Geophysical Research Abstracts, Vol. 9, 01880, 2007
SRef-ID: 1607-7962/gra/EGU2007-A-01880

Source scaling for intermediate-depth Vrancea (Romania) earthquakes with empirical Green's functions

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The intermediate-depth earthquakes occurring in the Vrancea (Romania) seismogenic zone pose a serious threat to Romania and its neighbouring countries. During the last century, four events with magnitudes larger than 6.5 occurred within this narrowly confined focal volume. A better understanding of the source process of Vrancea earthquakes is of crucial importance in order to properly assess the ground motion level that has to be expected from future large events.

The strong ground motion database gathered up to now from large Vrancea events is rather sparse. Therefore, in order to use every possible source of information, we extended our analysis to two recent moderate events, which have been recorded by the K2–accelerometer network installed in the framework of the Collaborative Research Center (CRC 461) 'Strong Earthquakes' (operative since 1997, http://www-sfb461.physik.uni-karlsruhe.de/). Moreover, we propose an approach to use macroseismic intensity data to retrieve estimates of earthquake source parameters taking the large 1977 (Mw=7.4) earthquake as an example.

The empirical Green's functions method of Irikura is used to generate synthetic time series for the October 27, 2004 (Mw = 5.8) and May 14, 2005 (Mw = 5.2), and the two large August 30, 1986 (Mw = 7.1) and March 4, 1977 (Mw = 7.4) earthquakes, from small event recordings. Irikura's technique allows for an estimate of several source parameters characterizing the so-called strong motion generation area (SMGA). This area, which is defined as a rectangular area of large slip-velocity within a total (background) rupture area, is characterized by five parameters: length, width, rise time and position of the rupture initiation point along strike and dip. The parameters are ob-

tained by matching acceleration envelope, displacement waveform and MSK intensity patterns using a genetic algorithm. The strong motion recordings of Vrancea earthquakes can be reasonably well reproduced using relatively small (compared to crustal events) SMGA's and rise times, which corresponds to small asperities with high stress drops (300 – 1200 bar) and high particle velocities (3 – 5 m/s). The May 2005 event, however, shows dimensions close to the expectation for crustal earthquakes.