Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Effects of polymers on the spatial structure of turbulent flows MICHAEL SINHUBER, JOSEPH G. BALLOUZ, NICHOLAS T. OUELLETTE, Stanford University — It is well known that the addition of minor amounts of polymers to a turbulent water flow can significantly change its properties. One of the most prominent effects is the observed drastic reduction of drag in wall-bounded flows that is utilized in many engineering applications. Much of the research on polymers in turbulence has focused on their influence on the turbulent energy cascade and their interaction with the energy transfer processes. Much less investigated are their effects on the spatial structure of turbulent flows. In a classical von-Krman swirling flow setup, we used Lagrangian particle tracking to obtain three-dimensional particle trajectories, velocities, and accelerations and find that polymers have a significant effect on Lagrangian measures of the turbulence structure such as radial distribution functions and the curvature of particle trajectories. We find that not only do the statistical distributions change, but also that polymers appear to affect the spatial statistics well beyond the size of the polymers themselves.

Michael Sinhuber
Stanford University

Date submitted: 29 Jul 2017 Electronic form version 1.4