Keady, Grant

A semilinear elliptic boundary-value problem describing small patches of vorticity in an otherwise irrotational flow. (English) Zbl 0568.35040

Nonlinear analysis, Miniconf. Canberra/Aust. 1984, Proc. Cent. Math. Anal. Aust. Natl. Univ. 8, 123-132 (1984).

[For the entire collection see Zbl 0552.00008.]

Let Ω be a bounded convex domain in R^2 and the boundary $\partial\Omega$ of class C^2 has the curvature bounded away from zero. The problem

$$(P) \quad -\Delta\psi \in \lambda H(\psi - k) \quad in \quad \Omega, \quad \psi = 0 \quad on \quad \partial\Omega$$

is considered, H being the set-valued Heaviside stepfunction ($H(t) = 0$ if $t < 0$, $H(0) = [0, 1]$ and $H(t) = 1$ for $t > 0$). let (λ_n, k_n, ψ_n) be a sequence of the positive solutions of the problem (P) such that area of $\{ x \in \Omega : \psi_n(x) > k_n\}$ tends to zero. Then $(\sup_{x\in\Omega} \psi_n(x) - k_n)/k_n \to 0$.

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MSC:

35J65 Nonlinear boundary value problems for linear elliptic equations
35R05 PDEs with low regular coefficients and/or low regular data
35B40 Asymptotic behavior of solutions to PDEs
35J25 Boundary value problems for second-order elliptic equations

Keywords:

semilinear elliptic boundary-value problem; small patches of vorticity; irrotational flow; maximum principles; discontinuous elliptic equation; asymptotic estimate