SECOND EUROPEAN CONFERENCE ON EARTHQUAKE ENGINEERING
AND SEISMOLOGY, ISTANBUL AUG. 25-29, 2014

SOURCE SCALING PROPERTIES IN THE CARPATHIANS AREA, ROMANIA: CRUSTAL VERSUS MANTLE EARTHQUAKES

Mircea RADULIAN[1], Emilia POPESCU[1], Anica Otilia PLACINTA[1], Felix BORLEANU[1],

ABSTRACT

Seismicity in Romania concentrates along the Carpathians orogen with a sharp clustering beneath the mountain bend in the Vrancea region. Apparently, earthquake activity in the mantle is decoupled from that in the overriding crust. However, new investigations coming into favour of some interdependence between the two seismicity ranges have begun to be encouraged by seismologists and recent observations.

The present study aims at estimating scaling properties for the earthquakes all along the Carpathians in Romania and comparing them with scaling properties specific for subcrustal earthquakes. Source parameters are estimated using empirical Green's function deconvolution and spectral ratio technique. In some cases, the iterative deconvolution technique proposed by Sokos and Zahradnik (2008) is applied as well. The observation data for crustal earthquakes are provided by the broadband stations of the National Institute for Earth Physics in Bucharest and come from both East and South Carpathians and Apuseni Mountains. Most of these data come from seismic sequences. The magnitude range includes small to moderate earthquakes (2.5 – 5.1). The main findings of our investigation can be summarized as follows: (1) improved quality of the scaling relations as obtained for the crustal events shows no significant discrepancies among source areas wherever they are located in Carpathians region; (2) high stress drop values are characteristic both in the crustal domain and in the mantle range (Vrancea), despite the differences in the focal mechanism; (3) differences in scaling relations of magnitude and source dimension as a function of seismic moment for the crustal and mantle earthquakes are statistically significant. The high stress drop values in the crust are explained by the intra-continental setting of seismic activity in the Carpathians, while for the mantle earthquakes reflect the efficient release of tectonic energy (high rupture velocity). Differences in scaling properties for shallow and deep earthquakes are interpreted by differences in the source processes.

[1]Dr , NATİONAL INSTİTUTE FOR EARTH PHYSICS, MAGURELE, ROMANIA, mircea@infp.ro