Geophysical Research Abstracts
Vol. 12, EGU2010-3024, 2010
EGU General Assembly 2010

A Study on the Relationship between Disaster and Spectral Intensity

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Nowadays, the structural environment is becoming so complicated that an index, which can better assess earthquake damage than the originally defined intensity scale and PGA, is needed. Housner [1] suggested that spectral intensity (SI) can be a risk index of an earthquake. After Housner some earthquake engineers keep on exploring different period range of SI and its application [2-5]. The study of Matsumura [4] shows that SI is a better measure of earthquake intensity for a wide range of frequencies with a good correlation with damage than peak ground acceleration (adequate to structures with shorter natural period) and peak ground velocity (adequate to structures with longer natural period). Recently, Jean [6] investigated earthquake intensity attenuation law and site effect of strong ground motion using earthquake records in Taiwan area. Their results show that SI is a better earthquake damage index than PGA. This study enhanced the SI concept proposed by Jean [6]. The spectral intensity was separated into three periods, short period (acceleration controlled period), medium period (velocity controlled period), and long period (displacement controlled period). The average spectral intensity of short period, medium period, and long period can be an earthquake damage index of low-rise buildings, buildings of medium height, and high-rise buildings. Since average value of a certain data is meaningful when the data has a small variance, the start and end points of the three periods are calculated by statistical method so that the data at each period has minimum variance. Finally, the relationship between disaster and spectral intensity of 1999 Taiwan Chi-Chi earthquake was investigated in this study.

[1] Housner, G. W. (1952). “Spectrum intensity of strong-motion earthquakes,” in Proc. Sym. Earthq. Blast Eeff. on Stru., EERI, U.C.L.A..
[2] Hidalgo.P. and R. W.Clough (1974). “Earthquake simulator study of a reinforced concrete frame,” Report UCB/EERC-74/13, EERC, University of California, Berkeley.
[3] Kappos, A. J (1991). “Analytical prediction of the collpase earthquake for R. C. buildings: suggested methodology,” Earthq. Eng. Stru. Dyn., 20, 2, pp. 167-176.
[4] Matsumura, K. (1992). “On the intensity measure of strong motions related to structural failures,” in Proceeding of 10 WCEE, 1, pp. 375-380.
[5] Martinez-Rueda, J. E (1998). “Scaling procedure for natural accelerograms based on a system of spectrum intensity scales,” Earthq. Spec., 14, 1,.
[6] Jean, W. Y., Y. W. Chang, K. L. Wen, and C. H. Loh (2006). “Early estimation of seismic hazard for strong earthquakes in Taiwan,” Natural Hazards, vol. 37, pp. 39-53.