THE ADMB–KDV EQUATION IN ANISOTROPIC SOBOLEV SPACES

Amin Esfahani

Abstract. Considered herein is the anisotropic dissipation-modified Boussinesq-KdV equation which is a two-dimensional version of the KdV equation. It is established that the Cauchy problem associated to this equation is locally well-posed in anisotropic Sobolev spaces $H^{s_1,s_2}(\mathbb{R}^2)$, for all $s_1 > -1/2$ and $s_2 \geqslant 0$. A global existence result for this equation will be obtained under suitable conditions.

REFERENCES

[1] N. AKHMEDIEV, A. ANKIEWICZ, *Dissipative Soliton*, in: Lecture Notes in Physics **661**, Springer Verlag, Berlin, Heidelberg, 2005.

[2] A. B. AL'SHIN, M. O. KORPUSOV, A. G. SVESHNIKOV, *Blow-up in nonlinear Sobolev type equations*, De Gruyter Ser. Nonlinear Anal. Appl. **15**, Walter de Gruyter & Co., Berlin, 2011.

[3] J. ANGULO, *Nonlinear dispersive equations. Existence and stability of solitary and periodic travelling wave solutions*, Math. Surveys Monogr. **156**, Amer. Math. Soc., Providence, RI, 2009.

[4] H. BAHOURI, J.-Y. CHEMIN, R. DANCHIN, *Fourier Analysis and Nonlinear Partial Differential Equations*, Grundlehren der mathematischen Wissenschaften **243**, Springer, 2011.

[5] D. E. BAR, A. A. NEPOMNYASHCHY, *Stability of periodic waves generated by long-wavelength instabilities in isotropic and anisotropic systems*, Physica D, **132** (1999), 411–427.

[6] J. L. BONA, W. G. PRITCHARD, L. R. SCOTT, *An evaluation of a model equation for water waves*, Philos. Trans. Royal Soc. London Series A, **302** (1981), 457–510.

[7] J. BOURGAIN, *Fourier transform restriction phenomena for certain lattice subsets and application to nonlinear evolution equations I. Schrödinger equations*, GAFA, **3** (1993), 107–156.

[8] J. BOURGAIN, *Fourier transform restriction phenomena for certain lattice subsets and application to nonlinear evolution equations II. The KdV equation*, GAFA, **3** (1993), 209–262.

[9] J. BOURGAIN, *On the Cauchy problem for the Kadomtsev-Petviashvili equation*, GAFA, **3** (1993), 315–341.

[10] J. BOURGAIN, W.-M. WANG, *in Mathematical Aspects of Nonlinear Dispersive Equations*, edited by J. Bourgain, C. E. Kenig, and S. Klainerman (Princeton University Press, Princeton, NJ, 2007.

[11] W. CHEN, J. LI, *On the low regularity of the modified Korteweg-de Vries equation with a dissipative term*, J. Differential Equations, **240** (2007), 125–144.

[12] B. I. COHEN, J. A. KROMMES, W .M. TANG, M. N. ROSENBLUTH, *Nonlinear saturation of the dissipative trapped-ion mode by mode coupling*, Nuclear Fusion, **16** (1976), 971–992.

[13] J. COLLIANDER, G. STAFFILANI, H. TAKAOKA, *Global well-posedness of the previous KdV below L^2*, Math. Res. Lett., **6** (1999), 755–778.

[14] D. B. DIX, *Large-Time Behavior of Solutions of Linear Dispersive Equations*, in: Lecture Notes in Mathematics **1668**, Springer-Verlag, Berlin, 1997.

[15] A. ESFAHANI, *The Cauchy problem for the dissipation-modified Kadomtsev-Petviashvili equation*, J. Math. Anal. Appl., **390** (2012), 439–455.

[16] J. HAMMACK, H. SEGUR, *The Kortweg-de Vries equation and water waves. II. Comparison with experiments*, J. Fluid Mech., **65** (1974), 289–313.

[17] J. HAN, L. PENG, *The well posedness of the dissipative Korteweg-de Vries equations with low regularity data*, Nonlinear Analysis, **69** (2008), 171–188.

[18] N. HAYASHI, E. I. KAIKINA, P. I. NAUMKIN, I. A. SHISHMAREV, *Asymptotics for Dissipative Nonlinear Equations*, Lecture Notes in Mathematics **1884**, Springer-Verlag, 2006.

[19] C. E. KENIG, G. PONCE, L. VEGA, *A bilinear estimate with applications to the KdV*, J. Amer. Math. Soc., **9** (1996), 573–603.

[20] C. E. KENIG, G. PONCE, L. VEGA, *Quadratic forms for the* 1*-D semilinear Schrödinger equation*, Trans. Amer. Math. Soc., **348** (1996), 3323–3353.

[21] F. LINARES, G. PONCE, *Introduction to nonlinear dispersive equations*, Springer, 2009.

[22] L. MOLINET, F. RIBAUD, *The Cauchy problem for dissipative Korteweg-de Vries equations in Sobolev spaces of negative order*, Indiana Univ. Math. J., **50** (2001), 1745–1776.

[23] L. MOLINET, F. RIBAUD, *The global Cauchy problem in Bourgain's type spaces for a dispersive dissipative semilinear equation*, SIAM J. Math. Anal., **33** (2002), 1269–1296.

[24] L. MOLINET, F. RIBAUD, *On the low regularity of the Korteweg-de Vries-Burgers equation*, Int. Math. Res. Not., **37** (2002), 1979–2005.

[25] M. OTANI, *Well-posedness of the generalized Benjamin-Ono-Burgers equations in Sobolev spaces of negative order*, Osaka J. Math., **43** (2006), 935–965.

[26] P. L. SACHDEV, C. S. RAO, *Large time asymptotics for solutions of nonlinear partial differential equations*, Springer Monographs in Mathematics, Springer, New York, 2010.

[27] T. TAO, *Nonlinear Dispersive Equations: Local and Global Analysis*, in: CBMS Regional Conference Series in Mathematics, 2006.

[28] J. TOPPER, T. KAWAHARA, *Approximate equations for long nonlinear waves on a viscous fluid*, J. Phys. Soc. Japan, **44** (1978), 663–666.

[29] S. K. TURITSYN, J. J. RASMUSSEN, M. A. RAADU, *Stability of weak double layers*, Royal Institute of Technology, Stockholm, TRITA-EPP-91 -01, 1991.

[30] N. J. ZABUSKY, C. GALVIN, *Shallow-water waves, the Korteweg-de Vries equation and solitons*, J. Fluid Mech., **47** (1971), 811–824.

[31] E. ZAUDERER, *Partial Differential Equations of Applied Mathematics*, 33rd ed., John Wiley & Sons, Inc., New York, 2006.

Differential Equations & Applications
www.ele-math.com
dea@ele-math.com