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INTERPRETATION SEISMIC AND GRAVITY DATA OF HAZAR LAKE AND SURROUNDINGS, EASTERN ANATOLIA

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Abstract. The frequency-magnitude distribution of the earthquakes occurred in the city of Elazig and surrounding area was analysed with Bouguer gravity anomaly map. This region is located in Eastern Anatolia and tectonically very active and has a high seismic hazard risk. A complete set of 1550 earthquakes of Md ≥ 1 from 1 January 2010 to 28 February 2019 was used. The spatial mapping of frequency-magnitude distribution was produced. Outstanding variations in the b-value were detected with b ranging from b ≈ 0.7 to 1.3. The gravity anomaly were showed the lineaments and especially important geologic units. The results show that the accumulated stresses are high at the Pütürge segment in contrast to the fault, drawn in the south, represents the main thrust belt that runs through Hani-Lice and stretches to Çüngüş. The realtionships between two data, showing very high relation between them. The last activity on this area, the results of this study will give very clearly information to earthsciences.

Keywords: seismic, gravity, data

Introduction. The tectonic structure of the Anatolian plate is very complex because of the many plates such as the Eurasian, the Arabian and African plates significantly influenced its tectonic and geodynamic structure (Şengör and Yılmaz 1981). An interplay of this movement and also the geological process of the Mediterranean layer to a lower place the Anatolian plate causes a N-S expansion and E-W shortening in western Turkey. As a consequence of this, the area is underneath expansion in a NNE-SSW direction. The interactions cause a large variety of complex tectonic processes like collision, subduction, back-arc extension, strike-slip faulting and rotation of different blocks and microplates at intervals a comparatively little region (Ketin 1966). Elazığ located in Eastern Anatolia, where has a complex and active tectonic structure (Hempton

1983). The aim of the study is to investigate the seismic activity of the studied region by using a-value and b-value and its realation with Bouguer anomaly map.

Data and Methods. To calculate seismic parameters consisting of a-value, b-value and Mc (Magnitude of Completeness) of the study area, a complete set of 1550 earthquakes of Md ≥ 1 from 1 January 2010 to 28 February 2019 taken from Bogazici University, Kandilli Observatory and Earthquake Research Institute, Regional Earthquake-Tsunami Monitoring Center (KOERI) was used. The spatial mapping of frequency-magnitude distribution was produced for the study region. log10N= a – bM is used to define the frequency of occurrence of earthquakes as a function of magnitude where N denotes the cumulative number of earthquakes with magnitude greater than M (Gutenberg and Richter, 1944). Bouguer gravity anomaly map taken by joint study of MTA and TP was used to determine the tectonic lineaments of the study area shown in Fig. 1. The region gives negative gravity anomalies range between negative 116 to 56 mGal. Regional anomalies with negative high amplitude dominate in Bouguer gravity anomaly map of Eastern Anatolia region due to the thick crust (Pamukcu et al 2007). High negative gravity anomalies (maximum anomalies) indicates topographic highs.

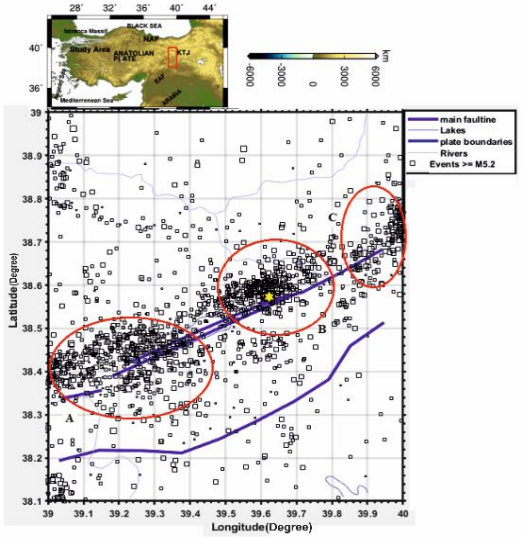

Figure *1.* – The location of the study area within Turkey and the epicentres of the earthquakes

Results. Seismotectonic b- and a-values of the study area are investigated by the analysing of region-time characteristics of earthquakes in Elazig, Turkey. The b-value is computed as 1.33±0.06 with a completeness level of 2.6, and this result indicates that frequency-magnitude distribution of seismicity in Elazig is well represented with a b-value slightly greater than 1.0. The spatial b-value map for the region (Fig.2, 3) indicated that the b-values of seismicity for the whole region is not homogeneous. The observed variations in b value are probably related to changes in locally and regionally stresses accumulated in the region. The regional variation in b-value may be associated with changes in stress of the active fault systems. An inverse relation between gravity anomaly and b-value is found. Negative high gravity anomalies and intermediate to high b-values are associated with a comparatively thicker crust. On the other hand, high gravity anomaly and low b-values are all consistent with a thinner crust.

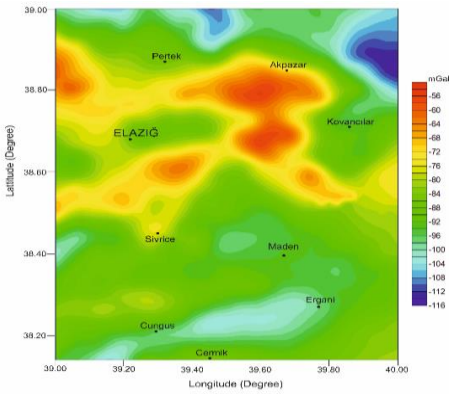

Figure *2.* – Bouguer gravity anomaly map of the region.

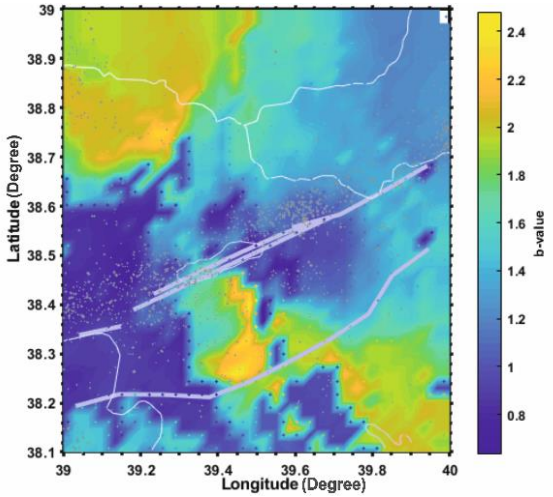

Figure *3.* – Regional variations of b-value changes between 1 January 2010 - 28 February 2019

Conclusion. Negative high gravity anomalies and intermediate to high b-values are associated with a comparatively thicker crust. On the other hand, high gravity anomaly and low b-values are all consistent with a thinner crust.

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