



Probability of occurrence of rogue waves

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A number of extreme wave studies have been conducted theoretically, numerically, experimentally and based on the field data in the last years, which has significantly advanced our knowledge of ocean waves. It has been demonstrated that the contribution from higher-order and fully nonlinear solutions, compared with the second order wave models may be significant. Several new wave records including extreme waves have been collected in the field and in laboratories allowing verification of wave model predictions. The Rogue Waves 2008 Workshop in Brest organized by Ifremer October 13-15, 2008 has contributed to further increase in our knowledge about extreme and rogue waves and suggested some directions for future research. <http://www.ifremer.fr/web-com/stw2008/rw/>. However, so far, consensus about the probability of occurrence of rogue waves has not been reached. The present study is addressing this topic from the perspective of design needs. Probability of occurrence of extreme crest is discussed based on higher order time domain simulations of wave surface, experiments and field data from the North Sea. Numerical simulations are carried out by solving the equations with the Higher Order Spectral Method in West et al. (1987) with a third order expansion of the vertical velocity at the surface so that only effects related to modulational instability are included. The JONSWAP spectrum is used in the analysis. The results are compared with the second order theory predictions. The discussion includes extreme wave crest determined by direct extrapolation of the long- term crest distribution and an extreme sea state condition. Uncertainties related to the analysis are identified and ranked.