Tsunami inundation simulation by GPU computing and its application to tsunami forecast

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Numerical simulation is effective approach together with stable observation for tsunami forecast, however inundation simulation usually requires high computational cost. We are developing a numerical simulation code by the Compute Unified Device Architecture (CUDA) programming to conduct tsunami propagation and inundation simulation using a Graphics Processing Unit (GPU). The simulation code was optimized on TSUBAME3.0 operated by the Tokyo Institute of Technology. It takes two hours to compute 6 hours of tsunami for the tsunami inundation database of the forecast system developed by the NIED (e.g. Aoi et al. 2015JpGU). The computation area of 1600km by 3000km was represented by ununiformed grid applying nesting method and the minimum grid size was 10 m to compute inundation. We estimated the computational cost of the GPU and CPU computing. The GPU computing is approximate 20 times faster than the computing based on CPU. Numerical simulation using GPU computing would be effective to research tsunami forecasting based on numerical modeling with high computing cost, for example, construction of tsunami inundation database and real-time simulation after tsunami generation.
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