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**Experiments with Non-Equilibrium Co- and Counter-circulating Vortices** MICHAEL RAY, EMINE ALTUNTAŞ, THOMAS LANGIN, DAVID HALL, Amherst College — We present an experimental study of real-time dynamics of small clusters of vortices in a trapped Bose-Einstein condensate. These dynamics have been typically understood in terms of vortex-vortex interactions and interactions between each vortex and the condensate background. We demonstrate that thermal atoms can also play an important role, and a rotating thermal cloud can be used in conjunction with established techniques to create and manipulate vortex clusters. The effect of co- and counter-rotating a thermal cloud is to move the vortices in towards or away from the center of the condensate, respectively. With this technique different configurations of vortices in the cluster can be readily achieved.

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