Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Magnus Force in Discrete and Continuous Two-Dimensional Superfluids ZOLTAN GECSE, SERGEI KHLEBNIKOV, Department of Physics, Purdue University — Motion of vortices in two-dimensional superfluids is studied by solving the Gross-Pitaevsky equation numerically on a uniform grid. Simulations show that in the limit of small lattice spacing, corresponding to a nearly Galilean-invariant case, vortices move with the superflow, while on coarse grids their motion depends on the orientation of the superflow relative to the grid. In particular, when the superflow is parallel to one of the primitive vectors of the grid, vortices in the coarse limit move perpendicular to the superflow. Thus, in this case, we observe a crossover from the full Magnus force in a Galilean-invariant system to a sharply reduced effective Magnus force in a discrete system. The latter regime corresponds to existing experiments on vortex motion in Josephson junction arrays.

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Date submitted: 30 Nov 2004 Electronic form version 1.4