Developments in the Earthquake Early Warning System for Istanbul, NW Turkey

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The implementation of the earthquake early warning system (EEWS) in Istanbul commenced in 2001 following the devastating 1999 Izmit (Mw=7.5) and Duzce (Mw=7.2) earthquakes. At present the EEWS network consists of 10 inland and 5 OBS strong motion stations located as close as possible to the Great Marmara Fault zone. At the beginning data transmission was provided with Spread Spectrum Radio Modem; now, a satellite based and fiber optic data transmission system is used for communication between the remote stations and the base station at KOERI. The continuous on-line data from these stations is used to provide real time warning for emerging potentially disastrous earthquakes. A simulation of Early warning times for 280 earthquakes portrays a lead time between 0-30 seconds for Istanbul metropolitan area. The fiber optic lines provide high data transmission speed (2-4 miliseconds) from the remote stations to the KOERI data center, i.e. no latency exists taking into account the 100 sps sampling interval of the data. Redundancy of communication system is essential which we supply using a satellite data transmission system.

Considering the complexity of fault rupture and the short fault distances, a simple and robust Early Warning algorithm, based on the exceedance of specific threshold time domain amplitude levels (band-pass filtered accelerations and the cumulative absolute velocity) named as CAV is implemented. Onsite and regional early warning algorithms based on translation of the early P-wave waveform charactersitics to final source parameters of the earthquakes are to be implemented as well.

The early warning sygnal (consisting three alarm levels) is to be communicated to the appropriate servo shut-down systems of the receipent facilities, which will automatically decide proper action based on the alarm level. Among the prospective end users of the EEW sygnal are the facilities such as Fast Train and Tube Tunnel, Istanbul Gas Distribution Corporation (IGDAS), Recently constructed tall buildings, electric power plants and so on.

The continuous upgrade of the EEWS network, the software and the hardware is going on. In addition to the present strong motion stations additional ones are to be deployed along the southern coastline of the Marmara sea. The improved station coverage will enable regional warning technique be implemented along with the present on-site warning algorithm.

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