Geophysical Research Abstracts
Vol. 18, EGU2016-2231, 2016
EGU General Assembly 2016

Deceleration of the small solitons in the soliton lattice: KdV-type framework

Ekaterina Shurgalina (1), Konstantin Gorshkov (1), Tatiana Talipova (1,2), Efim Pelinovsky (1,2)

(1) Applied Physics Institute, Department of Nonlinear Geophysical Processes, Nizhny Novgorod, Russian Federation, (2) Alekseev Nizhny Novgorod State Technical University, Nizhny Novgorod, Russia

As it is known the solitary waves (solitons) in the KdV-systems move with speed which exceeds the speed of propagation of long linear waves (sound speed). Due to interaction between them, solitons do not lose their individuality (elastic interaction). Binary interaction of neigborough solitons is the major contribution in the dynamics of soliton gas. Taking into account the integrability of the classic and modified Korteweg-de Vries equations the process of the soliton interaction can be analyzed in the framework of the rigorous analytical two-soliton solutions. Main physical conclusion from this solution is the phase shift which is positive for large solitons and negative for small solitons. This fact influences the average velocity of individual soliton in the soliton lattice or soliton gas. We demonstrate that soliton of relative small amplitude moves in soliton gas in average in opposite (negative) direction, meanwhile a free soliton moves always in the right direction. Approximated analytical theory is created for the soliton motion in the periodic lattice of big solitons of the same amplitudes, and the critical amplitude of the small soliton changed its averaged speed is found. Numerical simulation is conducted for a statistical assembly of solitons with random amplitudes and phases. The application of developed theory to the long surface and internal waves is discussed.