Towards a future seismic design code for Romania – recent developments

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1. Introduction

The last version of the Romanian seismic design code P100-1/2013 has been issued in 2013. One of the main modifications compared to the previous version from 2006 is related to the increase of the mean return period for the design seismic action from 100 years to 225 years (20% in 50 years probability of exceedance). However, this value is below the current accepted mean return period (475 years) of the design seismic action accepted at European level.

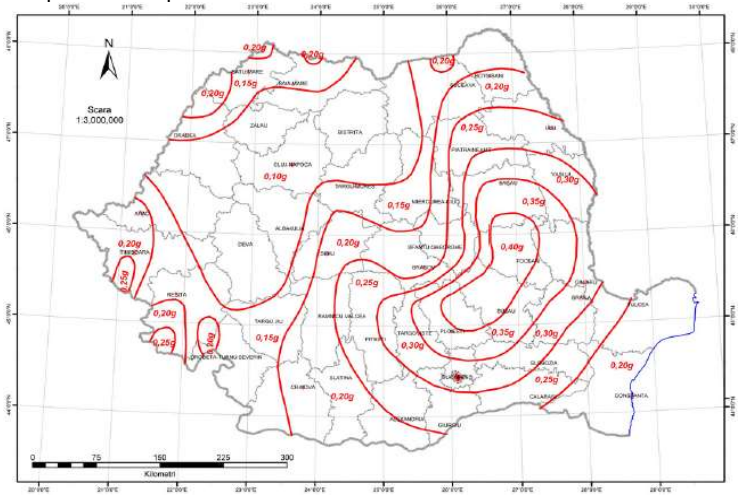

Figure 1 – Seismic zonation map for Romania according to the P100-1/2013 (2013)

Another key issue in the future revision of the Romanian seismic design code is related to the evaluation of the soil conditions and the design spectral acceleration response spectra. Currently, the soil conditions are defined in terms of the control period T_C which represents the border between the constant acceleration and constant velocity plateau. Three values, namely 0.7 s, 1.0 s and 1.6 s for the control period T_C computed based on ground motion recorded during the Vrancea intermediate-depth earthquakes of March 1977 (M_W = 7.4, h = 94 km), August 1986 (moment magnitude M_W = 7.1, h = 131 km) and May 1990 (moment magnitude M_W = 6.9, h = 91 km) are proposed by the code. Consequently, large spectral displacement demands are imposed by the code, especially for sites with T_C = 1.6 s as is the case of Bucharest, the capital city of Romania.

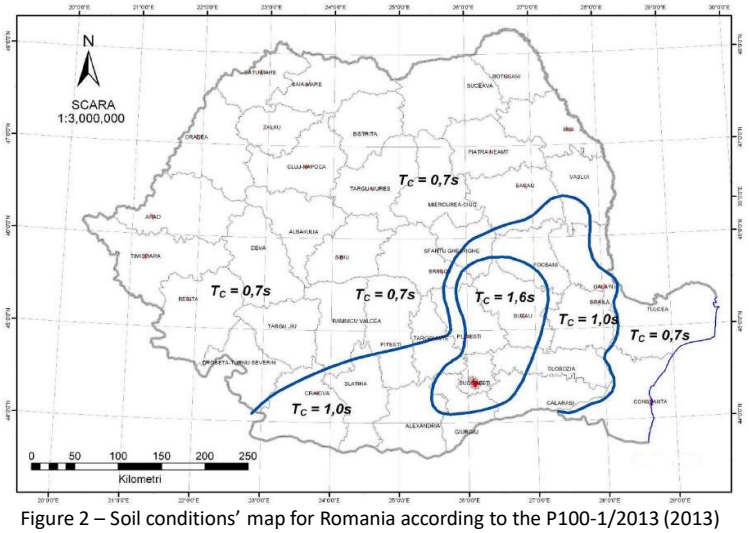

Figure 2 – Soil conditions' map for Romania according to the P100-1/2013 (2013) code

2. Recent and future developments

Among the recent developments regarding the development of a future version of the Romanian seismic code, several aspects could be mentioned:

- Updating the ground motion database with recordings from recent Vrancea earthquakes (2016 and 2017);
- Development of a seismic hazard model for soil and rock conditions;
- Evaluation of site-dependent soil amplifications for Bucharest.

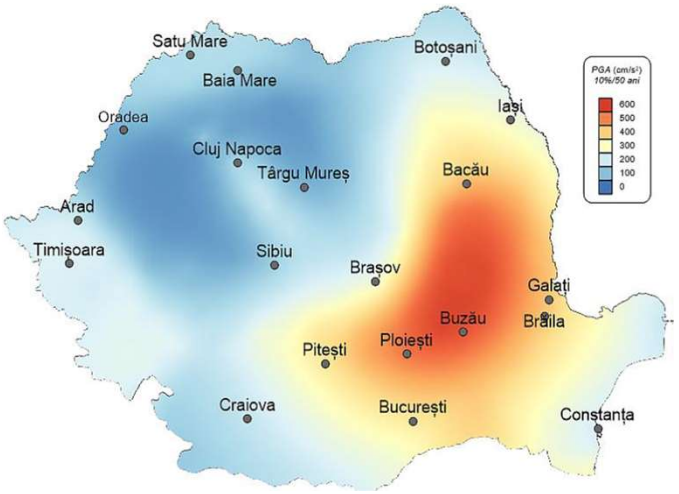

Figure 3 – Seismic hazard map for peak ground acceleration for a mean return period of 475 years (Pavel et al. 2016)

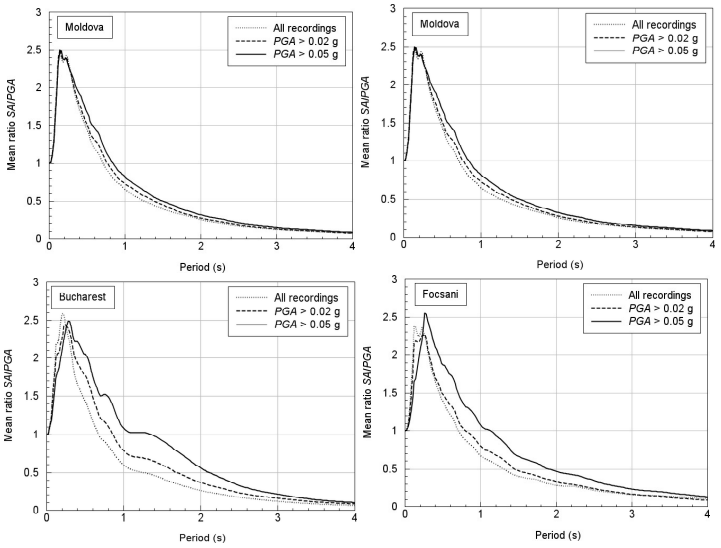

Figure 4 – Normalized acceleration response spectra as a function of peak ground acceleration level and region

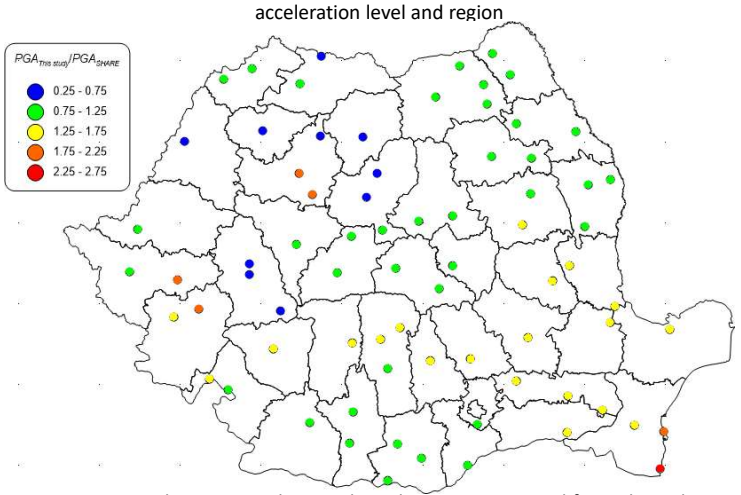

Figure 5 – Ratio between peak ground accelerations computed for rock conditions (this study vs. SHARE)

Future developments:

- Application of the single-station sigma method using data from both crustal and intermediate-depth earthquakes;
- Evaluation of soil amplifications using nonlinear ground response analyses;
- Development of site-specific design spectral shapes.