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Experimental observation of particles in a superfluid counterflow GREGORY P. BEWLEY, Yale University, MATHEW PAOLETTI, DANIEL P. LATHROP, University of Maryland, K.R. SREENIVASAN, International Center for Theoretical Physics — We introduce micron-sized solid hydrogen particles into superfluid helium and demonstrate that they adhere to the cores of quantized vortices. We then observe the particles in a thermal counterflow near 2.1 Kelvin and report several interesting phenomena that depend on the volume fraction of hydrogen in the system. At volume fractions near 10^{-4}, the particles collect onto continuous filaments that form stable networks. At lower volume fractions near 10^{-6}, we observe that individual particles move with two separate types of motion. In the context of the two-fluid model, we attribute one of these motions to particles moving with the normal fluid, and the other to particles confined to move along quantized vortex lines in the superfluid. Although particles are routinely used to reveal the motions of classical fluids, their role in studying flows in superfluid helium must be determined. As is well known, the response of particles to the motions of superfluid helium is often complicated and difficult to interpret, due to the particles' interaction with quantized vortices. In addition, the response of the fluid to the presence of particles is not well understood. We show that in some cases the particles cannot be considered passive tracers of the flow, even when present at low volume fractions.

Gregory P. Bewley
Yale University

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