Large-scale parallel realistic tsunami analysis with floating objects on Ishinomaki city using hierarchical domain decomposition explicit MPS method

*Kohei MUROTANI¹, Seiichi KOSHIZUKA¹, Kazuya SHIBATA¹, Tasuku TAMAI¹, Naoto MITSUME¹, Shinobu YOSHIMURA¹, Satoshi TANAKA², Kyoko HASEGAWA², and Toshimitsu FUJISAWA³

¹Department of Systems Innovation, School of Engineering, the University of Tokyo, 7-3-1 Hongo Bunkyo-ku Tokyo 113-8656, Japan
²Department of Media Technology, Ritsumeikan University, 1-1-1 Noji-higashi, Kusatsu Shiga 525-8577, Japan
³Prometech Software, Inc., 7-3-1 Hongo Bunkyo-ku Tokyo 113-0033, Japan

*Corresponding author: muro@sys.t.u-tokyo.ac.jp

In this research, a new distributed memory parallel algorithm of the explicit MPS (Moving Particle Simulation) method is presented. An analysis region is divided for a distributed memory parallel computation using ParMETIS. As a result, we have been able to run the MPS analysis of 20 billion particles using 4,800 nodes by the Fujitsu PRIMEHPC FX10 System (Oakleaf-FX) of the University of Tokyo. In the performance, we have achieved 7.25% of the peak performance by 4,800 nodes and 79.48 speed-up from 60 nodes to 4,800 nodes. A large-scale three-dimensional simulation of the tsunami run-up with floating objects that occurred during the Great East Japan Earthquake was carried out on FX10 of the University of Tokyo and CX400 of Kyushu University.

Keywords: MPS method, Large scale parallel computing, Floating object, Tsunami