Geophysical Research Abstracts
Vol. 16, EGU2014-612, 2014
EGU General Assembly 2014

Freak waves at the surface of deep water

Dmitriy Kachulin (1), Alexander Dyachenko (1,2), Vladimir Zakharov (1,2,3)

(1) Novosibirsk State University, Novosibirsk, Russia, (2) Landau Institute for Theoretical Physics, Moscow, Russia, (3) Department of Mathematics, University of Arizona, Tucson, USA

In the paper ([1]) authors applied canonical transformation to water wave equation not only to remove cubic nonlinear terms but to simplify drastically fourth order terms in Hamiltonian. After the transformation well-known but cumbersome Zakharov equation is drastically simplified and can be written in X-space in compact way. This new equation is very suitable for analytic study as well as for numerical simulation. At the same time one of the important issues concerning this system is the question of its integrability. The first part of the work is devoted to numerical and analytical study of the integrability of the equation obtained in ([1]). In the second part we present generalization of the improved Zakharov equation for the "almost" 2-D water waves at the surface of deep water. When considering waves slightly inhomogeneous in transverse direction, one can think in the spirit of Kadomtsev-Petviashvili equation for Korteveg-de-Vries equation taking into account weak transverse diffraction. Equation can be written instead of classical variables $\eta(x, y, t)$ and $\psi(x, y, t)$ in terms of canonical normal variable $b(x, y, t)$. This equation is very suitable for robust numerical simulation. Due to specific structure of nonlinearity in the Hamiltonian the equation can be effectively solved on the computer. It was applied for simulation of sea surface waving including freak waves appearing.

References

[1] A.I. Dyachenko and V.E. Zakharov, Europ. J. Mech. B **32**, 17 (2012)