



“Gheorghe Asachi” Technical University of Iasi, Romania



A STUDY ON THE DETERMINATION OF CUMULATIVE ABSOLUTE VELOCITY (CAV) THRESHOLD LEVELS FOR VRANCEA EARTHQUAKES

**Hakan Alcik^{1*}, Alexandru Marmureanu², Victorin Toader²,
Constantin Ionescu², Can Zulfikar¹**

¹*Bogazici University, Kandilli Observatory and Earthquake Research Institute, Earthquake Engineering Department,
Cengelkoy, 34684, Istanbul, Turkey*

²*National Institute for Earth Physics, P.O. Box MG-2, 76900, Magurele, Ilfov, Romania*

Abstract

Natural disasters from earthquakes can cause considerable damages, with potentially severe effects to urban environment. Last strong Vrancea earthquake on March 4, 1977 ($M_w=7.4$, depth=95km); tens of thousands of buildings damaged, many people injured and dead. Strong earthquakes in the Vrancea zone occur between 60-200 km depth within an almost vertical column. Bucharest Earthquake Early Warning (EEW) system detects earthquakes with a seismic network in the epicentral Vrancea region and issue a warning in Bucharest providing 20-25s warning time. In this study, we have investigated the relationships of the bracketed cumulative absolute velocity window (BCAV-W) approach versus epicentral distance and magnitude for Vrancea region. Firstly, a set of time histories contains 11 earthquakes, 111 strong ground motion records for intermediate depth earthquakes with different magnitudes ($4.0 \leq M_w \leq 6.0$) and epicentral distances (0-200 km) are analyzed to determine relations between the window size (W) and BCAV-W ratio. The BCAV-W computed for different windows time size 2s, 4s, 8s, 12s, 16s, 32s, 64s, 128s and 256s have the ratios 24%, 40%, 61%, 74%, 84%, 97%, 97%, 100% and 100% to the total BCAV respectively. The results show that there is no significant benefit to choose a window size more than 16s. Subsequently, rational threshold levels related to $M_w=5.4+$ earthquakes are determined as 0.28 m/s and 0.34 m/s related to 12-second and 16-second windows, respectively. The goal of the paper is to enhance EEW capability to decrease the effects of Vrancea earthquakes on urban and built environment.

Key words: Bucharest, built environment, cumulative absolute velocity, earthquake early warning, Vrancea seismic area

Received: October, 2012; Revised final: August, 2013; Accepted: August, 2013

* Author to whom all correspondence should be addressed: e-mail: alcik@boun.edu.tr; Phone:+90 216 5163326; Fax:+90 216 3080163