Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Investigation of flow characteristics in the vicinity of a sediment embedded vertical retaining wall NASSER HEYDARI, PANAYIOTIS DIPLAS, Lehigh Univ — Global measurements of turbulent flows at the leading edge a vertical retaining wall were conducted to examine the intricate flow physics behind the local scouring process. Three laboratory setups were considered: one with an immobile, permeable, rough boundary and a fixed channel bank, one with a mobile gravel bed, but a static channel bank, and one with a mobile bed and an erodible bank. The measurements were obtained using stereo particle image velocimetry (SPIV) in a plane perpendicular to the approach flow direction over a granular bed under a clear-water scour condition. Time-averaged flow topology, turbulence statistics, and instantaneous fields associated with the in-plane and out-of-plane velocity components were examined. Investigation of instantaneous streamline topology indicated the intermittent development of vortices within the area under study. It was also demonstrated that, in the presence of a scour hole, streamwise vorticity tends to diffuse along the boundary rather than concentrate close to the wall and bed. Additionally, the results indicated that development of scour hole increases the values of turbulent kinetic energy (TKE) and turbulence intensity near the bed. These, in turn, provide more energy to enhance grain mobility and sustain the transport of sediment particles and consequently deepen the scour hole.

Nasser Heydari
Lehigh Univ

Date submitted: 05 Jul 2017 Electronic form version 1.4