Abstract Submitted
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Rotation and Alignment of Rods in Two-Dimensional Chaotic Flow[1] JERRY GOLLUB, JEFFREY GUASTO, MONICA KISHORE, Haverford Coll., SHIMA PARSA MOGHADDAM, GREG VOTH, Wesleyan U., NICHOLAS OUELLETTE, Yale U. — We study the dynamics of rod shaped particles in two-dimensional electromagnetically driven fluid flows. Two separate flows are compared: one with time-periodic flow and the other with non-periodic flow. Video particle tracking is used to make accurate measurements of the motion and orientation of rods along with the carrier fluid velocity field. Measured rod rotation rates are in agreement with predictions for ellipsoidal particles based on the measured velocity gradients at the center of the rods. There is little dependence on length for the rods we studied (up to 53% of the length scale of the forcing). Rods are found to align weakly with the direction of extensional strain. However, the alignment is much stronger with the direction of Lagrangian stretching defined by the eigenvectors of the Cauchy-Green strain tensor. A simple model of the stretching process predicts the degree of alignment of rods with the stretching direction.

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