

ShakeMap analysis for Vrancea (Romania) intermediate-depth earthquakes and implications on disaster management strategy

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The ShakeMap is a ground shaking representation obtained within minutes after the occurrence of a large earthquake. Such maps, released via Internet, provide valuable information for a diverse audience composed of emergency response agencies, scientists, businesses, media, and the general public. Ideally, ShakeMaps should uniquely integrate all the information available before and after a main shock. Therefore, previously compiled databases on soil conditions and regional attenuation, information on the rupture mechanism and magnitude of an event, as well as the actual strong ground motion recordings from the event, transmitted in real-time are required.

The earthquakes generated beneath SE Carpathians, in the Vrancea area (Romania), are characterized by very peculiar features which differentiate this seismic area from all other seismic areas in the World. In particular, the concentration of seismicity in a narrow focal volume and the persistence of seismic activity in time (with an average of 3 shocks above magnitude 7 per century) allow us to set in advance the approximate epicenter position of the next large event and roughly the expected time interval. Moreover, the predominance of the reverse faulting mechanism with relatively well-defined fault plane geometry, reduce the number of the possible scenarios we can expect for these earthquakes.

Specific shake maps are computed on the basis of Vrancea earthquakes scenarios. To account for the site amplification factors, we introduced a generalized geological classification for different subdivisions of the territory at regional scale, based on geology, geomorphology, and geotechnical characteristics and thickness of sedimentary layers. At the same time, features related to deep crust and upper mantle structure (mainly lateral variation in seismic wave attenuation) are included in the computation.

On the basis of an existing earthquake database, we test how accurately the scenarios computations are matching the observations. Finally the implications on seismic hazard and seismic risk in Romania are analyzed and the proper earthquake disaster management implementation is discussed.