Geophysical Research Abstracts
Vol. 19, EGU2017-4305, 2017
EGU General Assembly 2017

Interactions of surface envelope solitons with a vertical wall and among each other

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The investigation of dynamics of intense solitary wave groups of collinear surface waves is performed by means of numerical simulations of the Euler equations and laboratory experiments. The processes of solitary wave generation, reflection from a wall and collisions are considered. Steep solitary wave groups with characteristic steepness up to $kA_{cr} \approx 0.3$ (where k is the dominant wavenumber, and A_{cr} is the crest amplitude) are concerned. They approximately restore the structure after all the considered interactions. In the course of the interaction with the wall and collisions the maximum amplitude of the wave crests is shown to enhance up to 2.5 times. A standing-wave-like structure occurs in the vicinity of the wall, with certain locations of nodes and antinodes regardless the particular phase of the reflecting wave group. A strong asymmetry of the maximal wave groups due to an anomalous set-up is shown in situations of collisions of solitons with different frequencies of the carrier. In some situations of head-on collisions the amplitude of the highest wave is larger than in over-head collisions of the same solitons. The discovered effects in interactions of intense wave groups are important in the context of mechanisms and manifestations of oceanic rogue waves.

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