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Incipient spots in plane Couette flow BRUNO ECKHARDT, Philipps-Universitaet Marburg, TOBIAS M. SCHNEIDER, Harvard University, DANIEL MARINC, RWTH Aachen — We investigate by direct numerical simulations the transition from laminar to turbulent plane Couette flow in long and wide domains. Previous studies in small domains have established that the boundary between laminar and turbulent is formed by the stable manifold of a persistent structure, called the edge state. Because of the small size of the domain and its periodic continuation in downstream and spanwise directions, this edge state was infinitely extended. Using an adaptation of the edge state tracking algorithm to larger domains we could detect edge states that are localized in the spanwise, in the downstream or in both directions. The structures are dominated by downstream vortices, and they are found to be exponentially localized in the downstream direction, and faster than exponentially in the spanwise direction. The structures serve as nuclei for the formation of spots and provide estimates for optimal widths and intensities. They evolve towards space filling turbulence by first increasing in energy content then by spreading in the surrounding laminar regions.

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