Multi-scale and –physics tsunami disaster simulation for disaster prevention and mitigation

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ABSTRACT

On March 11, 2011, the huge tsunami caused by the great east Japan earthquake devastated many infrastructures in pacific coast of north eastern Japan. Particularly, the damage of outflow of bridge girders caused a traffic disorder and these collapse behaviours led to delay of recovery after the disaster. After 2011 tsunami, disaster prevention and mitigation techniques are actively developing in coastal infrastructures and establishing prediction method for tsunami disaster is one of the severe issues toward the next millennium tsunami.

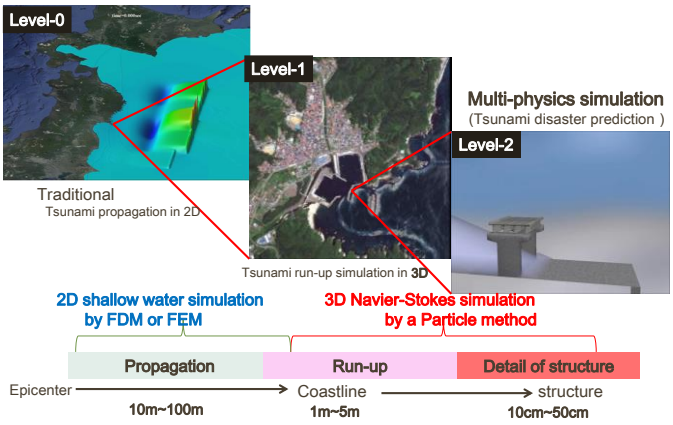

Fig.1 Multi-level tsunami simulator

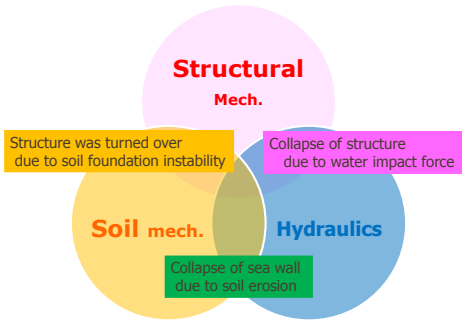

Fig.2 Multi-physics tsunami problems

In our study, a multi -level and –physics tsunami simulator based on the Smoothed Particle Hydrodynamics (SPH) Method (Gingold et al.[1]) has been developed. The concept is summarized in Fig.1. The last level (Level-2) can treat multi-physics problem shown in Fig.2, and the simulator can predict bridge wash out accidents during tsunami by using one of the modules of multi-physics simulation. Recently, SPH is widely used in field of fluid and solid dynamics, and a stabilized ISPH (Asai et al.[2]) has been developing to treat the coupling behaviour among structure-fluid-soil mechanics. Each level can be connected by a proposed virtual wave maker [3]. The performance and efficiency of our developed multi-scale and –physics tsunami disaster simulation tool is given by a couple of numerical examples.

REFERENCES

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