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Istanbul Earthquake Early Warning and Rapid Response System

M.Erdik, H.Alcik, A.Mert, O.Ozel
Bogazici Universtity, Istanbul

As part of the preparations for the future earthquake in Istanbul a Rapid Response and Early Warning system in the metropolitan area is in operation. For the Early Warning system ten strong motion stations were installed as close as possible to the fault zone. Continuous on-line data from these stations via digital radio modem provide early warning for potentially disastrous earthquakes. Considering the complexity of fault rupture and the short fault distances involved, a simple and robust Early Warning algorithm, based on the exceedance of specified threshold time domain amplitude levels is implemented. The current algorithm compares the band-pass filtered accelerations and the cumulative absolute velocity (CAV) is compared with specified threshold levels. For the rapid response system one hundred 18 bit-resolution strong motion accelerometers were placed in quasi-free field locations (basement of small buildings) in the populated areas of the city, within an area of approximately 50x30km, to constitute a network that will enable early damage assessment and rapid response information after a damaging earthquake. Early response information is achieved through fast acquisition and analysis of processed data obtained from the network. The stations are routinely interrogated on regular basis by the main data center. After triggered by an earthquake, each station processes the streaming strong motion data to yield the spectral accelerations at specific periods and sends these parameters in the form of SMS messages at every 20s directly to the main data center through a designated GSM network and through a microwave system. A shake map and damage distribution map (using aggregate building inventories and fragility curves) will then be automatically generated using the algorithm developed for this purpose. Loss assessment studies are complemented by a large citywide digital database on the topography, geology,

soil conditions, building, infrastructure and lifeline inventory. The shake and damage maps will be conveyed to the governor's and mayor's offices, fire, police and army headquarters within 3 minutes using radio modem and GPRS communication. An additional forty strong motion recorders were placed on important structures in several interconnected clusters to monitor the health of these structures after a damaging earthquake.