RARID ESTIMATION OF EPICENTARL DISTANCE USING INITIAL PORTION OF P-WAVE

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An important focus for earthquake early warning system is rapid estimation of epicentral distance base on initial 3 seconds of *P*-wave. One of the most famous earthquake warning systems on the world is Urgent Earthquake Detection and Alarm System (UrEDAS) in Japan which used of a mathematic approach introduced by Odaka et al. (2005) in order to estimate of epicentral distance. Recently, scientists started new projects for implementing earthquake early warning system in Iran. Thus, I tested Odaka's approach using different envelope of *P*-wave and calculate new attenuation relationship between the initial slop of *P*-wave's envelope and epicentral distance for Iran.

Seismic waves may have different envelope waveforms relevant to some of factors including the magnitude, depth, and epicentral distance. The amplitude of the initial *P*-wave record is commonly small incorporation of the later maximum amplitudes of *S*- and surface waves. In order to scale epicentral distance with anisotropic attenuation effects, I used of different envelopes such as linear and exponential envelope (which introduced by Odaka et al. (2005)) over data, which have recorded at different epicentral distances. For this purpose, after removing the zero and trend shift on the records, I applied the logarithms of the absolute ground motion values.

In order to calculate best relationships between the attenuation and epicentral distance for Iran, I introduce three function Bt•exp(At), C•exp(Dt) and Ft and determine the unknown parameters A, B, C, D and F by the least square method and fitting this function to the observed seismic waveforms. The origin of time t is taken at P-wave arrival time. The fitting of the above functions is made to an envelope of the original vertical acceleration waveforms.

In this paper, I used of Iranian Building and Housing Research Center accelerometer network, BHRC, including some of large earthquakes, were occurred throughout of the Iran. My results indicate that there are relations between the rising slopes (B, D and F) of a short time after *P*-wave arrival using purposed envelope and epicentral distance. In all of the slopes, which I define by the parameters B, D and F, does not be influenced by the earthquake magnitude, but depend chiefly on epicentarl distance. Although the B parameter shows best results and agreements with epicental distance, but that is very sensitive to P-wave detected time. I contrast, D and F values, show less show less compliance with epicentral distance, but these values are not sensitive to the P-wave time triggering. In additional to the inelastic attenuation factor on wave, the geometric spreading can decrease B, D and F with distance. My results show that the three parameters B, D and F can be used in an earthquake early warning system in order to rapid estimation of epicentarl distance. Figure 1 shows a sample of results for 2012, August 11 Ahar-Varzaghan earthquake, which illustrates good agreement with world relationship (Japanese relationship).

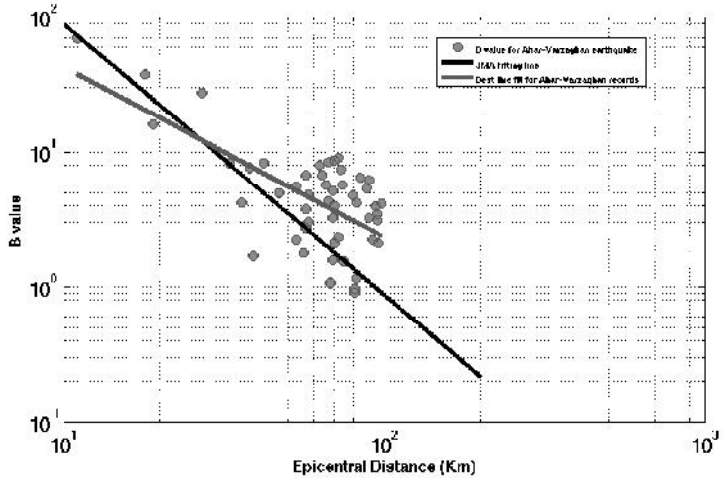

Figure 1. The obtained B-values and corresponding best line for Ahar-Varzaghan earthquake records

REFERENCES

Odaka T, Ashiya K, Tsukada S and Sato S (2005) A New Method of Quickly Estimating Epicentral Distance and Magnitude from a Single Seismic Record, 93(1): 526-532