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Relaxation of Two-dimensional Turbulent Superflow and Vortex Pair Annihilation GEOL MOON, WOO JIN KWON, JAE-YOON CHOI, YONG-IL SHIN, School of Physics, Seoul National University, Seoul 151-747, Korea — We study relaxation dynamics of two-dimensional turbulent superflow in highly oblate Bose-Einstein condensates. Turbulent superflow is generated by moving a Gaussian repulsive laser beam in a trapped condensate and the relaxation dynamics is characterized by measuring the temporal evolution of the vortex number in the condensate. We observe non-exponential decay behavior of the vortex number. The initial fast decay is attributed to the vortex-anti-vortex pair annihilation at high vortex density, and furthermore, the vortex pair annihilation is directly demonstrated by observing a crescent-shape, density-depleted region in the condensate. We quantitatively investigate the pair annihilation rate for various sample conditions and present a simple model to explain our experimental results.

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