

Visualization of tsunami behavior for evacuation against tsunami

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The consciousness of people to tsunamis increases by 2011 Tohoku tsunami and, coming tsunami along Nankai Trough. Currently, evacuation routes and the place to refuge in the event of a tsunami are decided by estimated tsunami inundation areas. It is necessary to plan how to evacuate more reasonably by considering tsunami behavior, because as people evacuate from tsunami, so the tsunami inundation area is wider in actual fact. We simulated tsunami numerically and tried to visualize the tsunami behavior that it is useful to plan to evacuate from tsunami.

In the numerical simulation, we simulated 2011 Tohoku tsunami and focused on tsunami that reached and ran up in the coastal area of Miyagi. An initial condition was decided by the deformation of seabed ground calculated by using the equations of Okada(1985) from the fault model of Tohoku university (Imamura et.al., version1.1). The propagation in the offshore and the inundation on land were calculated using non-linear long-wave equation with Staggered grid and Leap-Frog Scheme. A grid size of bathymetric and topographic datasets of each region were 405,135,45,15,5m. A time interval of calculation was 0.1 second.

As a simple method to visualize tsunami behavior, we drew inundation area and inundation depth, flow velocity, and set some drawings to compare these parameters each time. This visualization is useful to understand easily tsunami behavior. However, it is difficult to find important numerical value because it is necessary to compare drawings of each time.

Therefore, we try to draw a distribution of maximum inundation depth at each grid. We also try to draw a distribution of tsunami arrival time. A distribution of maximum inundation depth shows height of arrival tsunami at tsunami shelter. If you see the drawing, you should understand it necessary to evacuate to place higher than tsunami height. A distribution of tsunami arrival time should show you evacuation route which you arrive to the place to refuge earlier than tsunami.

It is considered that these methods to visualize tsunami behavior are useful to decide evacuation routes and the place to refuge from tsunami and to evacuate more reasonably against coming tsunami.

Reference

Imamura et al.(2011),simulation of tsunami by The 2011 off the Pacific coast of Tohoku Earthquake with Tohoku university model(version1.1),online<www.tsunami.civil.tohoku.ac.jp/hokusai3/J/events/tohoku_2011/model/dcrc_ver1.1_111107.pdf>

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