ESTIMATION OF STRONG GROUND MOTION PARAMETERS OF INITIAL PART OF P-WAVE FOR EARLY WARNING SYSTEMS IN THE AZARBAYJAN REGION

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ABSTRACT

Two recent earthquakes that struck the Azarbayjan region, NW-Iran, on 10 August 2012 (Mw=6.2 and 6.1) caused major concern about future earthquake occurrences in Azarbayjan Region.

In order to improve the capability of NW-Iran earthquake early warning system for giving early warning of a damaging earthquake in the Azarbayjan Region, we explored an alternative approach with the use of a period parameter (tc) and a high-pass filtered displacement amplitude parameter (Pd) from the initial 3 s of the P wave forms. The empirical relationships both between τ_c and moment magnitude (Mw), and between Pd and peak ground parameters (PGA, PGV and PGD) for the this region are presented. These relationships can be used to detect a damaging earthquake within seconds after the arrival of P waves, and can provide on-site warning in the Azarbayjan Region.

INTRODUCTION

Rapid magnitude estimation is at the heart of Earthquake Early Warning Systems (EEWS). The challenge is to use only a few seconds of the P wave data from a limited number of stations to quickly determine a useful estimate of the earthquake magnitude. Effective Early Warning Systems for natural hazards are now increasingly perceived as an integral component of disaster risk reduction programs. EEWS, already in operation in several countries around the world, have been using mainly two approaches; regional warning and on-site warning. In the first approach, the traditional seismological method is used to locate an earthquake, and determine the magnitude from stations at close epicentral distances, and estimate the ground motion at other distant sites. This approach has already been used in Japan (Nakamura, 2004), Mexico (Espinosa et al., 1995) and Taiwan (Wu et al., 2003). In the second approach, the beginning of the ground motion (mainly P waves) observed at a site is used to predict the ensuing ground motion (mainly by S- and surface waves) at the same site. On-site warning is usually based on individual sensors, while regional warning requires seismic networks. Therefore the regional warning approach is more reliable but requires more time, and cannot be used for the sites at short distances. In contrast, the second one is less reliable, but it is very fast and could provide early warning to sites even at very short distances, where an early warning is