Abstract Submitted
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Three-dimensional structure of momentum transfer in turbulent channels[1] ADRIÁN LOZANO-DURÁN, U. Politecnica de Madrid, ÓSCAR FLORES, U. Carlos III Madrid, JAVIER JIMÉNEZ, U. Politecnica de Madrid — The three-dimensional structures of the intense tangential Reynolds stress in plane turbulent channels (Qs) are studied by quadrant analysis, with emphasis on the logarithmic and outer layers. Wall-detached Qs are isotropically oriented background stress fluctuations, common to most turbulent flows, and do not contribute to the mean stress. Most of the stress is carried by a self-similar family of larger attached Qs, increasingly complex away from the wall, with fractal dimensions $D \approx 2$. They are "sponges of flakes," while vortex clusters are "sponges of strings." Although their number decays away from the wall, the fraction of the stress that they carry is independent of their heights, and a substantial part resides in a few objects extending beyond the centreline, reminiscent of the VLSM of several authors. The predominant logarithmic-layer structures are side-by-side Q4-Q2 pairs of sweeps and ejections, with an associated cluster, with dimensions and stresses similar to Townsend's conjectured attached eddies. They align themselves streamwise, but not strongly enough to explain the very long structures in the channel centre.

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