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Particle-turbulence interaction and sediment suspension from ripple beds in oscillatory flow PHILIP KNOWLES, KEN KIGER, University of Maryland, ALBERTO SCOTTI, University of North Carolina — An experimental sediment flume is used to investigate sediment transport mechanics within an oscillatory turbulent boundary layer over a mobile sediment bed in the ripple bed regime. Two-phase PIV is utilized to simultaneously capture data from each phase, allowing examination of suspension mechanisms, carrier phase stresses, and to obtain statistics to describe the momentum exchange between the phases. The technique employs median filtering, as well as size and brightness criteria to separate and accurately identify each phase. Independent well-conditioned tests have been conducted to improve the algorithm to account for the imaging conditions encountered in the vicinity of a mobile bed in order to minimize cross-talk between the phases and allow quantification of the dispersed phase concentration. Results show that large-scale vortical structures are responsible for the majority of sediment suspension from the bed. By examining the fluid stresses, it is found that a larger portion of the momentum transport is contained in the mean flow than in the turbulent fluctuations. Measurements of the conditional slip velocity between the phases show regions of large interfacial momentum transfer between the phases around the dune crests at flow reversal and maximum stream-wise velocity.

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