

Modeling of Floating Body Movements due to Tsunami Waves, Using SPH Method

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Abstract

The propagation of tsunami waves at oceans and their impact on coastal areas have become more important for researchers following recent years terrible tsunamis. Nevertheless, the behavior and movement of floating bodies under tsunami waves have less been studied yet; Therefore, here it has been evaluated and simulated, using SPH numerical method.

As the source of tsunami and its generation cannot be simulated in the SPH model, so in the study the "solitary wave" is considered as the representative wave for tsunami; Because previous studies have revealed that solitary wave can reproduce the characteristics of tsunami wave at propagation and run-up stages well. In order to generate of solitary wave in SPH model, a piston type wave maker paddle has been applied which its movement is calculated using presented mathematical relations.

Different scenarios were defined and modeled for impact of tsunami wave on floating bodies; The simulation results shows the behavior of floating bodies is extremely changes if tsunami wave breaks or don't breaks before it impacts on them ;

If tsunami touch the floating body after breaking, the horizontal movement of body will be more than non-breaking impact; Because the floating body is carried by the current caused by wave breaking. But in contrast, the vertical movement of body will decrease when tsunami wave breaks before impact on it, because of reduction of tsunami wave height due to breaking. The results also shows, as predicted, the floating bodies displacement is directly related to tsunami wave height and higher tsunamis displace floating bodies more.

Keywords

Floating bodies, Tsunami waves, SPH Method, Numerical Simulation, Solitary wave.