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Stretching Fields in Chaotic and Turbulent Fluid Flows GREG VOTH, Wesleyan University — The stretching that fluid elements experience along their trajectories is responsible for many of the dominant features of passive scalar fields (such as an advected dye), passive director fields (such as advected fibers) and the vorticity field. Recent work on passive director fields has shown that fibers are usually aligned with their neighbors by fluid stretching. However, there are also thin walls across which the fiber orientation changes rapidly which we call alignment inversion walls. Experiments in a turbulent flow between oscillating grids and numerical simulations of homogeneous isotropic turbulence are used to explore the mechanism that produces alignment inversion walls in a fractal pattern in chaotic and turbulent flows. The orientation field of fibers provides not only fascinating mathematical structure but also a new way to study the dynamics of the turbulence.

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