

Abstract Submitted
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The behavior of droplet-laden pipe flow at the onset of turbulence¹ KYLE WINTERS, ELLEN LONGMIRE, University of Minnesota — The addition of either dispersed fluid droplets or solid particles to a pipe flow can modify the Reynolds number at which the flow transitions to turbulence, Re_c . For dispersed solid particles, Matas et al. (2003) studied the behavior of Re_c as a function of volume fraction and particle size, and found that for certain regimes particles can promote transition, while for others, transition was delayed to higher values of Re_c . To explore the phenomenon in droplet-laden flows, pressure and PIV measurements are taken in facility comprised of a pump-driven circuit with a 44mm diameter, D , and with an 8.8m (200D) development and test section. Static mixers are placed upstream to generate an even dispersion of silicone oil in a refractive index matched water-glycerin flow. Pressure signals were used to identify transitional structures and trigger a high repetition rate PIV system downstream. Information from the pressure drop traces is used to determine Re_c for various droplet sizes and volume fractions. Additionally, PIV data provide detailed information about velocity variations and the transitional structures in the flow. Pressure and PIV data from droplet laden flow are compared to similar data from single phase flows in our facility and in the literature.

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Kyle Winters
University of Minnesota

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