Rogue Internal Waves in the Ocean

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Huge internal waves in the ocean are very often observed in the various areas of the World Ocean; their heights can reach 50 -100 meters. The model of rogue internal waves is based on the Gardner equation which is the extended Korteweg-de Vries equation included both quadratic and cubic terms. This equation is derived for long waves of main mode in continuously stratified ocean on density and shear flow. The quadratic nonlinear term can have either sign depending from the pycnocline location. The positive cubic term which is positive often for waves on the shelves and leads to modulational instability of internal wave groups and generation of large-amplitude breathers. Numerical simulation in the framework of the Gardner equation performed for narrow-band wave packets (number of satellites up to 21). Increasing of wave amplitude and number of satellites results to the almost chaotic generation of large-amplitude (rogue) waves appeared for short time. Its shape can be as solitary-like or "three sisters". The maximal amplification can exceed three times.