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**Turbulent Boundary Layers Absent Mean Shear** BLAIR JOHNSON, EDWIN COWEN, Cornell University — In environmental flows, we often observe turbulence levels that far exceed those produced by mean boundary shear (e.g., breaking surface waves), contributing to significant sediment resuspension and turbulent boundary layers that differ strikingly from classic turbulent boundary layer characterizations. We choose to study sediment resuspension in turbulence in the absence of mean shear using a novel laboratory facility that uses a Randomly Actuated Synthetic Jet Array (RASJA), designed to generate homogeneous isotropic turbulence with low mean flows. We use Particle Image Velocimetry (PIV) at both solid glass and sediment boundaries to examine the turbulent structures and nature of the flow at the two bed conditions. The sediment boundary is narrowly graded sand with a median grain size (D50) of 260 microns. Surprisingly, we find that the interaction of turbulence with a sediment boundary results in the formation of ripple patterns, with spacings on the order of the integral length scale. We measure metrics such as the turbulence intensity, turbulent kinetic energy, spectra, and dissipation. Our analysis includes a quadrant-based Reynolds stress analysis and the determination of critical turbulent stresses responsible for sediment resuspension, from which we develop a non-dimensional Shields-like parameter that captures incipient particle motion.

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