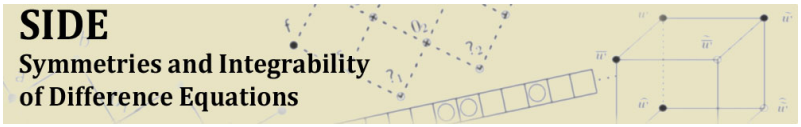
SIDE 14.2



Contribution ID : 64

The theory of periodic anomalous (rogue) waves in continuous and discrete NLS type equations

Wednesday 21 Jun 2023 at 09:15 (00h30')

Content :

Modulation instability and nonlinearity are the main causes of the appearance of anomalous (rogue) waves (AWs) in several physical contexts. The theory of periodic anomalous waves has been recently developed on the basic Nonlinear Schrödinger (NLS) model in 1+1 dimensions, adapting the finite gap method to the Cauchy problem for periodic initial perturbations of the homogeneous background solution of NLS [1]. This theory allows one to express the solution of the Cauchy problem, to leading order, in terms of elementary functions of the unstable part of the initial data, and has already been tested in the nonlinear optics of a photorefractive crystal [2]. Also a perturbation theory of AWs allowing one to study the leading order effects of small perturbations of the NLS equation on the dynamics of AWs has been constructed [3]. In this lecture we develop a lattice theory of AWs using as basic model the Ablowitz-Ladik lattice, integrable discretization of the NLS equation [4], [5].

[1] P. G. Grinevich and P. M. Santini: ``The finite-gap method and the periodic NLS Cauchy problem of anomalous waves for a finite number of unstable modes'', Russian Math. Surveys {\bf 74:2} 211-263 (2019). DOI:10.1070/RM9863.
[2] D. Pierangeli, M. Flammini, L. Zhang, G. Marcucci, A. J. Agranat, P. G. Grinevich, P. M. Santini, C. Conti, and E. DelRe, ``Observation of exact Fermi-Pasta-Ulam-Tsingou recurrence and its exact dynamics'', Phys. Rev. X {\bf 8}, 041017 (2018). doi.org/10.1103/ PhysRevX.8.041017.
[3] F. Coppini, P. G. Grinevich and P. M. Santini: ``The effect of a small loss or gain in the periodic NLS anomalous wave dynamics. I'', Phys. Rev. E {\bf 101}, 032204 (2020). DOI: 10.1103/PhysRevE.101.032204. arXiv:1910.13176.
[4] F. Coppini and P. M. Santini: ``Modulation instability, periodic anomalous wave recurrence, and blow up in the Ablowitz - Ladik lattices''. Preprint 2023.
[5] F. Coppini and P. M. Santini: ``The effect of loss/gain and hamiltonian perturbations of the Ablowitz - Ladik lattice on the recurrence of periodic anomalous waves''. Preprint 2023.

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Session classification : Non-linear waves

Track classification : --not yet classified--

Type : --not specified--