



Map of probabilistic seismic hazard assessment for Romania as a basis for a new building code

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Introduction

A seismic hazard map as part of a new building code for Romania based on EUROCODE 8 requires macroseismic intensities for a probability of exceedance of 10% in 50 years (recurrence period of 475 years). The seismic hazard is computed with EQ-RISK based on the probabilistic approach developed by Cornell (1968) and McGuire (1976). We used the earthquake catalogue for Central and Southeastern Europe for the years 342 BC - 1990 AD (Shebalin et al., 1998).

Data and method

Seismic source zones inside an area of about 200 km around Romania were based on seismicity, neotectonics and geological development. Fore- and aftershocks have been removed considering the ten day criteria. For each seismic source the intensity-frequency relation was calculated and a maximum possible earthquake as well as a seismogenic depth has been estimated. An appropriate attenuation law was assumed (Sponheuer 1954). At all grid points contributions of all seismic sources are summed up to the annual probability of exceedance.

To cope with the irregular isoseismals of the Vrancea intermediate depth earthquakes a factor Ω has been included to the attenuation law:

$$I_{site} = I_{epic.} - 3 \cdot \log(r/h) - 1.3 \cdot \alpha \cdot \Omega \cdot (r-h)$$

r = hypoc. dist.; h = focal depth; α = absorption coeff. [km^{-1}]

Using detailed macroseismic maps of three intermediate depth earthquakes Ω has been calculated for each observation assuming $\alpha = 0.001 \text{ km}^{-1}$. Strong local variation of Ω has been avoided by a gridding of 0.5 degree in longitude and 0.25 degree in latitude. 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.

Results

The final seismic hazard is the combination of both contributions, of zones with crustal earthquakes and of the Vrancea intermediate earthquakes zone. The influence of the assumed seismogenic depth of the Vrancea intermediate zone has been shown as the difference between the seismic hazards for $h = 95 \text{ km}$ and 150 km . Additional calculations have been done for a recurrence period of 10,000 years. All maps show the dominating effects of the intermediate depth earthquakes in the surrounding of the Vrancea zone, also for the capital Bucharest.

References

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