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Experimental characterization of thermally driven superfluid flow
DANIEL P. LATHROP, MATTHEW S. PAOLETTI, RALPH B. FIORITO, University of Maryland at College Park, KATEPALLI R. SREENIVASAN, International Centre for Theoretical Physics — We characterize the flow of superfluid ^{4}He by analyzing trajectories of solid hydrogen seed particles. A thermal counterflow is driven by heating the bottom of a cylindrical channel filled with superfluid ^{4}He while also cooling the free surface. While all particles feel Stokes drag with the normal fluid, some subset are scattered or trapped by quantized vortices of the superfluid. Particle tracking is used, instead of particle image velocimetry cross-correlations, due to this lack of a single underlying velocity field. We find that upward moving particles show the expected normal fluid velocity for all measured temperatures and heat fluxes. Tracers affected by the quantized vortices move downward, opposing the motions driven by Stokes drag, and exhibit erratic trajectories.

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