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Turbulent Boundary Layers in Absence of Mean Shear BLAIR JOHNSON, EDWIN COWEN, Cornell University — Environmental flows are often observed in which turbulence levels significantly exceed what would be expected from mean boundary shear (e.g. breaking surface waves). This enhanced turbulence produces sediment resuspension and boundary layers that differ greatly from classic turbulent boundary layer characterizations. To identify the contribution of turbulence to such sediment resuspension, experiments are conducted in a facility designed to generate homogeneous isotropic turbulence in absence of mean shear via a Randomly Actuated Synthetic Jet Array (RASJA). Using particle image velocimetry (PIV), boundary layers above both a solid glass bed and a narrowly graded sediment bed are characterized by their mean flows, turbulent kinetic energy, dissipation, spectra, and Reynolds stress. Furthermore, a surprising observation includes the formation of ripple patterns when the turbulence decays above the sediment bed. We hypothesize that the ripples scale with the integral length scale of the turbulence. By varying the percentage of active jets and the relative on- and off-times of jets in the RASJA, our investigations consider the impact of altering the integral length scale of the facility on the resulting turbulent structures and sediment motions observed.

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