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Behavior of coherent groups in three-dimensional fully-nonlinear potential wave fields

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We investigate the appearance of coherent groups in three-dimensional fully-nonlinear potential deep water waves computed in the course of long-term numerical simulations based on the three-dimensional Laplace equation for the velocity potential subject to nonlinear kinematic and dynamic boundary conditions at the free surface. The initial wave spectrum is assumed to be of the JONSWAP type with directional distribution given by $\cos^n \theta$, where n is the integer varying from 1 to 16. The statistics of wave groups propagating in the directions forming angle θ, $45^\circ \leq \theta \leq 45^\circ$ with the main wave propagation direction are presented. The average value of the velocity v_g of the detected groups is found to be independent of the direction of their propagation. The average value of the maximum wave height in the groups normalized with the significant wave height for the wave field is found to decrease with the increase of n. The results show that the extreme waves are more likely to propagate in the main wave direction and to be observed in the fields with wider initial spectra.