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Three Dimensional Motions, Kelvin Waves, and Nanoparticle Tracking in Superfluid Helium DAVID MEICHLE, DANIEL LATHROP, University of Maryland College Park — Liquid Helium becomes a quantum superfluid when cooled below the lambda transition temperature of 2.17 Kelvin. Superfluid helium exhibits interesting macroscopic effects such as zero viscosity; and its flow is irrotational except for the presence of line-like topological phase defects with quantized circulation called quantum vortices. The vortex dynamics can be observed by dispersing tracer particles into the fluid, which become trapped on the vortex cores. Using atmospheric ice particles our group recently observed the excitation and self-similar propagation of helical Kelvin waves on these quantized vortex cores following a vortex reconnection event. This observation of an intrinsically three dimensional phenomenon has motivated the development of a three dimensional imaging apparatus for liquid helium. We will present new data obtained by dispersing fluorescent nanoparticles tracers and our progress towards full three dimensional tracking of quantized vortex dynamics in liquid helium.

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