

Seismicity and Tectonics of the Bingöl Area: Eastern Anatolia

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In this study, Bingöl Earthquakes which have occurred in recent years have been evaluated from seismological point of view. The Eastern Anatolia Region is the most seismologically deformed area of the Anatolian plate and is under compression due to the relative movement of the Arabian and Eurasian plates in general. The Anatolian plate bounded by the North Anatolian Fault Zone (NAFZ) and Eastern Anatolian Fault Zones (EAFZ) moves relatively westward. Bingöl Earthquakes are located within the Eastern Anatolian Fault Zone and this fault zone occurs due to the movement of the parts. Bingöl and the surrounding area is the most active regions in Turkey in terms of seismicity. The most important earthquakes in Bingöl during the instrumental period were the 1971 and 2003 earthquakes. Bingöl Fault starts from the south of Bingöl and extends along the Göynük stream valley. This fault length is about 75 km. which is northern part of the Eastern Anatolian Fault Zone and joins the North Anatolian Fault Zone after passing through the villages of Serpmekaya and Sakaören. During the 1971 Bingöl Earthquake, about 38 km surface rupture occurred which it started from Ormanardi to the southeast of Bingöl and extends to the N45°E degree in the southwestern direction of Göynük. The observed faults showed a strike-slip and a left lateral movement and the fault plane solutions supported the field observations. The other important earthquake occurred on May 1, 2003. In this earthquake, 176 citizens were killed and 521 citizens were injured in various places. In particular, public buildings were severely damaged. The epicentral area is between the Balikcay village plateau, Hanocayiri-Kurtulus and Sudugunu Plateau. Stepped fractures with NW-SE trending N20-30°W trending were observed in Hanocayiri, which is one of the closest settlements of earthquake. As a result of earthquake, a great deal of collapses and mud currents were formed due to the effect of groundwater pressure. The fault traces in the region continued on the slopes of the NW-SE trending Kade mountains. Liquefaction, sitting, collapse and faulting samples were seen together in Hanocayiri hamlet. The earthquake caused severe damage, destruction and death in the buildings located on the alluvial terrace of Göynük Creek in Bingöl province. During the earthquake, the Celtiksuyu Boarding School of Bingöl province was completely destroyed and 84 students died under the rubble. In addition, many public buildings were damaged. The macroseismic epicenter of the earthquake is approximately 12 km. distance between the district of Elcagini-Elmacayiri and Sudugunu plateaus. The area is mountainous and there are no frequent settlements. The nearest settlements are Balikcay, Hanocayiri Village, Elmacayiri village and Kurtulus village. It was observed that the epicenter of Bingöl Earthquake was highly compatible with the NW-SE trending faults. The fault of N-NW, which passes between Kurtulus-Elmacayiri-Hanocayiri and towards the Balikcay-Cimenli villages, was defined as the fault which was broken by the 2003 Bingöl Earthquake. In this study, 12 earthquakes fault plane solutions have given (magnitude $M_w > 5.0$) between 1971-2015 time period in Bingöl. The fault plane solution of 6 earthquakes was conducted within the scope of the study. The stress analysis shows that the dominant stress axes in the region are dominated by NW-SE directional compression and strike-slip faulting which are characterized by NE-SW extension axes. The recent earthquakes showed that the ongoing deformation in the region continued with the strike-slip fault systems as the dominant. Structural heavy damages caused by earthquakes were mostly due to poor soil conditions, improper production, low quality and missing materials.

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