Geophysical Research Abstracts
Vol. 15, EGU2013-3818, 2013
EGU General Assembly 2013

Super rogue waves in weakly and fully nonlinear simulations

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The rogue wave solutions of the nonlinear Schrodinger equation (NLS) are tested in numerical simulations of weakly nonlinear and fully nonlinear hydrodynamic equations. Only the lowest order solutions from 1 to 5 are considered.
A higher accuracy of wave propagation in space is reached using the modified NLS equation (MNLS) also known as the Dysthe equation. This numerical modelling
allowed us to directly compare simulations with recent results of laboratory measurements in Chabchoub et al [1]. In order to achieve even higher physical accuracy, we employed fully nonlinear simulations of potential Euler equations.
These simulations provided us with basic characteristics of long time evolution of rational solutions of the NLS equation in the case of near breaking conditions. The analytic NLS solutions are found to describe the actual wave dynamics of steep waves reasonably well.

[1] A. Chabchoub, N. Hoffmann, M. Onorato, A. Slunyaev, A. Sergeeva, E. Pelinovsky, and N. Akhmediev, Observation of a hierarchy of up to fifth-order rogue waves in a water tank. Phys. Rev. E 86, 056601 (2012).