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Computational Analysis of Sediment Entrainment in Three Dimensional Channel Flow BENJAMIN YERGEY, MARIA-LAURA BENINATI, Bucknell University, JEFFREY MARSHALL, University of Vermont, JOHN MOUSEL, University of Iowa — A computational method that utilizes an unsteady Reynolds-averaged Navier-Stokes (RANS) code for the fluid phase together with a discrete-element method to simulate the transport of individual sediment particles in natural systems is applied within the near-bed region of a 3D channel flow. The coupling of the methods utilizes the interpolated fluid velocity at each particle and the resulting particle body force for each fluid cell. Sediment entrainment, the act of a fluid medium accelerating particles from within a fluidized bed, is relevant to a better understanding of river and coastal erosion as well as some biological and chemical transport applications. Initial conditions include coherent fluid structures over a bed of packed particles, where the fluid properties represent those of water, and the particle properties represent those of natural sediment. The effect of two-way coupling to particle momentum is quantified. The results and conclusions of this micro-scale study are necessary for further development of models including the effects of shielding on particles at the top of the bed which is essential to the study of sediment entrainment and bed-load transport.

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