Geophysical Research Abstracts
Vol. 21, EGU2019-17208-4, 2019
EGU General Assembly 2019

Strongly interacting soliton gas

Andrey Gelash (1,2) and Dmitry Agafontsev (3)

(1) Novosibirsk State University, Novosibirsk, Russia (agelash@gmail.com), (2) Institute of Thermophysics, SB RAS, Novosibirsk, 630090, Russia, (3) P.P. Shirshov Institute of Oceanology, RAS, Moscow, Russia (Dmitry.Agafontsev@gmail.com)

We suggest new approach to construct soliton gas of high spatial density or, in other words, strongly interacting soliton gas [1]. To model such gas we use N-soliton solutions (N-SS) of the NLS equation with N$\sim$100, which we generate using specific implementation of the dressing method combined with 100-digits arithmetics. To our knowledge, multisoliton solutions containing so many solitons were not generated by anyone else before. This allows us to study both uniform (after evolution of the N-SS in a periodic numerical box) and localized in space soliton gas. We examine the major statistical characteristics of the strongly interacting soliton gas, in particular the kinetic and potential energies, the kurtosis, the wave-action spectrum and the probability density function of wave field intensity. Rogue waves emerging in the soliton gas are multisoliton collisions, and yet some of them have spatial profiles very similar to those of the Peregrine solutions of different orders. We present example of three-soliton collision, for which even the temporal behaviour of the maximal amplitude is very well approximated by the Peregrine solution of the second order.

The work was supported by RFBR Research Project No. 16-31-60086 mol_a_dk.

[1] A.A. Gelash and D.S. Agafontsev, Strongly interacting soliton gas and formation of rogue waves. PRE, 98, 042210, 2018.