



Communications in Partial Differential Equations >

Volume 35, 2010 - [Issue 8](#)

289 Views | 23 CrossRef citations to date | 0 Altmetric

Original Articles

Decay Properties for the Damped Wave Equation with Space Dependent Potential and Absorbed Semilinear Term

Kenji Nishihara

Pages 1402-1418 | Received 16 Dec 2008, Accepted 08 Mar 2010, Published online: 07 Jul 2010

Cite this article <https://doi.org/10.1080/03605302.2010.490285>

Sample our
Mathematics & Statistics
Journals
>> [Sign in here](#) to start your access
to the latest two volumes for 14 days

Full Article

Figures & data

References

Citations

Metrics

Reprints & Permissions

Read this article

Share

Abstract

We consider the Cauchy problem for the damped wave equation with space dependent potential $V(x)u_t$ and absorbed semilinear term $|u|^{p-1}u$ in \mathbb{R}^N . Our assumption on $V(x) \sim (1 + |x|^2)^{-\alpha/2}$ ($0 \leq \alpha < 1$) still implies the diffusion phenomena and the decay rates of solutions are expected to be the same as the corresponding parabolic problem. In this paper we obtain two kinds of decay rates of the solution effective for $p > p_c(N, \alpha) = 1 + 2/(N - \alpha)$ and for $p < p_c(N, \alpha)$. We believe that in the “supercritical” exponent the decay rates obtained are almost the same as those for the linear parabolic problem, while, in the “subcritical” exponent the solution decays faster than that of linear equation, thanks to the absorbed semilinear term. So we believe that $p_c(N, \alpha)$ is a

critical exponent. Note that $\rho_c(N, \alpha)$ with $\alpha = 0$ coincides to the Fujita exponent $\rho_F(N) := 1 + \frac{2}{N}$.

Keywords:

- Absorbed semilinear term
- Damped wave equation
- Space dependent potential

Mathematics Subject Classification:

- 35L05
- 35L70
- 37L15

Acknowledgments

The author would like to thank Professor Grozdена Todorova so much for her comments and advice on the original version of this manuscript. This work was supported in part by Grant-in-Aid for Scientific Research (C) 20540219 of Japan Society for the Promotion of Science.

Related research

- People also read
- Recommended articles
- Cited by
23

Information for

[Authors](#)

[R&D professionals](#)

[Editors](#)

[Librarians](#)

[Societies](#)

Opportunities

[Reprints and e-prints](#)

[Advertising solutions](#)

[Accelerated publication](#)

[Corporate access solutions](#)

Open access

[Overview](#)

[Open journals](#)

[Open Select](#)

[Dove Medical Press](#)

[F1000Research](#)

Help and information

[Help and contact](#)

[Newsroom](#)

[All journals](#)

[Books](#)

Keep up to date

Register to receive personalised research and resources by email



Sign me up



Copyright © 2025 Informa UK Limited [Privacy policy](#) [Cookies](#) [Terms & conditions](#)

[Accessibility](#)

 Taylor and Francis Group

Registered in England & Wales No. 01072954
5 Howick Place | London | SW1P 1WG