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Direct Numerical Simulation of Superfluid Turbulence KARLA MORRIS, City College of New York, DAMIAN ROUSON, NRL, JOEL KOPLIK, City College of New York — At low temperatures, as quantum effects become increasingly apparent, helium (He^4) transforms into a superfluid. The motion of superfluid helium (He II) can be decomposed into two interpenetrating components: a superfluid, which is an inviscid liquid comprised of line vortices with quantized circulation, and a normal fluid, which is a gas of elementary thermal excitations. At sufficiently high driving velocities, the motion of He II becomes unstable and makes a transition to turbulence, commonly termed superfluid turbulence or quantum turbulence. A growing body of empirical evidence suggests that the macroscopic statistical behavior of quantum turbulence closely matches that of classical turbulence despite considerable differences in the physics at the mesoscopic and microscopic scales. This paradoxical similarity has been attributed to a phenomenology involving quantum-vortex/normal-vortex locking [1]. Results will be presented from direct numerical simulations (DNS) of superfluid vortices driven by homogeneous normal fluid turbulence. Wavelet transform techniques inspired by Farge et al. [2] will be used to compare the location and alignment of normal fluid vortices with those of the quantum vortices. [1] Stalp S.R et al. (2002) Physics of Fluids, Vol. 14, Number 4 [2] Farge M. et al. (2003) Physics of Fluids, Vol 15, Number 10

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