

COMPILATION OF AVAILABLE SEISMOTECTONIC DATA FOR NORTH MACEDONIA AS AN INPUT FOR PSHA

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North Macedonia is a country characterized by moderate seismic activity. As a consequence of its special tectonic regime, and occurrence of damaging earthquakes (12 earthquakes $M_L \geq 6$ after 1900; [1]), necessity for reliable seismic hazard and risk assessments are of utmost importance. Initial and one of the most important steps in PSHA is the seismic source characterization. Reliable seismological and tectonic data are one of the key pillars of the reliable seismic hazard assessment. For the purpose of this study a compilation, comparison, and analysis of available national and regional seismotectonic data for North Macedonia ([2]; [3]; [4]; [5]; [6]; [7]; [8]) have been performed. In relation to seismological data, three earthquake catalogues that can be used with reliability are selected and comparatively analyzed: the national catalogue from the seismological observatory (SO-PMF)¹ [9], the BSHAP-2² catalogue [10] and the ESHM20³ catalogue [8].

Detailed analysis of the available national fault databases shows that none of them comprises of all relevant state-of-the-art seismicity parameters, needed for reliable seismic hazard definition. The most comprehensive national database as of now is the one given by [4]. The databases presented in the [2], [3] and [5] although containing valuable geological and tectonic information, does not offer a consistent and harmonized set of seismic fault parameters. The latest national research presented in [7] should be considered as valuable in the domain of fault classification and slip rate determination. Regarding the latest European research, the 2020 update of the European Seismic Hazard Model – ESHM20, although comprehensive by its structure and content, this database is created with larger regional resolution and contains information only for seismogenic faults that may be capable of generating earthquakes with magnitude ≥ 5.5 , which limits the overall fault modelling excluding the faults that are capable of generating earthquakes with magnitude 4.0 – 5.5.

Analyzed earthquake events from the three chosen catalogues refer to the region defined by the boundaries $40.6^\circ N \leq \varphi \leq 42.4^\circ N$ and $20.3^\circ E \leq \lambda \leq 23.2^\circ E$ (Republic of North Macedonia and surrounding areas) and the 100 km belt around the zone ($39.8^\circ N \leq \varphi \leq 43.3^\circ N$, $19.3^\circ E \leq \lambda \leq 24.2^\circ E$). To compare the catalogues, two main criteria were taken: time period 1900-2012 and moment magnitude of earthquakes ≥ 4.0 . For the selected earthquake catalogues, a detailed analysis has been performed including comparison of the completeness magnitude (M_c), histogram analysis, time domain analysis for the selected parameters of interest, comparison of completeness intervals and comparison of spatial distribution of seismic hazard parameters (λ , b и M_{max}) [11]. Also, earthquakes with moment magnitude ≥ 6.0 are spatially analyzed and their magnitude and epicentral deviation in relation to the ESHM20 catalogue have been calculated. Significant differences have been observed between the

¹ SO-PMF: Seismological Observatory, Faculty of Natural Sciences and Mathematics, Ss. Cyril and Methodius University in Skopje, N. Macedonia.

² BSHAP-2: NATO SpS-984374 project, Improvements of the Harmonized Seismic Hazard Maps for the Western Balkan Countries

³ ESHM20: European Seismic Hazard Model 2020

analyzed earthquake catalogues generally resulting from the difference in the number of events and the related parameters, which ultimately affect the estimation of the seismic hazard parameters.

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