Geophysical Research Abstracts,
Vol. 10, EGU2008-A-02698, 2008
SRef-ID: 1607-7962/gra/EGU2008-A-02698
EGU General Assembly 2008

Probabilistic seismic hazard maps in terms of intensities for Bulgaria and Romania

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Since 2007 Bulgaria and Romania are members of the European Union. All member states have to introduce the European earthquake building code EUROCODE 8 (EC 8) in the coming years. Therefore new seismic hazard maps have to be calculated according to the recommendations in EC 8. Here the authors present a novel approach to compute such hazard maps. We prefer to use the macroseismic intensity as hazard parameter because of two reasons: First, the intensity is directly related to the degree of damage. Second, a great advantage of using intensities here is that the irregular spatial attenuation field of the Vrancea intermediate depth earthquakes can be estimated by detailed macroseismic maps.

The main base of our probabilistic analysis is the earthquake catalogue for SE-Europe (Shebalin et al. 1998) in combination with some local catalogues. Fore- and aftershocks were removed. Seismic source zones inside an area of about 200 km around Romania and Bulgaria were defined based on seismicity, neotectonics and geological development. For each seismic source the intensity-frequency relation was calculated and a maximum possible earthquake as well as a seismogenic depth was estimated. An appropriate attenuation law was assumed. To cope with the irregular isoseismals of the Vrancea intermediate depth earthquakes a factor Ω was included in the macroseismic attenuation law.

Using detailed macroseismic maps of three intermediate depth earthquakes Ω was calculated for each observation. Strong local variation of Ω is avoided by a gridding of 0.5 degree in longitude and 0.25 degree in latitude.

The contributions of all seismic sources, the crustal normal depth source zones and the Vrancea intermediate depth zone, are summed up to the annual probability of exceedance. The contribution of the Vrancea intermediate depth zone to each grid point was computed with the corresponding representative Ω of this point; a seismogenic depth of 120 km has been assumed.

Each final seismic hazard map is a combination of two maps, the one for normal depth source zones and the one for the Vrancea intermediate depth zone. This is illustrated for a recurrence period of 475 years as partial maps and with the final map. Hazard maps were calculated for different recurrence periods. Detailed information can be found in Ardeleanu et al. (2005) and in Simeonova et al. (2006).

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Simeonova, S., D. Solakov, G. Leydecker, H. Busche, T. Schmitt, D. Kaiser, 2006: Probabilistic seismic hazard map for Bulgaria as a basis for a new building code. – Natural Hazards and Earth System Sciences, 6, 881 - 887. http://www.nat-hazards-earth-sys-sci.net/6/881/2006/