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On the Universality of Local Flow-Field Topologies in Turbulent Flows RISHITA DAS, SHARATH GIRIMAJI, Texas AM Univ — The local flow patterns observed in an incompressible turbulent flow field can be classified into four distinct topology types based on the invariants of the local velocity gradient tensor. We examine statistics of local flow-field topology and key small-scale mechanisms in turbulence fields at different Reynolds numbers and flow types forced isotropic turbulence, decaying isotropic turbulence and homogeneous shear turbulence. Direct numerical simulation (DNS) data are used to examine statistics of dissipation-rate, strain-rate, rotation-rate and their evolution conditioned upon the local flow topology. The dominant mechanisms at each topology are identified. The characteristic length scale of each topology is examined. The contributions of each topology towards the fabric of small-scale turbulence and small-scale universality are investigated.

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