Geophysical Research Abstracts
Vol. 21, EGU2019-7562, 2019
EGU General Assembly 2019

Nonlinear Airy wave pulses on the sea surface

Igor Shugan (1), Sergei Kuznetsov (2), Yana Saprykina (3), and Yang–Yih Chen (4)

(1) National Sun Yat-Sen University Kaoshiung, Taiwan, P.P.Shirshov Institute of Oceanology of Russian Academy of Sciences Moscow, Russia (ishugan@rambler.ru), (2) P.P.Shirshov Institute of Oceanology of Russian Academy of Sciences Moscow, Russia (kuznetsov@ocean.ru), (3) P.P.Shirshov Institute of Oceanology of Russian Academy of Sciences Moscow, Russia (saprykina@ocean.ru), (4) National Sun Yat-Sen University Kaoshiung, Taiwan (yichen@mail.nsysu.edu.tw)

The possibility of self-acceleration of the water-wave pulse with a constant envelope in the form of the nonlinear Airy function during its propagation in deep and intermediate water is experimentally and theoretically analyzed. This wave packet has amazing properties - accelerates without any external force, and preserves shape in a dispersive medium. The inverted Airy envelope wave function can propagate at a velocity that is faster than the group velocity. We experimentally study the behavior of Airy water-wave pulses in a super-tank and long scaled propagation, to investigate its main properties, nonlinear effects and stability. Theoretical modeling analysis is based on nonlinear Schrodinger equation. The following problems are investigated: - Defining the scope of applicability, feasibility and stability conditions of nonlinear Airy wave trains in a deep water conditions. - Defining regimes of self-acceleration and self-deceleration of the main pulse, immutability shape of Airy envelope. - Assessing the impact of nonlinearity on the propagation of Airy waves. We analyzed the influence of the initial pulse characteristics on self-acceleration (deceleration) of wave packet and the stability of the envelope form. The anticipated results allow extending the physical understanding of the evolution of nonlinear dispersive waves in a wide range of initial conditions and at different spatial and temporal scales, from both theoretical and experimental points of view.