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**Multiscale dynamics of the strain and enstrophy in turbulent channels**[1] ADRIAN LOZANO-DURAN, Technical University of Madrid, MARKUS HOLZNER, ETH Zurich, JAVIER JIMENEZ, Technical University of Madrid — The invariants of the velocity gradient tensor, Q and R, and their enstrophy and strain components are studied in the log-layer of a turbulent channel. The velocities are filtered in the three spatial directions and the results analyzed at different scales. We show that the Q–R plane does not capture the changes undergone by the flow as the filter width increases, and that the enstrophy/enstrophy production and strain/strain-production planes are better choices. We also show that the conditional mean trajectories may differ significantly from the instantaneous behavior of the flow since they are the result of an averaging process where the mean is 3-5 times smaller than the corresponding standard deviation. Our final goal is to test whether the dynamics of the flow are self-similar in the inertial range and the answer turns out to be no. The mean shear is found responsible for the absence of self-similarity and progressively controls the dynamics of the eddies observed as the filter width increases. However, a self-similar behavior emerges when the calculations are repeated for the fluctuating velocity. Finally, the turbulent cascade in terms of vortex stretching is considered by computing the alignment of the vorticity at a given scale with the strain at a larger one.

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