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**Particle Resolved DNS of Turbulent Oscillatory Flow Over a Layer of Fixed Particles**[1] CHAITANYA GHODKE, Oregon State Univ, JAVIER URZAY, Center for Turbulence Research, Stanford University, SOURABH APTE, Oregon State Univ — Particle resolved direct numerical simulations are performed using fictitious domain approach (Apte et al., JCP 2009) to investigate oscillatory turbulent flow over a layer of fixed particles representative of a sediment layer in coastal environments. Five particle Reynolds numbers in the range, $Re_D = 660 - 4240$ are studied and results are compared against available experimental data (Keiller & Sleath, JFM 1976). Flow is characterized in terms of coherent vortex structures, Reynolds stress variation, turbulent cross-correlations and PDF distributions. The nature of the unsteady hydrodynamic forces on particles and their correlation to sweep and burst events is reported. The net lift coefficient remains positive over the cycle and is well correlated with phase averaged near-bed velocity. Maximum in the lift coefficient occurs when the strength of the horseshoe vortices is maximum. At this phase the lift fluctuations are correlated negatively with pressure and positively with velocity fluctuations in the region above the particle bed. Preliminary analysis shows non-Gaussian distribution for velocity fluctuation and follows 4th order Gram-Charlier. These detailed findings could eventually be useful in improving the existing criterion for predicting sediment incipient motion.

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Chaitanya Ghodke
Oregon State Univ

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