SECOND EUROPEAN CONFERENCE ON EARTHQUAKE ENGINEERING
AND SEISMOLOGY, ISTANBUL AUG. 25-29, 2014

PSEUDO-PROBABILISTIC SEISMIC HAZARD SOURCES FOR VRANCEA DEEP SEISMICITY

Laurentiu DANCIU[1] and Jochen WOESSNER[2]

The newly released 2013 European Seismic Hazard Model [ESHM13] provides the seismic hazard estimates for the Euro-Mediterranean region. The model is the outcome of the EU-FP7 founded project "Seismic Hazard Harmonization in Europe - SHARE". ESHM13 is the result of a collaborative effort, harmonized framework and iterative processes to build a community-based seismic hazard model across the country borders.

At the seismic source modeling level three different earthquake source models were aggregated, describing the expected rate of future earthquake activity in terms of their spatial, depth and frequency-magnitude distribution as well as the style of faulting in different regions. The three earthquake source models include (i) an area source model, assuming a homogeneous distribution of earthquakes within each zone, (ii) a zoneless earthquake model distributing the catalogued earthquake activity based on kernel-smoothed earthquake and fault densities, and (iii) a fault source model inferring future seismic activity from estimated slip rates on active fault, distributing smaller events in background sources. The above mentioned source model was used to describe the seismicity of active shallow regions, stable continental regions. However, the subduction inslab and interface, and deep seismicity of Vrancea region, as illustrated in Figure 1, were modeled only by an individual source representation.

The deep seismicity of the Vrancea region, situated beneath the southern Carpathian Arc, located roughly at depths between 70 to 150km was modeled as four volumetric area sources Earthquake density, depth levels and maximum magnitudes vary within these zones. Maximum magnitude (Mmax) of each pseudo-deterministic source zone was assessed from the recorded or historically observed events. The maximum magnitude is depth dependent; the seismicity spanning depths from 70 to 90km was fixed to Mmax values of 7.5 and 7.8; the seismicity between 110 to 150km is limited to Mmax values of 7.8 to 8.1. For all of these, we inferred that the lower Mmax is associated with a weight of 0.75 and the higher one with a weight of 0.25. The volume sources and their differentiation in terms of maximum magnitude are illustrated in Figure 1. For all source zones all the available focal mechanisms indicate thrust faulting.

Attenuation of seismic wave amplitudes in this region seems to be azimuthally dependent – a characteristic that is not only due to site amplification. This characteristic has been implemented for intensity attenuation relations (Sokolov et al. 2008). However, this parameterization is not available in the ground motion prediction equations selected within SHARE project. We therefore prepared the characterization of the deep seismicity in a way that these observations are captured by defining productivity, preferred rupture directions and rupture depths within the four deep area sources (volumes) that were suggested by (Sokolov et al. 2008).

We present the procedures as well as the assumptions on modeling the deep seismicity of the Vrancea, as designed and implemented in ESHM13. Further, an overview of the ground motion prediction equations [GMPEs] used for seismic hazard computation is presented, also.

[1] PhD, Swiss Seismological Service, ETH Zurich, laurentiu.danciu@sed.ethz.ch
[2] PhD, Swiss Seismological Service, ETH Zurich, jochen. woessner@sed.ethz.ch

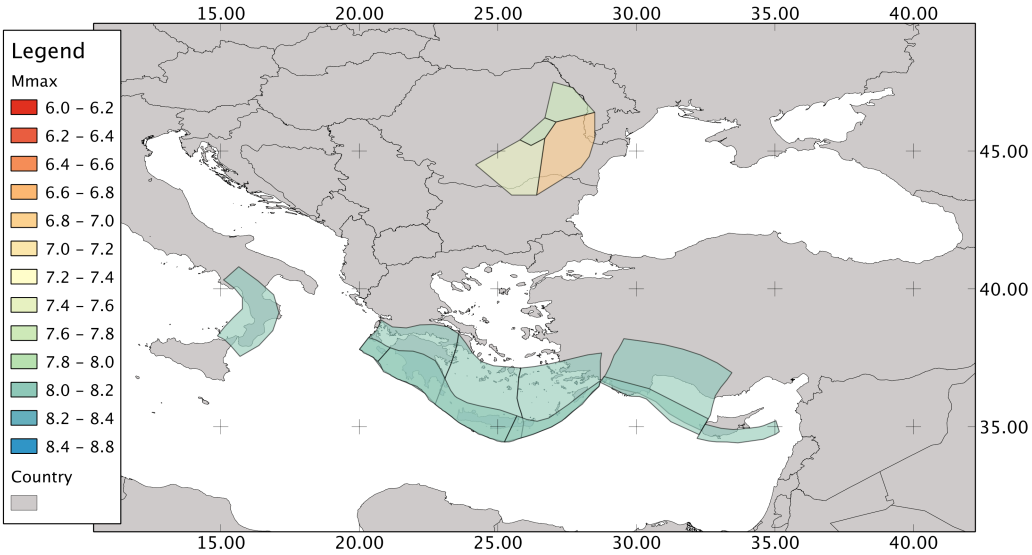

Figure 1. Seismic sources together with their assigned maximum magnitude for modelling the subduction interface and in-slab seismicity as well as the deep seismicity in Vrancea Region, Romania, as defined by ESHM13.

REFERENCES

Sokolov, V.Y., Bonjer, K.P., Wenzel, F., Grecu, B., Radulian, M. (2008). Ground-motion prediction equations for the intermediate depth Vrancea (Romania) earthquakes. Bulletin of Earthquake Engineering. 6(3): 367-388.