The intermediate-depth Vrancea (Romania) earthquakes. Source characteristics, seismic attenuation and site amplification from the analysis of strong and weak motion recordings

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The Vrancea seismogenic zone is located at the bend of the Carpathian mountain arc in Romania. Here, frequent and strong intermediate-depth earthquakes occurr within a narrowly confined focal volume. Four such events with M>6.5 took placde during the last century, and especially the large shock in 1977 led to disastrous consequences on Romanian territory.

Therefore, it is of utmost importance to obtain insights into the source characteristics, seismic attenuation and site effects in the area in order to be able to reasonably assess the seimic hazard. Since 1997, a modern digital accelerograph network, deployed in the framework of the Collaborative Research Center (CRC 461) 'Strong Earthquakes' at the University of Karlsruhe, is recording the Vrancea earthquakes and has led to an abundance of high-quality data on Romanian territory.

In my talk, I will present the results of a source study with empirical Green's functions to derive the kinematic source properties of several large Vrancea earthquakes. For the 1977 event, macroseismic intensity is used as input data for the derivation of source parameters, which is a very promising approach when not enough waveform data of the mainshock are available. Furthermore, we carried out an inversion of the ground motion spectra resulting from 55 Vrancea earthquakes at 43 stations. The results show that Vrancea earthquakes depict high stress drops in the range of 1 kbar, that seismic attenuation beneath the Vrancea region shows important lateral heterogeneities and that the H/V ratios are not a good estimate of site response in the case of Vrancea earthquakes. The results presented in the talk are a key step for improving seismic hazard assessment on Romanian territory.