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Temporal evolution of flow features in isotropic turbulence and shock-turbulence interaction JONAS BUCHMEIER, Univ of Southern California, ALEXANDER BUSSMANN, Technical University of Munich, XIANGYU GAO, IVAN BERMEJO-MORENO, Univ of Southern California — We present a numerical study of the temporal evolution of flow structures in compressible turbulent mixing of passive scalars. To elucidate the effect of shock waves on the geometry of the scalar structures and mixing enhancement, we compare temporally decaying homogeneous isotropic turbulence, and the statistically stationary interaction of a nominally planar shock wave with spatially decaying isotropic turbulence ($Re_\lambda = 40$; $M_t = 0.2$; $M = 1.5, 3.0$). The passive scalar fields are initialized as collections of uniformly spaced spheres and ellipsoids of varying scales, commensurate to the Taylor microscale, λ, of the underlying turbulence. Isosurfaces of the passive scalars and the Q-criterion field are individually tracked in time. We analyze how changes in the evolving geometry relate to changes in physical quantities relevant to mixing, such as the alignments between the scalar gradient, the strain eigendirections and the vorticity, mapped on each isosurface. The interaction between passive scalar structures and the shock increases the scalar gradient magnitude, and hence the scalar dissipation, on the structures and induces an increased number of splitting structures which further enhances the mixing. Larger scalar gradients correlate with flat surface regions

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