A Generalized 4th-Order Runge-Kutta Method for the Gross-Pitaevskii Equation MARTIN KANDES, San Diego State University — We present the implementation of a method-of-lines approach for numerically approximating solutions of the time-dependent Gross-Pitaevksii equation in non-uniformly rotating reference frames. Implemented in parallel using a hybrid MPI + OpenMP framework, which will allow for scalable, high-resolution numerical simulations, we utilize an explicit, generalized 4th-order Runge-Kutta time-integration scheme with 2nd- and 4th-order central differences to approximate the spatial derivatives in the equation. The principal objective of this project is to model the effect(s) of inertial forces on quantized vortices within weakly-interacting dilute atomic gas Bose-Einstein condensates in the mean-field limit of the Gross-Pitaevskii equation. Here, we discuss our work-to-date and preliminary results.

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