Abstract Submitted
for the DAMOP16 Meeting of
The American Physical Society

Simple point vortex model for the relaxation of 2D superfluid turbulence in a Bose-Einstein condensate JOON HYUN KIM, WOO JIN KWON, YONG-IL SHIN, Seoul Natl Univ — In a recent experiment [Phys. Rev. A 92, 051601(R) (2015)], it was found that the dissipative evolution of a corotating vortex pair in a trapped Bose-Einstein condensate is well described by a point vortex model with longitudinal friction on the vortex motion and the thermal friction coefficient was determined as a function of sample temperature. In this poster, we present a numerical study on the relaxation of 2D superfluid turbulence based on the dissipative point vortex model. We consider a homogeneous system in a cylindrical trap having randomly distributed vortices and implement the vortex-antivortex pair annihilation by removing a pair when its separation becomes smaller than a certain threshold value. We characterize the relaxation of the turbulent vortex states with the decay time required for the vortex number to be reduced to a quarter of initial number. We find the vortex decay time is inversely proportional to the thermal friction coefficient. In particular, we observe the decay times obtained from this work show good quantitative agreement with the experimental results in [Phys. Rev. A 90, 063627 (2014)], indicating that in spite of its simplicity, the point vortex model reasonably captures the physics in the relaxation dynamics of the real system.

Joon Hyun Kim
Seoul Natl Univ

Date submitted: 28 Jan 2016 Electronic form version 1.4