Geophysical Research Abstracts
Vol. 16, EGU2014-6090, 2014
EGU General Assembly 2014

Verification of Reproduction Simulation of the 2011 Great East Japan Tsunami Using Time-Stamp Data

Motohiro Honma (1) and Motoyuki Ushiyama (2)

(1) Disaster Prevention Research Institute, Kyoto University, Kyoto, Japan (honma.motohiro.7v@kyoto-u.ac.jp), (2) Center for Integrated Research and Education of Natural Hazard, Shizuoka University, Shizuoka, Japan (ushiyama@disaster-i.net)

In the 2011 off the pacific coast of Tohoku earthquake tsunami, the significant damage and loss of lives were caused by large tsunami in the pacific coastal areas of the northern Japan. It is important to understand the situation of tsunami inundation in detail in order to establish the effective measures of disaster prevention. In this study, we calculated the detailed tsunami inundation simulation of Rikuzentakata city and verified the simulation results using not only the static observed data such as inundation area and tsunami height estimated by traces but also time stamp data which were recorded to digital camera etc.

We calculated the tsunami simulation by non-linear long-wave theory using the staggered grid and leap flog scheme. We used Fujii and Satake (2011)'s model ver.4.2 as the tsunami source. The inundation model of Rikuzentakata city was constructed by fine ground level data of 10m mesh. In this simulation, the shore and river banks were set in boundary of calculation mesh. At that time, we have calculated two patterns of simulation, one condition is that a bank doesn't collapse even if tsunami overflows on it, another condition is that a bank collapses if tsunami overflows on it and its discharge exceeds the threshold.

We can use the inundation area data, which was obtained by Geospatial Information Authority of Japan (GSI), and height data of tsunami trace, which were obtained by the 2011 Tohoku Earthquake Joint Survey (TTJS) group, as "static" verification data. Comparing the inundation area of simulation result with its observation by GSI, both areas are matched very well. And then, correlation coefficient between tsunami height data resulted from simulation and observed by TTJS is 0.756.

In order to verify tsunami arrival time, we used the time stamp data which were recorded to digital camera etc. by citizens. Ushiyama and Yokomaku (2012) collected these tsunami stamp data and estimated the arrival time in Rikuzentakata city. We compared the arrival time resulted from tsunami simulation with estimated by Ushiyama and Yokomaku (2012) for some major points. The arrival time is earlier 2-4 minutes in the condition that a bank collapses when tsunami overflows and its discharge exceeds $0.05m^2/s$ at each mesh boundary than in the condition that a bank doesn't collapse. And, on the whole the arrival time estimated from time stamp data is in accord with the result which were calculated in the condition that a bank collapse.

We could verify reproducibility about not only the final tsunami inundation situation but also the temporal change of tsunami inundation situation by using the time stamp data.

Acknowledgement
In this study, we used tsunami trace data obtained by The 2011 Tohoku Earthquake Tsunami Joint Survey (TTJS) Group.

Reference
1) Fujii and Satake: Tsunami Source of the Off Tohoku-Pacific Earthquake on March 11, 2011, http://iisee.kenken.go.jp/staff/fujii/OffTohokuPacific2011/tsunami_ja_ver4.2and4.6.html, 2011.
2) Ushiyama and Yokomaku: Estimation of situation in Rikuzentakata city just before tsunami attack based on time stamp data, J.JSNDS31-1, pp.47-58, 2012.