Self-similar collapsing solutions in the generalized Constantin-Lax-Majda Equation with Dissipation

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We consider the generalized Constantin-Lax-Majda equation with dissipation

$$\omega_t = -au\omega_x + \omega\mathcal{H}\omega - \nu\Lambda^\sigma(\omega)\,, \quad u_x = \mathcal{H}\omega\,,$$

where $\widehat{\Lambda^\sigma} = |k|^\sigma$, for $\sigma = 2$, and study self-similar collapsing solutions near $a = 0$ and $a = 0.386....$ The self-similar scalings change as parameter a approaches 0 from the right and it crosses the value $a = a_d = 0.386...$, where the dissipation term becomes subdominant compared to the nonlinear terms.