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Evolution of 2D steep random gravity wave groups: numerical simulations based on laboratory measurements. Temporal and spatial approaches

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Extensive numerical simulations emulating laboratory experiments by Shemer and Sergeeva (2008) have been performed using Dysthe equation (spatial and temporal versions) and fully nonlinear algorithms for Euler equations. The numerical results of steep wave groups are verified by the laboratory measurements; the simulations enable extending the limits of the laboratory experiments. Both spatial and temporal approaches are considered. The study is mainly focused on the evaluation of statistical properties of irregular waves with initially Gaussian spectrum with different energies. In particular, good agreement between the Dysthe model and the fully nonlinear simulations is obtained for not too steep narrow-banded waves; trends for steeper waves are also established.

Shemer, L., and Sergeeva A. 2008 An experimental study of spatial evolution of statistical parameters in a unidirectional narrow-banded random wave field. JGR – Oceans.