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Deformation of the turbulent/non-turbulent interface by large-scale motions in boundary layers¹ JIN LEE, KAIST, Johns Hopkins University, HYUNG JIN SUNG, KAIST, TAMER A. ZAKI, Johns Hopkins University, Imperial College London — The relationship between large-scale motions (LSMs) and the shape of the turbulent/non-turbulent interface (TNTI) is examined using data from direct numerical simulation (DNS) of turbulent boundary layer (TBL) flow. The Reynolds number based on the momentum thickness and the free-stream velocity ranges from 1180 to 3500. Feature extraction techniques are used to identify cores of the large-scale motions in the perturbation fields. Since turbulence kinetic energy and enstrophy are different inside low- and high-speed LSMs, the wall-normal elevation of TNTI is correlated with the streamwise momentum of these structures. The large-scale crests and troughs of TNTI are matched to the locations of the wall-detached LSMs of low- and high-speed streaks, respectively. In addition, abrupt changes in turbulence statistics across the TNTI reported in previous studies are associated with population trends of the wall-detached LSMs near the TNTI.

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