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Catalog of focal mechanism solutions for crustal earthquakes in Intra-Carpathian region of Romania

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The study region is a part of Tisa-Dacia geodynamic block developed in the Carpatho-Pannonian Basin. The geology is very complex, both in composition/lithology and tectonic peculiarities. The present structure of the lithosphere has been accomplished from many pre-Alpine and Alpine tectogenesises and can be characterized by i) successive reactivation of the structures and faults systems and, respectively ii) development of the newest geological entities (basins, grabens, horsts) that overlay the older ones (e.g. nappes, suture zones, magmatic bodies, etc.) and are bordered by normal/listric faults. A specific neotectonic activity is known, controlled by the transition between an extensional to compressional tectonic regime (basin inversion). The distribution of seismicity allows us to identify narrower zones with seismogenic potential confirmed by the damaging earthquakes recoded in the region: November 26, 1829 (Ms=6.4), October 10, 1834 (Ms=6.3), January 26, 1916 (Ms=6.4), July 12, 1991 (Mw=5.7), December 2, 1991 (Mw=5.5). In this geological complex context and from the need to know and to understand seismic hazard, it is necessary, among other data, to study and to model realistically the active tectonics. The determination of focal mechanism solutions, that connect seismicity, specific known faults and stress field is crucial to such specific studies. The unprecedented increase of the number of high sensitive seismic stations operated by NIEP forming a dense national network. These ones and the temporary stations installed within the framework of South Carpathians Project 2009-2011 provided a unique dataset of waveforms used in the paper. We present a robust catalogue of fault plane mechanism solutions for the crustal earthquakes occurred within Intra-Carpathian region of Romania. The solutions were determined for several hundreds of relocated earthquakes (ML>1.5) using the JHD method and an elaborated local velocity model. We applied different techniques to determine double couple earthquake focal mechanism, like polarities and/or amplitude ratios and/or moment tensor inversion. The catalog provides valuable input data i) for formal stress inversion and active stress field investigations with causative fault discrimination and ii) to analyze the role of small earthquakes in the stress redistribution process. A statistical analysis of the focal mechanism parameters (Frohlich's diagrams, 1991) shows a diversity of the faulting types for the entire study region, from pure strike-slip to pure normal and reverse faults, with a significant number of mixed ones. The case study of formal stress inversion of focal mechanisms in the southern area pointed out the role of different stress orders (senso Zobach, 1992) on the reactivation process of the localized complex structure and faults systems.