

Improved Regression Relations Between Different Magnitude Types and the Moment Magnitude in the Western Balkan Earthquake Catalogue

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Abstract : The seismic event catalog has been updated in the framework of a bilateral project supported by the Central European Investment Fund and with the extensive support of Global Earthquake Model Foundation to update Albania's national seismic hazard model. The earthquake catalogue prepared within this project covers the Western Balkan area limited by 38.0° - 48°N, 12.5° - 24.5°E and includes 41,806 earthquakes that occurred in the region between 510 BC and 2022. Since the moment magnitude characterizes the earthquake size accurately and the selected ground motion prediction equations for the seismic hazard assessment employ this scale, it was chosen as the uniform magnitude scale for the catalogue. Therefore, proxy values of moment magnitude had to be obtained by using new magnitude conversion equations between the local and other magnitude types to this unified scale. The Global Centroid Moment Tensor Catalogue was considered the most authoritative for moderate to large earthquakes for moment magnitude reports; hence it was used as a reference for calibrating other sources. The best fit was observed when compared to some regional agencies, whereas, with reports of moment magnitudes from Italy, Greece and Turkey, differences were observed in all magnitude ranges. For teleseismic magnitudes, to account for the non-linearity of the relationships, we used the exponential model for the derivation of the regression equations. The obtained regressions for the surface wave magnitude and short-period body-wave magnitude show considerable differences with Global Earthquake Model regression curves, especially for low magnitude ranges. Moreover, a conversion relation was obtained between the local magnitude of Albania and the corresponding moment magnitude as reported by the global and regional agencies. As errors were present in both variables, the Deming regression was used.

Keywords : regression, seismic catalogue, local magnitude, tele-seismic magnitude, moment magnitude

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