Accepted Manuscript

Blow-up phenomena for a nonlinear pseudo-parabolic equation with nonlocal source

Qunfei Long, Jianqing Chen

PII: S0893-9659(17)30208-2
DOI: http://dx.doi.org/10.1016/j.aml.2017.06.006
Reference: AML 5281

To appear in: *Applied Mathematics Letters*

Received date : 8 May 2017
Revised date : 10 June 2017
Accepted date : 10 June 2017

Please cite this article as: Q. Long, J. Chen, Blow-up phenomena for a nonlinear pseudo-parabolic equation with nonlocal source, Appl. Math. Lett. (2017), http://dx.doi.org/10.1016/j.aml.2017.06.006

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

ACCEPTED MANUSCRIPT

*Manuscript
Click here to view linked References

Blow-up phenomena for a nonlinear pseudo-parabolic equation with nonlocal source

Qunfei Long and Jianqing Chen

Department of Mathematics & FJKLMAA, Fujian Normal University, Fuzhou, 350117, P. R. China

Abstract

We discuss a class of quasi-linear pseudo-parabolic equation with nonlocal source

$$u_t - \Delta u_t - \nabla\cdot\left(|\nabla u|^{2q}\nabla u\right) = u^p(x,t)\int_\Omega k(x,y)u^{p+1}(y,t)dy \quad x,y\in\Omega, t\in(0,T_0],$$

where $q \le p$ and $0 < q < \frac{n-2}{2}$. By establishing the criterions for blow-up, we determine the upper bounds for blow-up time under not only $q < p$ and non-positive initial energy but also $q = p$ and negative initial energy. The results shown that the upper bound for blow-up time under $q < p$ is different from it under $q = p$. Moreover, we also determine the lower bound for blow-up time.

Keywords: Pseudo-parabolic equation, Bounds, Blow up, Nonlocal source

2010 MSC: 35K44, 35K70

1. Introductions

The aim of this paper is to investigate the bounds for blow-up time on the Cauchy problem

$$u_t - \Delta u_t - \nabla\cdot\left(|\nabla u|^{2q}\nabla u\right) = u^p(x,t)\int_\Omega k(x,y)u^{p+1}(y,t)dy, \quad x,y\in\Omega, t\in(0,T_0), \tag{1.1}$$

$$u = 0, \quad x\in\partial\Omega, t\in(0,T_0), \tag{1.2}$$

$$u(x,0) = u_0 \ge 0, \quad x\in\Omega. \tag{1.3}$$

where Ω is a bounded domain with sufficiently smooth boundary $\partial\Omega$ in $\mathbb{R}^n$ $(n \ge 3)$, $0 < q < \frac{n-2}{2}$, $q \le p \le \frac{2}{n-2}$, T_0 is the bow-up time if blow-up does occur, or else $T_0 = \infty$ and $k(x,y)$ is an integrable and real valued function which satisfies

$$\begin{aligned} &k(x,y) = k(y,x), \int_\Omega\int_\Omega k^2(x,y)dxdy < +\infty, \\ &\int_\Omega\int_\Omega k(x,y)u^{p+1}(x,t)u^{p+1}(y,t)dxdy > 0. \end{aligned} \tag{1.4}$$

The pseudo-parabolic equations describes a variety of important physical and biological phenomena, for example, the aggregation of population [6], the unidirectional propagation of nonlinear dispersive long waves [7].

*Corresponding author
Email address: qflongfjnu@126.com (Qunfei Long and Jianqing Chen)

Download English Version:

https://daneshyari.com/en/article/5471558

Download Persian Version:

https://daneshyari.com/article/5471558

Daneshyari.com