Differential
Equations
& Applications
Volume 3, Number 2 (2011), 299–308

LARGE TIME BEHAVIOR OF SOLUTIONS FOR THE GENERALIZED KADOMTSEV–PETVIASHVILI EQUATION

TOMOYUKI NIIZATO

Abstract. We consider the Cauchy problem for the generalized Kadomtsev-Petviashvili (KP) equation

$$\begin{cases} u_t + u_{xxx} + \sigma\partial_x^{-1}u_{yy} = -(u^\rho)_x, & (x,y) \in \mathbb{R}^2,\ t \in \mathbb{R}, \\ u(0,x,y) = u_0(x,y), & (x,y) \in \mathbb{R}^2, \end{cases}$$

where $\sigma = 1$ or $\sigma = -1$, $\partial_x^{-1} = \int_{-\infty}^{x} dx'$. Hayashi-Naumkin-Saut [2] have shown asymptotics of solutions for KP equation when $\rho \geqslant 3$ and the initial data is sufficiently small and regular. Our aim is to fill the gap of the proof of $\mathbf{L}^\infty$ time decay of small solutions obtained in [2] and improve their result on the regularity of the data.

Mathematics subject classification (2010): 35Q53.
Keywords and phrases: Kadomtsev-Petviashvili equation, scattering problem.

REFERENCES

[1] A. FRIEDMAN, Partial Differential Equations. New York: Holt-Rinehart and Winston, 1969.
[2] N. HAYASHI, P. I. NAUMKIN, AND J. C. SAUT, *Asymptotics for large time of global solutions to the generalized Kadomtsev-Petviashvili Equation*, Commun. Math. Phys., **201** (1999), 577–590.
[3] P. ISAZA, J. MEJIA AND V. STALLBOHM, *Local solution for the Kadomtsev-Petviashvili equation in* $\mathbb{R}^2$, J. Math. Anal. and Appl., **196** (1995), 566–587.
[4] B. B. KADMOTSEV AND V. I. PETVIASHVILI, *On the stability of solitary waves in weakly dispersive media*, Soviet Phys. Dokl., **15** (1970), 539–541.
[5] S. KLAINERMAN AND G. PONCE, *Global, small amplitude solutions to nonlinear evolution equations,* Commun. Pure Appl. Math., **36** (1983), 133–141.
[6] J. C. SAUT, *Remarks on the generalized Kadomtsev-Petviashvili equations*, Indiana Univ. Math. J., **42** (1993), 1011–1026.
[7] J. C. SAUT, *Recent results on the generalized Kadomtsev-Petviashvili equations,* Acta Applicandae Mathemticae, **39** (1995), 477–487.
[8] J. SHATAH, *Global existence of small solutions to nonlinear evolution equations,* J. Differential Equations, **46** (1982), 409–425.
[9] W. A. STRAUSS, *Nonlinear scattering theory at low energy,* J. Funct. Anal., **41** (1981), 110–133.
[10] S. K. TURISYN AND G. E. FAL'KOVITCH, *Stability of magnetoelastic solutions and self-focusing of sound in antiferromagnet*, Soviet Phys. JETP, **62** (1985), 146–152.

Paper DEA-03-18