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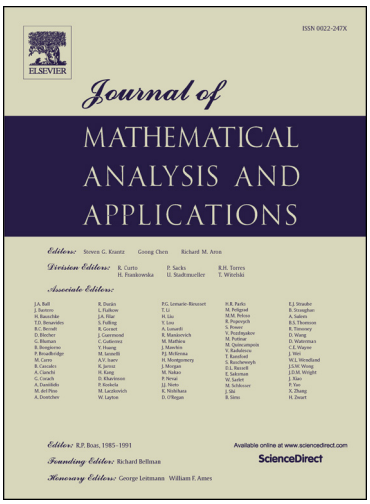

Finite time blow-up and global existence for the nonlocal complex Ginzburg-Landau equation

Xiaoliang Li, Baiyu Liu

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Finite time blow-up and global existence for the nonlocal complex Ginzburg-Landau equation[☆]

Xiaoliang Li[a], Baiyu Liu[b,*]

[a] *School of Mathematics and Physics, University of Science and Technology Beijing*
[b] *School of Mathematics and Physics, University of Science and Technology Beijing*

Abstract

In this paper, we consider the Cauchy problem for a family of nonlocal complex Ginzburg-Landau equation

$$e^{-i\theta}u_t = \Delta u + \left(\frac{1}{|x|^{n-\alpha}} * |u|^p\right)|u|^{p-2}u - \lambda u$$

on $\mathbb{R}^n$, where $-\pi/2 < \theta < \pi/2$ and $\lambda \in \mathbb{R}$. First, the local well-posedness in Lebesgue spaces is established by a fixed point argument. Then we set up the H^2 regularity and derive the energy identities. By constructing some invariant sets, we further find some sufficient conditions on finite time blow-up and global existence for solutions which in particular determines a sharp threshold of initial date when $\lambda > 0$. In addition, we estimate the lifespan of solutions as a function of θ and obtain the lower bound of the maximal existence time for $\lambda \in \mathbb{R}$.

Keywords:
nonlocal complex Ginzburg-Landau equation, global existence, finite time blow-up, blow-up time
2010 MSC: 35Q56, 47J35

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[*]Corresponding author
Email address: liubymath@gmail.com, liuby@ustb.edu.cn (Baiyu Liu)

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