Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Alignment and rotation of anisotropic particles in complex flows

GREG VOTH, Wesleyan University — Anisotropic particles in fluid flows develop orientational order that strongly affects both particle rotation statistics and rheology of multi-phase flows. We have measured the motion and rotation of non-brownian particles in chaotic and turbulent flows using video particle tracking to reconstruct 3D particle trajectories. The preferential alignment of particles of many different shapes can be understood using a simple picture that considers the stretching a particle has recently experienced. The stretching can be quantified using the Cauchy-Green strain tensors. Particle rotation statistics can be understood as a result of the preferential alignment of fluid vorticity and the particles by stretching. The Cauchy-Green eigenvalue fields have been widely used to identify Lagrangian coherent structures that affect fluid mixing. We show how their eigenvector fields can help understand the complex orientational order that occurs in these flows.

Greg Voth
Wesleyan University

Date submitted: 24 Nov 2015 Electronic form version 1.4