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Earthquake risk modeling for Baden-Wurttemberg, Germany

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The paper is to present an improved CEDIM Earthquake Risk Model aimed at assessing probable seismic damage and losses on a regional scale. The main concept of the GIS-based approach was described in several previous publications of the CEDIM earthquake team and the developed computational algorithm based on simplified models was used for the seismic risk mapping for Germany. Here several principal improvements of the method are presented, which concern all the main factors contributing to the risk (hazard, vulnerability, assets) and allow obtaining more detailed and accurate estimates of damage and losses in earthquake prone areas. The description and application of the modified approach is done with specific reference to the area of the Federal State of Germany – Baden-Wurttemberg. The main modifications of the approach are as follows:
- Utilization of the CORINE land use data (CORINE Land Cover 2000 – Germany), so the real spatial distribution of the building stock within the area of communities can be taken into consideration. Consequently, the intersection of the asset and hazard layers can be done in a more accurate manner. The intersection of the grid of the CLC classes with the grid of the administrative boundaries of communities increases the number of the computational cells and allows more differentiated consideration of the affected area. This is especially appropriate for analysis of scenario earthquakes.
- Improvement of the vulnerability composition models is done on the base of available information from the INFAS statistical dataset. Instead of the previously used representative vulnerability models based on the classification of communities into population classes depending on their size, the improved approach implies construction of individual vulnerability composition models for all communities.
- Improvement of the method from the viewpoint of the seismic input for scenario earthquakes is based on a realistic engineering-seismological model proposed for Baden-Wurttemberg. The developed model is based on regional ground-motion models (Fourier Amplitude Spectrum), site amplification parameters and stochastic simulation. The model allows accounting for the variability of local geological conditions in the area under study and their probable influence on site effects.
The presented results include both analysis of the spatial distribution of the existing seismic risk in the state and estimates of damage and losses from generated scenario earthquakes.