## Earthquake Early Warning System Currently in Operation in Turkey: Istanbul EEW System

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## Abstract

17 August (Mw 7.4) and 12 November 1999 (Mw 7.2) earthquakes have caused major concern about future earthquake occurrences in Istanbul and in the Marmara Region. Stress transfer studies and renewal model type probabilistic investigations indicate about 2% annual probability for a Mw = 7+ earthquake in the Marmara Sea. As part of the preparations for the expected earthquake in Istanbul, an early warning system has been established in 2002. Ten (10) of the strong motion stations are sited in the Marmara region at locations as close as possible to the Great Marmara Fault in on-line data transmission mode to enable Earthquake Early Warning A simple and robust algorithm, based on the exceedance of specified threshold time domain amplitude and the cumulative absolute velocity (CAV) levels, is implemented for this system. Rational threshold levels related to new bracketed CAV window approach (BCAV-W) are determined, based on dataset of strong ground motion records with fault distances of less than 100 km, as 0.2 m/s, 0.4 m/s and 0.7 m/s related to three alarm levels which will be incorporated in the Istanbul earthquake early warning system.

In order to improve the capability of Istanbul Earthquake Early Warning system (IEEWS) and to rapidly assess the potential for damage of an earthquake for the purpose of earthquake early warning in the Marmara Region, we explored an alternative approach to earthquake early warning with the use of a ground-motion parameter ( $\tau_c$ ) and high-pass filtered vertical displacement amplitude parameter (*Pd*) from the initial 3 s of the P waveforms. We proposed empirical relationships both between  $\tau_c$  and Moment Magnitude (M<sub>w</sub>), and between *Pd* and Peak Ground Velocity (PGV) for the Marmara Region. These relationships can be used to detect a damaging earthquake within seconds after the arrival of P waves, and can provide onsite warning in the Marmara Region.