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Estimation of water-induced impact force during Tsunami by a stabilized SPH simulation

ASAI, Mitsuteru

***Keywords*:** *SPH simulation, Stabilization, Turbulence model, Digital map*

SUMMARY

The Tohoku (-Pacific Ocean) Earthquake on Mar11 in 2011 generated huge Tsunami and critical damages on structures in the coastal areas had been occurred. In addition, global warming of earth makes the scale of flood disaster large. The rational design of the coast structure, like breakwaters against for Tsunami and/or storm surge, is strongly required for safety life in coastal areas. The amount of water-induced impact force acting on structures should be preciously evaluated. Numerical simulation, which can evaluate flood area and its water induced impact force during the flood disaster, are strongly required.

In this study, a stabilized Smoothed Particle Hydrodynamics for incompressible flow (ISPH) is utilized for this purpose. At first, water-induced impact pressure during a 3D dam break problem is validated by comparing with an experimental data shown in Fig.1. A new source term in the pressure Poisson equation and traditional turbulence model called by Smagorinsky model has been introduced in the ISPH to achieve accurate pressure distribution. After the improvements, the same simulation technique is applied to a tsunami simulation in Fukuoka, Japan. The inputted geometry is modeled from the numerical MAP, and texture mapping on the geometrical surface is used to generate a realistic animation as shown in Fig.2.

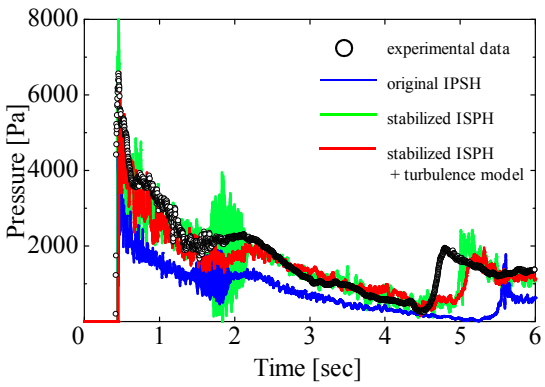

Fig.1 Pressure prediction and with an experimental data.

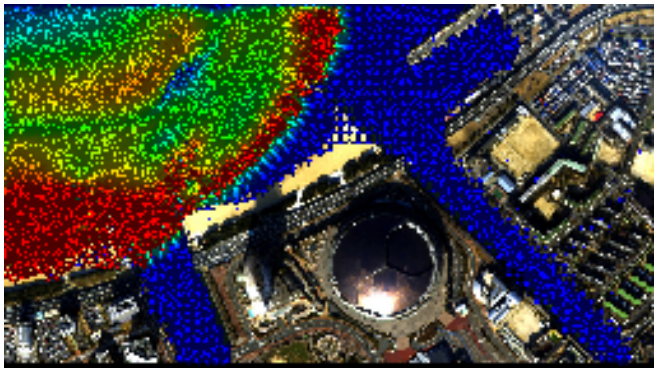

Fig.2 Tsunami simulation in Fukuoka