

Asymptotic Analysis of Radial Point Rupture Solutions for Elliptic Equations

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Assume a region $\Omega \subset \mathbb{R}^2$, and consider the general elliptic equation

$$\Delta u = f(u)$$

Where f is a positive continuous function satisfying

$$\lim_{u \rightarrow 0^+} f(u) = \infty.$$

Motivated by the thin film equations, a solution u is said to be a point rupture solution if for some $p \in \Omega$, $u(p) = 0$ and $u(p) > 0$ in $\Omega \setminus \{p\}$. We are interested in the asymptotic behavior of radial solutions. Our main goal is to understand the dependence of the limiting profile of radial solutions u and their associated energies versus their prescribed volume.