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Development of Turbulent Spots in Bypass Transition KEVIN NOLAN, TAMER ZAKI, Imperial College London — The transition region in a boundary layer experiences sporadic bursts of localized turbulent spots. These spots spread as they are convected, and merge to sustain the turbulent boundary layer downstream. In this work, turbulent spots are identified and tracked from their point of inception in Direct Numerical Simulations (DNS) of bypass transition. The spreading angle, spatial extent and volume are recorded for each turbulent spot. The variation of these parameters is investigated for different pressure gradients. While the spreading angle depends on pressure gradient, the volumetric growth rate is found to be insensitive. The instantaneous structure of the spots is also examined in isolated events and in the ensemble average. The early stage of spot growth comprises a large-scale structure in the form of a streamwise-oriented vortex pair. The ensemble-averaged statistics are computed and demonstrate the important contributions to the turbulent-kinetic-energy budget within the structure of the turbulent patches.

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