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Elastic Turbulence in Parallel Shear Flows at Low Re[1] BOYANG QIN, PAULO ARRATIA, Univ of Pennsylvania — In this talk, the flow of a viscoelastic fluid is experimentally investigated using particle velocimetry methods in a microfluidic device. The device is a long and straight microchannel that is 100-μm wide and deep; the channel has a short 3-mm region that contains an linear array of cylinders (perturbation region) followed by a 3-cm long and straight region (parallel shear region). We find that, both in the wake of the cylinders and far downstream in the parallel shear region, the flow is excited over a broad range of frequencies and wavelengths. These velocity fluctuations are consistent with the main features that characterize elastic turbulence at low Re. In the wake of the cylinder, we find that the decay in velocity temporal and spatial spectra is approximately -2.7 and -3.0, respectively. These fluctuations persist far downstream in the parallel shear flow region, but with a different power law for the spatial spectrum, -2.0. Our velocimetry measurements indicate that, as the flow moves from the perturbation to the parallel shear region, there is substantial decrease in large length scale fluctuations. Temporally, there is an increase in low frequency fluctuations (and decrease in high frequency velocity fluctuations).

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