

BLOW-UP FOR A SEMILINEAR PARABOLIC EQUATION WITH LARGE DIFFUSION ON \mathbf{R}^N

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We consider the Cauchy problem for a semilinear heat equation,

$$\begin{cases} \partial_t u = D\Delta u + |u|^{p-1}u, & x \in \mathbf{R}^N, t > 0, \\ u(x, 0) = \lambda + \varphi(x), & x \in \mathbf{R}^N, \end{cases}$$

where $D > 0$, $p > 1$, $N \geq 3$, $\lambda > 0$, and

$$\varphi \in L^\infty(\mathbf{R}^N) \cap L^1(\mathbf{R}^N, (1 + |x|^K)dx)$$

for some $K > 2$. In this paper we study the blow-up time and the location of the blow-up set of the solution as $D \rightarrow \infty$. In particular, we prove that, if D is sufficiently large, then the location of the blow-up set depends on the large time behavior of the solutions of the heat equation. This is a joint work with Yohei Fujishima (Tohoku University, Japan).