Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

Coupled fluid-sediment model of wave bottom boundary layer JOSEPH CALANTONI, Naval Research Laboratory, DONALD SLINN, University of Florida, TODD HOLLAND, Naval Research Laboratory — The desire to develop predictive models for nearshore bathymetric evolution necessitates a better understanding of the physics of the fluid-sediment wave bottom boundary layer (WBBL). For example, an incomplete description of the effect of fluid-sediment interactions on near bed turbulence hinders our ability to improve parameterized models for both bedload and suspended load transport. We have developed a small-scale model that performs a coupled, direct numerical simulation of both the fluid and sediment in a two-phase WBBL. The fluid phase solves a modified version of the Navier Stokes equation on a fixed grid that accounts for the presence of particles through mass conservation and momentum exchange. The sediment phase is a DEM that resolves the Lagrangian motions of every sediment particle in the simulation domain. Coupling allows preliminary simulations to focus on the role of turbulent suspension in particle saltation dynamics. Direct comparisons between model predictions and existing measurements from a laboratory U-tube for sediment concentration and velocity within the active particle layer will be presented.

Joseph Calantoni
Naval Research Laboratory

Date submitted: 04 Aug 2007 Electronic form version 1.4