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Characterization of Oscillatory Boundary Layer Over a Closely Packed Bed of Sediment Particles[1] JOSEPH SKITKA, SOURABH APTE, Oregon State University — Lack of accurate criteria for onset of incipient motion and sediment pickup function remain two of the biggest hurdles in developing better predictive models for sediment transport. To study pickup and transport of sediment, it is necessary to have a detailed knowledge of the small amplitude oscillatory flow over the sediment layer near the sea bed. Fully resolved direct numerical simulations are performed using fictitious domain approach (Apte et al., JCP 2009) to investigate the effect of a sinusoidally oscillating flow field over a rough wall made of regular hexagonal pack of spherical particles. The flow arrangement is similar to the experimental data of Keiller & Sleath (JFM 1976). Transitional and turbulent flows at $Re_\delta = 50, 100, 150, 200$ (based on the Stokes layer thickness, *delta*) are explored over a range of non-dimensional sphere sizes. The coherent vortex structures, turbulent cross-correlations and lift forces on the roughness elements are characterized for these flow conditions and compared against available data of Keiller & Sleath (JFM 1976) and Sleath (JFM 1986). The dynamics of the oscillatory flow over the sediment bed is used to understand the mechanism of sediment pick-up.

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Joseph Skitka
Oregon State University

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