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Non-uniqueness for the complex Ginzburg–Landau equation

We show that singularities of the three-dimensional cubic complex Ginzburg–Landau equation developing from smooth initial data can induce non-uniqueness of solutions after the time of blowup. The solutions we study start as backward self-similar solutions, and the source of the non-uniqueness is an unstable eigenvalue of the linearization around the forward self-similar profile generated by the singularity. Using a computer-assisted proof, we rigorously establish the existence of this unstable eigenvalue for specific parameter values in the equation. The work is in part motivated by similarities to the Navier–Stokes equations, with which the complex Ginzburg–Landau equation shares key features such as scaling symmetry and an energy inequality, where recent breakthroughs on finite-time blowup from smooth initial data make the question of post-blowup non-uniqueness highly relevant.