Japan Geoscience Union Meeting 2014
(28 April - 02 May 2014 at Pacifico YOKOHAMA, Kanagawa, Japan)

HDS27-P07 会場:3 階ポスター会場 時間:5 月 1 日 18:15-19:30

Simulation of tsunami inundation from future megathrust earthquake scenarios of Central Peru

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MAS, Erick[1*] ; ADRIANO, Bruno[2] ; PULIDO, Nelson[3] ; KOSHIMURA, Shunichi[1]
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[1]International Research Institute of Disaster Science, IRIDeS, Tohoku University, [2]Graduate School of Engineering, Tohoku University, [3]National Research Institute for Earth Science and Disaster Prevention, NIED
[1]International Research Institute of Disaster Science, IRIDeS, Tohoku University, [2]Graduate School of Engineering, Tohoku University, [3]National Research Institute for Earth Science and Disaster Prevention, NIED

Great tsunami events like the 2011 Great East Japan Earthquake and Tsunami might occur around the world in the future. In particular at areas of the Pacific Rim or the Andaman Sea as history has confirmed. In this study we will focus on the central coast of Peru on the western Pacific. The earthquake history of Peru accounts for many devastating tsunami disasters in the past (1555, 1586, 1609, 1630, 1655, 1678, 1687, 1746). The potential damage to national infrastructure exposed in Callao and Lima could yield to a heavy economical breakdown in Peru. It is of great importance to assess and estimate the future tsunami inundation scenarios in order to grasp the extent of possible damage and the severity of it. Consequently, this study evaluates the tsunami hazard and the related features of inundation at the central coast areas of Peru based on possible megathrust earthquakes.

The source model we used in this study (Mw = 8.90) was obtained from results of the interseismic coupling distribution in subduction areas using GPS monitoring data as well as historical earthquake recurrence information (Pulido et al., 2011). This slip model was used to generate twelve additional slip scenarios for strong ground motion simulation, by adding spatially correlated short-wavelength slip heterogeneities (Pulido et al., 2012).

Here, we used these thirteen scenarios to evaluate the tsunami hazard of Callao area in Peru. From results of strong ground motion simulations Pulido et al. (2012) reported that the slip scenario with the deepest along strike slip average (Mw = 8.86) was the worst case scenario for strong ground motion in Lima-Callao area. On the other hand, in this study the slip model with the largest peak slip (Mw = 8.87) yielded the highest tsunami inundation and maximum velocity near shore. Such differences on maximum scenarios for peak ground acceleration and tsunami height reveals the importance of a comprehensive assessment of earthquake and tsunami hazard in order to provide plausible worst case scenarios of strong ground motion and tsunami inundation.

Acknowledgments

This study was carried out under the framework of the SATREPS project ”Enhancement of Earthquake and Tsunami Disaster Mitigation Technology in Peru, project sponsored by the Japan International Cooperation Agency (JICA) and the Japan Science and Technology Agency (JST). Our appreciation goes to the Ministry of Education, Culture, Sports, Science and Technology (MEXT), National Research Institute for Earth Science and Disaster Prevention (NIED) and the International Research Institute of Disaster Science (IRIDeS), Tohoku University for their support.

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キーワード: megathrust earthquake, megatsunami, numerical simulation, tsunami Peru, scenarios
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