



Long-crested and short-crested waves of the three-dimensional fully-nonlinear potential wave fields

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Occurrence of freak waves on deep water depends on the short-crestedness of the surface wave field. There are two contributions with different physics involved in the formation of the short-crested waves: superposition of linear long-crested waves and lateral modulation, which is a nonlinear phenomenon. This study investigates three-dimensional fully-nonlinear potential deep water waves whose initial spectrum is assumed to be of JONSWAP type with directional distribution given by $(\cos \theta)^n$, where n is the integer in the range from 1 to 16. The analysis is based on the results of long-term wave simulations performed using a numerical scheme based on solving a full three-dimensional potential equation. Statistics of the short-crested wave fields obtained is compared with the analysis of linear superposition of sinusoidal waves with identical directional spectra.