Abstract Submitted
for the DFD09 Meeting of
The American Physical Society

Elementary vortex processes in thermal superfluid turbulence
DEMOSTHENES KIVOTIDES, LOUISE WILKIN, University of California, Santa Barbara — By solving pertinent mathematical models with numerical and computational methods, we analyze the formation of superfluid vorticity structures in a turbulent normal fluid with an inertial range exhibiting Kolmogorov scaling. We demonstrate that mutual friction forcing causes quantum vortex instabilities whose signature is spiral vortical configurations. The spirals expand until they accidentally meet metastable, intense normal fluid vorticity tubes of similar curvature and vorticity orientation that trap them by driving them towards low mutual friction sites where superfluid bundles are formed. The bundle formation sites are located within the tube cores, but, due to tube curvature and many-tube interaction effects, are displaced by variable distances from the tube centerlines as they follow the contours of the latter. We analyze possible implications of these processes in fully developed thermal superfluid turbulence dynamics.

Demosthenes Kivotides
University of California, Santa Barbara

Date submitted: 31 Jul 2009 Electronic form version 1.4