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Turbulent Spots Inside the Turbulent Boundary Layer JINHIE SKARDA, Center for Turbulence Research, Stanford University, XIAOHUA WU, Royal Military College of Canada, PARVIZ MOIN, ADRIAN LOZANO-DURAN, Center for Turbulence Research, Stanford University, JAMES WALLACE, University of Maryland, JEAN-PIERRE HICKEY, University of Waterloo — We present evidence that the buffer region of the canonical turbulent boundary layer is populated by locally generated turbulent spots, which cause strong indentations on the near-wall low-momentum streaks. This evidence is obtained from a spatially-developing direct numerical simulation carrying the inlet Blasius boundary layer through a bypass transition to the turbulent boundary layer state over a moderate Reynolds number range. The turbulent spots are structurally analogous to their transitional counter-parts but without any direct causality connection. High-pass filtered time-history records are used to calculate the period of turbulent spot detection and this period is compared to the boundary layer bursting period reported in hot-wire experiments. The sensitivity of the results to parameters such as the high pass filter frequency and the amplitude discriminator level is examined. The characteristics of these turbulent spots are also quantified using a spatial connectivity based conditional sampling technique. This evidence seems to be at odds with the notion that the buffer region is dominated by quasi-streamwise vortices, and contributes to the potential unification of the studies on near-wall turbulent boundary layer dynamics.

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