Geophysical Research Abstracts
Vol. 19, EGU2017-2980, 2017
EGU General Assembly 2017

Modulational instability of weakly nonlinear long waves: High-order Korteweg-de Vries framework

Efim Pelinovsky (1,2,3) and Elena Tobisch (4)

(1) Applied Physics Institute, Department of Nonlinear Geophysical Processes, Nizhny Novgorod, Russian Federation (pelinovsky@hydro.appl.sci-nnov.ru), (2) Nizhny Novgorod State Technical University n.a. R.E. Alekseev, Nizhny Novgorod, Russia, (3) National Research University – Higher School of Economics, Moscow, Russia, (4) Johannes Kepler University, Linz, Austria

Modulational instability of the weakly nonlinear wavetrains is a very important mechanism of the rogue wave formation. Meanwhile, surface shallow-water waves described by the canonic Korteweg-de Vries equation are modulational stable. Internal shallow-water waves described by the modified Korteweg-de Vries equation can be modulational unstable for certain oceanographic stratifications. Here we study the effect of modulational instability in the framework of the high-order Korteweg-de Vries equation, contained the derivative from $u\hat{}\{2n+1\}$ in the nonlinear term (n is integer). First of all, the structure of the weakly nonlinear travelling wave and its dispersion relation is investigated in weakly nonlinear approximation. The second one, the high-order nonlinear Schrodinger equation for weakly modulated weakly nonlinear waves is derived. It is shown that this equation has focused type if signs of nonlinear and dispersive terms in Korteweg-de Vries-type equation are the same. Such wavetrains will be modulational unstable. The problem of instability of periodic and solitary wave solutions of the high-order Korteweg-de Vries equation is discussed.