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Sea storm with ice cake investigation

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The dangerous phenomenon - the sea storm with ice cakes (SSIC) can be generated in the areas covered with marginal ice due to impact of stormy sea waves. In such cases the ice floe can be trapped by waves propagating with the velocity equal to the wave phase speed, which value is larger than fluid particle velocity caused by waves. Such an “ice ram” is very dangerous both for ships and hydraulic structures. Nowadays there is no grounded model of such phenomenon, that is why it is difficult to estimate the ice impact on structures and to forecast sea storm with ice cakes.

Different types of ice floe motions are investigated depending on the ice and wave parameters. The cases of linear, limited Stokes and cnoidal waves are considered. The necessary conditions of ice floe trapping such as initial ice speed and friction coefficient are determined. It is shown that it is more probable for waves the culture ice floes in shallow water coastal area than in deep water as soon as the waves becomes steeper there. The estimations of momentum and kinetic energy of trapped ice and its blow impact on a vertical wall are obtained.

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