P8-1 SEISMOLOGICAL RISK ANALYSIS OF WESTERN TURKEY AND THE RESULTS OF GRAVITY DATA

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Some probability and statistic methods were used to estimate the seismic risk of western Turkey region which is rapidly deforming region of continental crust. Western Turkey is a zone of wide spread deformation within which complex relation exist between extensional, compressional and strike-slip deformation. The whole area is highly active seismically, and large magnitude historically and instrumentally recorded earthquakes have occurred. Most of the seismicity is associated with the Hellenic arc, the zones of normal faulting in Western Anatolia and strike-slip faulting in Greece. The most prominent structural and morphological feature of the western Turkey extensional province are E-W trending normal active fault systems which bounds the Buyuk Menderes, the Kucuk Menderes and the Gediz grabens. They may sole into sub-horizontal zones in the uppermost lower crust and therefore have a listrict geometry. Generally, the seismicity in western Turkey displays swarm-type activity with remarkable clustering of low-magnitude earthquakes in time and space mechanism solutions that are closely associated with major structures.

Gutenberg-Richter equation which is commonly used for seismic risk analysis was applied to the earthquake data of western Turkey region between 37°N - 40°N latitudes and 26°E - 30°E longitudes. However, proper application, as given by Gutenberg-Richter and proper interpretation of the results is very important in use of this equation. Otherwise, wrong estimate of the parameters should be expected. Since the wrong use of this equation is seen in literature, the main objective of this study is to search the proper use Gutenberg-Richter equation. When cumulative probability distribution of earthquake magnitudes are assumed to be an exponential function, it is possible to obtain theoretically and exactly the same equation of Gutenberg-Richter. Application of the method showed that Gutenberg-Richter equation, $\log N = a - bM$ where N is the number of the earthquakes which magnitudes equal to M or greater per unit time, should be used and interpreted as originally proposed.

The other objective of this study is the applicability of annual maximum value series, which is widely used in flood risk analysis in hdrogeology, in seismic risk studies. In this method maximum values of the magnitudes of each year are chosen initially. A lot of empirical equations have been suggested to estimate the probabilities of maximum values. In this study empirical Weibull equation was used. Normal, Log-normal, Exponential and Gumbel distributions were compared for the maximum values. Consequently, the proper probability distribution of the maximum magnitudes was found to be Normal distribution and applicability of maximum values method in seismic risk studies was shown.

And also 3-Dimensional Hilbert Transformation, which is used to estimate the structural parameters with the use of derivatives in x, y, z direction of the potential field data, was applied the gravity data of western Turkey region. Up to now, 3-D Hilbert Transformation has successfully applied to synthetic magnetic data. 2-D Hilbert Transformation technique is of a limited applicability because of the implicit assumption that the source is linear and 2-D body oriented at right angles to the profile direction. However, 3-D Hilbert Transformation has no limits in applicability and it can be used for all 3-D anomalies.

Only the first vertical derivative of gravity potential is measurable in gravity method. The other first and second derivatives of potential can be obtained using 3-D Hilbert Transformation purposes. Obtained derivatives determine the boundaries and upper surface corners of structures giving rise to the anomaly. By using 3-D Hilbert Transformation in the field data, fault lines defining tectonic zones, lateral and vertical relative motions of blocks can be determined.

Structural parameters obtained from the first and second derivatives of gravity potential data, plotted maps of magnitude and energy distribution and the tectonic map of the western Turkey region are given to show and to make comparison about the results.