Rogue wave modeling: Approximate vs fully nonlinear wave simulations

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The paper reports on authors' recent achievements on the rogue wave studies (see references below). Different scenarios of extreme wave occurrence and dynamics are discussed. The wave modeling is performed within the approximate models (envelope equations), and strongly and fully nonlinear approaches. Unidirectional and directional waves are considered. Relations between the envelopes, determined within different frameworks, and physical wave fields are examined. The major attention is paid to the comparison of the results provided by the approximate (envelope) approaches and by the simulation of primitive Euler equations, and also laboratory data. The numerical simulation and envelope approaches are employed for the in-situ rogue event reconstruction. Apart from the dynamics, statistical aspects of extreme waves are discussed. The rogue wave statistics is obtained through the stochastic wave simulations. Rogue wave kinematics (dynamical and probabilistic aspects) is discussed as well.

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