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Current status and issues of Tsunami simulation by HPC

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The Great East Japan Earthquake of 2011 has shown that a tsunami disaster is not limited to inundation damage in a specified region, but destruction over a wide area can cause a severe disaster. Because various structures stand on the land, in order to evaluate damage to these structures, it is necessary to perform highly precise evaluations of three-dimensional fluid motion. But the calculation cost of high precision three-dimensional fluid analysis is very high. So the goals of this research were to develop a method of coupling STOC (Tomita et al., 2005) and CADMAS-SURF/3D (Arikawa et al., 2005) to establish a method of efficiently calculating every stage from wave source to runup, and to verify its applicability.

Summing up shows that in order to improve overall calculation speed, as long as this method is adopted, the calculation domain of STOC-ML is as small as possible and CS3D is as large as possible, and it is important the number of calculation nodes be increased to the level eliminating synchronicity standby state.

Under this condition, calculation time is about 2s/step, and if the mesh is 1m wide, the time interval is an average of about 0.004s/step, so in order to calculate integration time of 1s, about 500s are necessary.

The coupling simulator with structure analysis is also shown. The breakwater under tsunami overflow was reproduced.

Finally, the issues of the future tsunami simulation will be discussed.

Keywords: Tsunami simulation, High performance computing, Tsunami, Coupling simulation