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Geometrical and multi-scale analysis of scalar structures in forced homogeneous turbulence[1] IVAN BERMEJO-MORENO, DALE PULLIN, California Institute of Technology — We present a methodology for the identification and characterization of scalar structures in turbulence consisting of a multi-scale analysis of a turbulence volume data set followed by the eduction of structures of interest and their geometrical characterization. The multi-scale analysis is performed through the curvelet transform (Ying et al, 2005). The eduction of structures is done by isocontouring the volume data sets for different scales. The geometrical characterization is based on the probability density functions of shape index and curvedness (Koenderink, van Door 1992), in terms of area coverage, associated with each structure. This allows a global characterization of the set of structures as well as the study and comparison of relevant groups of structures contained within this set. We present results from the application of this methodology to a turbulence data base obtained from a DNS simulation with 512^3 points in a periodic cube in which a passive scalar is mixed by a forced, turbulent velocity field in the presence of a mean scalar gradient.

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