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Time-resolved evolution of coherent structures in turbulent channels[1] ADRIAN LOZANO-DURAN, Universidad Politecnica de Madrid, JAVIER JIMENEZ, Universidad Politecnica de Madrid, CTR - Stanford University — The temporal evolution of vortex clusters and of the structures responsible for the momentum transfer in turbulent channels at $Re_\tau = 950$, 2000 and 4000 are studied using DNS sequences with temporal separations among fields short enough for individual structures to be tracked. From the geometric intersection of structures in consecutive fields we build temporal connection graphs of all the objects and define main and secondary branches in a way that each branch represents the temporal evolution of one coherent structure. A family of evolutions is found with self-similar sizes and lifetimes that can be born at any height with respect to the wall, although the probability increases close to it. Especial attention is paid to the wall-normal displacement of the structures. Sweeps tend to go towards the wall whereas ejections move away from it. In all the cases, the vertical velocity is close to u_τ and the wall-normal displacement is proportional to the lifetime of the structures and to their sizes. Finally, direct and inverse physical cascades are defined, associated with the process of splitting and merging among structures. The direct cascade predominates, but both directions are roughly comparable.

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