

COMPRESSIBLE FLUIDS AND SINGULARITY FORMATION IN SUPERCRITICAL DEFOCUSING SCHRÖDINGER EQUATIONS

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We will discuss recent work with F. Merle, P. Raphael and J. Szeftel, where we studied the problem of global regularity for a defocusing supercritical Schrödinger equation. The corresponding problem had been settled in the affirmative in a long series of works in the sub-critical and energy critical cases and was conjectured by J. Bourgain to have a similar positive answer in the supercritical case. We construct a set of smooth, nicely decaying initial data for which the corresponding solutions blow up in finite time with a highly oscillatory behavior near singularity. The construction proceeds by establishing a link between the Schrödinger and the compressible Euler equations. It also leads to new singularity results for the compressible Euler and Navier–Stokes equations.