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Seismotectonics of the foreland of the Romanian Carpathians, characterization of seismic sources and insights on seismic hazard analysis

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The foreland of the Romanian Carpathians consists of a puzzle of continental blocks with distinct evolution through geological time, firmly welded together at present day but still affected by localized recent to active tectonic deformation resulting in a complex earthquakes distribution, in terms of geographical pattern, depth, focal mechanism and magnitude range. This study aimed to define the most significant seismic source areas based on recent seismotectonic analysis and interpretation and to characterize each source in terms of geometry, maximum observed- and possible magnitude and recurrence rate defining the magnitude distribution. A new catalogue of more than 460 crustal earthquakes exceeding 3 degrees moment magnitude was compiled and integrated in a GIS database comprising most of the relevant geological and geophysical information. Six seismic sources have been identified, among which only one comprising subcrustal intermediate earthquakes (60-200 km depth), namely the Vrancea intermediate source, was extensively studied and characterized up to now. The other five comprise only crustal earthquakes ($<$ 60km depth) related to important active tectonic fault systems (Pecenega-Camena fault source, Sf. Gheorghe fault source, Intra-Moesian fault source) or to randomly distributed diffuse intracrustal deformation (Vrancea crustal source, Moesian source). Reccurence magnitude analysis has been performed for each source, uncertainties of each magnitude distribution model and source potential model have been determined and all the necessary parameters for probabilistic seismic hazard assessment were provided.

This study brings a new seismotectonic model of the Romanian Carpathians foreland, which considers evaluation of active seismicity and seismic hazard assessment in connection to well defined geometry and kinematics of active tectonic features. This model aims to improve the seismic hazards analysis results made on the base of impact and interaction of several seismic sources on a specific site.