

Shallow Rogue Waves: Observations, Laboratory Experiments, Theories and Modelling

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Rogue waves in the ocean are now a part of marine natural hazards. They are among waves naturally observed by people on the sea surface that represent inseparable feature of the Ocean. Rogue waves appear from nowhere, cause danger and disappear at once. They may occur at the surface of a relatively calm sea, reach not very high amplitudes, but be fatal for ships and crew due to their unexpectedness and abnormal features. Catalogue of rogue waves for 2005-2010 is presented. The serious studies of the phenomenon started about 20–30 years ago and have been intensified during the recent decade. The research is being conducted in different fields: in physics (search of physical mechanisms and adequate models of wave enhancement and statistics), in geoscience (determining the regions and weather conditions when rogue waves are most probable), and in ocean and coastal engineering (estimations of the wave loads on fixed and drifting floating structures). Thus, scientists and engineers specializing in different subject areas are involved in the solution of the problem. The state-of-art of the rogue wave study is presented in given review. Two approaches to the rogue wave description (deterministic and statistical) are presented. Briefly, the physical mechanisms that have been already suggested as possible explanations of the freak wave phenomenon are: i) wave-current interaction; ii) geometrical (spatial) focusing; iii) focusing due to dispersion (spatio-temporal focusing); iv) focusing due to modulational instability; v) soliton collision; vi) atmospheric action. Main attention is paid to the coastal freak waves and their modeling in the framework of the nonlinear shallow-water equations and variable-coefficient Korteweg-de Vries equation.

Recent publications of author's team are given bellow.

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