuations. For example, flow through vegetation dramatically increases the turbulent kinetic energy relative to the mean downstream velocity, and much of the transport occurs in the area of flow acceleration around the base of vegetation elements. In the case of sand transport through large immobile cobbles and boulders, as occurs in the Colorado River, mean velocities are small, or sometimes even upstream, in the tight spaces between immobile elements. Entrainment of sand occurs when sweep events in the above-bed turbulence penetrate into the spaces between the immobile elements. A number of high-speed PIV experiments of the turbulent flow field and high-speed video experiments of the sediment transport field will be presented. These experiments directly observe the coupling between turbulence and sediment transport, which will hopefully guide the formulation of new physical and empirical models of sediment transport in rivers with complex bed conditions.