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Tracking of flow structures in shock-turbulence interaction JONAS BUCHMEIER, University of Southern California, ALEXANDER BUSSMANN, Technical University of Munich, XIANGYU GAO, IVAN BERMEJO-MORENO, University of Southern California — A tracking algorithm is applied to study the time evolution of flow structures, defined as isosurfaces of a field of interest. Correspondences between structures in consecutive time steps are found in a higher dimensional feature space, which includes a geometric signature of the structures, in addition to their spatial information. To allow for larger tracking steps, constraints are used to reject correspondences based on physical realizability. Accepted correspondences are used to dynamically build a graph describing the evolution and interactions of structures over time. Complex split-merge interactions resulting from large tracking steps are handled based on confidence indicators obtained from the search, physical properties and history of the involved structures. The graph is then queried to retrieve statistical information on the evolution of the structures. The algorithm is applied to a shock-capturing DNS of shock-turbulence interaction ($Re_\lambda = 40$; $M_t = 0.1, 0.4$; $M = 1.5, 3.0$). Passive scalar isosurfaces with well-defined initial shapes and turbulence structures based on the Q criterion are tracked across the shock, analyzing relations between local geometry and physical quantities mapped on the surfaces.

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