

Complex Ginzburg-Landau equations with dynamic boundary conditions¹

Türker ÖZSARI

IN COLLABORATION WITH W.J. CORRÊA

The initial-dynamic boundary value problem (idbvp) for the complex Ginzburg-Landau equation (CGLE) on bounded domains of \mathbb{R}^N is studied by converting the given mathematical model into a Wentzell initial-boundary value problem (ibvp). First, the corresponding linear homogeneous idbvp is considered. Secondly, the forced linear idbvp with both interior and boundary forcings is studied. Then, the nonlinear idbvp with Lipschitz nonlinearity in the interior and monotone nonlinearity on the boundary is analyzed. The local well-posedness of the idbvp for the CGLE with power type nonlinearities is obtained via a contraction mapping argument. Global well-posedness for strong solutions is shown. Global existence and uniqueness of weak solutions are proven. Smoothing effect of the corresponding evolution operator is proved. This helps to get better well-posedness results than the known results on idbvp for nonlinear Schrödinger equations (NLS). An interesting result is proving that solutions of NLS subject to dynamic boundary conditions can be obtained as inviscid limits of the solutions of the CGLE subject to same type of boundary conditions. Finally, long time behaviour of solutions is characterized and exponential decay rates are obtained at the energy level by using control theoretic tools.

¹Türker Özsan's research was supported by TÜBİTAK 3501 Career Grant 115F055