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dynamics of nearly-parallel vortex filaments in the Gross-Pitaevskii equations

We study the motion of thin, nearly parallel vortex filaments in 3d solutions of the Gross-Pitaevskii equations. In particular, we show that in a certain scaling limit, these filaments are governed by a system of nonlinear Schrödinger equations formally derived by Klein, Majda, and Damodaran in the mid '90s in the context of the Euler equations. This is the first rigorous justification of the Klein-Majda-Damodaran model in any setting. This is joint work with Didier Smets.