

Abstract Submitted
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Manipulating Near-wall Turbulent Boundary Layer by Unsteady Air-films¹ CONG WANG, MORTEZA GHARIB, Caltech — Previously we have demonstrated that wall-attached air-films can be sustained in turbulent boundary layer (TBL) and dynamically modulated by pressure wave. This technique is effective in manipulating the near-wall turbulent shear flow. Here we show that in the presence of modulated air-films, the phase-averaged streamwise velocity demonstrates a Stokes type oscillatory motion. The near-wall viscous shear stress ($\nu \frac{\partial \bar{U}}{\partial y}$) is suppressed and negative Reynolds shear stress ($-\overline{u'v'}$) can be generated in the vicinity of air-films. Through a quadrant analysis, we identify a potential mechanism for the generation of negative Reynolds shear stress.

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