

## Intensity Based Seismic Hazard Map of Republic of Macedonia

Dragi Dojcinovski, Biserka Dimiskovska, and Marta Stojmanovska

Institute of Earthquake Engineering and Engineering Seismology, University "Ss Cyril and Methodius", Skopje, Macedonia,  
The Former Yugoslav Republic Of (dragi@pluto.iziiis.ukim.edu.mk)

The territory of the Republic of Macedonia and the border terrains are among the most seismically active parts of the Balkan Peninsula belonging to the Mediterranean-Trans-Asian seismic belt. The seismological data on the R. Macedonia from the past 16 centuries point to occurrence of very strong catastrophic earthquakes. The hypocenters of the occurred earthquakes are located above the Mohorovicic discontinuity, most frequently, at a depth of 10-20 km.

Accurate short-term prognosis of earthquake occurrence, i.e. simultaneous prognosis of time, place and intensity of their occurrence is still not possible. The present methods of seismic zoning have advanced to such an extent that it is with a great probability that they enable efficient protection against earthquake effects. The seismic hazard maps of the Republic of Macedonia are the result of analysis and synthesis of data from seismological, seismotectonic and other corresponding investigations necessary for definition of the expected level of seismic hazard for certain time periods. These should be amended, from time to time, with new data and scientific knowledge.

The elaboration of this map does not completely solve all issues related to earthquakes, but it provides basic empirical data necessary for updating the existing regulations for construction of engineering structures in seismically active areas regulated by legal regulations and technical norms whose constituent part is the seismic hazard map. The map has been elaborated based on complex seismological and geophysical investigations of the considered area and synthesis of the results from these investigations.

There were two phases of elaboration of the map. In the first phase, the map of focal zones characterized by maximum magnitudes of possible earthquakes has been elaborated. In the second phase, the intensities of expected earthquakes have been computed according to the MCS scale. The map is prognostic, i.e. it provides assessment of the probability for occurrence of future earthquakes with a defined area distribution of their seismic intensity, depending on the natural characteristics of the terrain.

The period of 10.000 years represents the greatest expected seismic threat for the considered area. From the aspect of low-cost construction, it is also necessary to know the seismicity in shorter time periods, as well. Therefore, maps for return time periods of 50, 100, 200, 500 and 1000 years have also been elaborated. The maps show a probability of 63% for occurrence of expected earthquakes with maximum intensities expressed on the MCS scale. The map has been elaborated to the scale of 1: 1.000.000, while the obtained isolines of seismic intensity are drawn with an error of [U+F0B1] 5 km.

The seismic hazard map of R. Macedonia is used for:

- The needs of the Rulebook on Technical Norms on Construction of Structures in Seismic Areas and for the needs of physical and urban planning and design.
- While defining the seismic design parameters for construction of structures in zones with intensity of I [U+F0B3] VII degrees MSK, investigations should be done for detailed seismic zoning and microzoning of the terrain of these zones in compliance with the technical regulations for construction in seismically prone areas.
- The areas on the map indicated by intensity X MCS are not regulated by the valid regulations. Therefore, in practice, these should be treated as such in which it is not possible to construct any structures without previous surveys.
- Revision of this map is done at a five year period, i.e. after each occurred earthquake whose parameters are such that require modifications and amendments of the map.