Impact of earthquake magnitude on the estimation of tsunami evacuation casualties

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Abstract

The importance of evacuation plans has been widely proven in recent tsunami events. Several evacuation models have been proposed to develop these plans and estimate city evacuation times. Typically, single extreme earthquake scenarios are used in these estimations; however, the impact of earthquake damage on the evacuation routes is usually neglected in these models. This article deals with the evaluation of the effect of three different earthquake magnitudes and the following tsunamis. Several spectral accelerations were sampled for each magnitude to estimate city damage, and from there the reduced capacity of evacuation routes due to earthquake debris. An agent-based evacuation model was used to assess the evacuation times for the city of Iquique, located in north Chile. Results show significant variability for different magnitude scenarios, thus leading to an observed increment on evacuation times up to 40% and an increase in the number of casualties due to the evacuation delay caused by earthquake debris spread on the evacuation routes