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Evolution of statistics of weakly nonlinear unidirectional waves over a sloping bottom in shallow water

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Using a Boussinesq model with improved linear dispersion, we show numerical evidence that bottom non uniformity can provoke significantly increased probability of freak waves as a wave field propagates into shallower water, in good agreement with recent experimental results (Trulsen *et al.*, 2012). Increased values of skewness, kurtosis and probability of freak waves can be found on the shallower side of a bottom slope, with a maximum close to the end of the slope. The increased probability of freak waves typically remain some distance after the slope ends, before it decreases and reaches a stable value depending on the depth. Maxima of the statistical properties are observed both in the case where there is a new region of constant depth after the slope, and in the case where the uphill slope is immediately followed by a downhill slope. In the case that waves propagate over a slope from shallower to deeper depth, however, we do not find any increase in freak wave occurrence.

TRULSEN, K., ZENG, H. & GRAMSTAD, O. 2012 Laboratory evidence of freak waves provoked by non-uniform bathymetry. *Phys. Fluids* **24**, 097101.