Earthquake probability assessment for the active faults in Taiwan

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Abstract

Due to the fast plate motions, there have been frequent high seismic activities in Taiwan. According to historical literature records, the most destructive earthquakes in Taiwan were mainly caused by inland active faults. The Central Geological Survey (CGS) has been publishing active fault maps in Taiwan since 1998. It has 33 active faults in the 2012 active fault map. After the Chi-Chi earthquake, CGS launched a series of projects to investigate the details to better understand each active fault in Taiwan. We gathered these collected data for compiling active fault parameters and referred to certain experiences from Japan and the United States to establish a methodology for earthquake probability assessment via active faults. The first step is to collect the fault parameters, which include fault geometry (length, rupture depth, and dip), segmentation, and slip rate. We calculated the characteristic earthquake magnitude of each fault by its rupture area. Every possible case considered, we needed to divide the fault segment to establish a rupture model. A fault rupture model is a weighted combination of the rupture cases of a fault. The long-term slip rate data can be applied to the characteristic earthquake model to obtain the recurrence interval. We calculated the recurrence interval of an earthquake by the characteristic earthquake model. Finally, we used the appropriate "probability model" to estimate the 30-, 50- and 100-year conditional probability of earthquakes for the 33 active faults in Taiwan. The parameters of active faults are important information which can be applied in the following seismic hazard analysis. We also might suggest that a fault with high earthquake probability should be paid more attention to prevent and mitigate the earthquake disaster.

Keywords: active fault, logic tree, earthquake probability model