Earthquake Early Warning and Rapid Loss Information Generation in İstanbul

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Current probabilistic estimates of a major earthquake in İstanbul is about 2% per annum. As part of the preparations for the future earthquake in Istanbul, an earthquake rapid response and an early warning system in the metropolitan area (I-NET) has been implemented in 2002. For the Istanbul earthquake early warning system (here after IEEWS) ten strong motion stations were installed along the northern shoreline of the Marmara Sea as close as to the main Marmara fault in on-line mode. 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 (low pass filtered peak ground acceleration and bracketed cumulative absolute velocity) is implemented. Currenty scheduled applications of the IEEW include the traffic control applications at the FSM Suspension Bridge and Marmaray Tube Tunnel across the Bosporus Straits and the actuation of the automatic shut-off valves at the regulator stations of the Istanbul Natural Gas Distribution Network.

Another important use of the I-Net is the generation of the rapid loss information. For this purpose one hundred strong motion accelerometers placed in the populated areas of the city are used. Early response information is achieved through fast acquisition and analysis of processed data obtained from the network. After triggered by an earthquake, each station processes the streaming strong motion data to yield the spectral accelerations at specific periods and periodically transfers these data in the form of SMS messages to the data center where a hazard and loss map will be automatically generated. Hazard maps are furher integrated with the predictive ground motion distribution maps (i.e. ShakeMap) based on the earthquake source parameters. This integration is based on rational techniques for bias correction with the empirical and predictive ground motion parameters. The generated loss are to be conveyed to the respective authorities (within few minutes) to provide orientation for the search and rescue operations.