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Earthquake sequence in western getic depression (Romania), December 2011 - January 2012: source characteristics and seismotectonics

E. Popescu, A Craiu, M Craiu, M Popa, and M Radulian
National Institute for Earth Physics, Bucharest, Romania,epopescu@infp.ro

The goal of the paper is to investigate the most recent crustal earthquake sequence (40 earthquakes detected and located in the time interval 30 December 2011– 10 January 2012), generated in the weastern part of the Getic Depression (about 20 km east from the Tg-Jiu city). The main shock, occurred on January 1, 2012, 23:57 (45.04, 23.56, h=14 km, MD = 4.5) was preceded by 7 foreshocks (MD less than 3.6) within 65-hour interval. The largest aftershocks of magnitude 4.0 and 3.9 occurred within the first 30-minute interval. Seismic source properties are determined using multiple approaches: empirical Green's functions (EGF) deconvolution, spectral ratios technique and acceleration spectra analysis. For EGF and spectral ratios application, we associated to the main event (MD = 4.5) many co-located foreshocks and aftershocks ($2.1 \leq MD \leq 4.0$), selected according to the requirements for empirical Green's functions. The source parameters are estimated as mean values for all the available pairs. Our analysis reveals distinct features, such as the alignment of the foreshocks and aftershocks along a NW-SE direction, in agreement with the focal mechanism similar for the three largest events, showing a rupture plane in the same direction. The relative location of the main shock indicates a unilateral rupture, from SE toward NW. In parallel, source parameters are retrieved from the analysis of the accelerometer spectra. The resulted source time functions are similar from one station to the other, suggesting negligible source directivity effects for the study events. The shape of the deconvolved source time function for the main shock of 1 January 2012 indicates a homogeneous rupture process in the focus.