

Abstract Submitted
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Temporal evolution of Townsend's attached eddies¹ ADRIAN LOZANO-DURAN, JAVIER JIMENEZ, Universidad Politecnica de Madrid — The temporal evolution of the eddies responsible for the momentum transfer in a turbulent channel are studied using time-resolved DNS data at $Re_\tau = 4000$. The eddies are identified as connected regions of intense tangential Reynolds stress, and tracked in time. Once their evolutions are properly organized, they provide the necessary information to characterize eddies from birth to death. Eddies are born at all distances from the wall, although with higher probability near it, where the shear is strongest. Most of them stay small and do not last for long times. However, there is a family of eddies that become large enough to get attached to the wall while they reach into the logarithmic layer. They can be considered the best candidates for Townsend's attached eddies found until now. They are geometrically self-similar, with sizes and lifetimes proportional to their distance from the wall. Eddies associated with ejections move away from the wall with $dy/dt = u_\tau$, and their base attaches very fast at the beginning of their lives. Conversely, sweeps move towards the wall at $-u_\tau$, and attach later. In both cases, they remain attached for 2/3 of their lives. In the streamwise direction, eddies are advected and sheared by the local mean velocity.

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