

Kinematic features, Fault Segmentation and Historical Earthquakes of the Ganos Fault Zone, NW Turkey.

Yaltırak C.,(1), Alpar, B.(2), Altınok Y. (3), Elitez, İ., (1) Tur, H., (3) Kıyak, N. (4), Zabcı C. (1)

(1) İstanbul Teknik Üniversitesi, Jeoloji Mühendisliği Bölümü, Maslak, İstanbul

(2) İstanbul Üniversitesi, Deniz Bilimleri ve İşletmeciliği Enst., Deniz Jeolojisi ve Jeofiziği Anabilim Dalı, İstanbul

(3) İstanbul Üniversitesi, Mühendislik Fakültesi, Jeofizik Mühendisliği Bölümü, Avcılar, İstanbul

(4) Işık Üniversitesi Fen-Edebiyat Fakültesi Fizik Bölümü, Maslak, İstanbul

Corresponding Author: Yaltırak, C., (yaltirak@itu.edu.tr)

Ganos Fault (GF) and surrounding fault segments initially evaluated five different tectonic event. **A:** Firstly an accretionary prism, which has an age of Cretaceous to Paleocene. **B:** The primary sense of motion was thrusting in the lower Eocene. **C:** This primary north-dipping thrust fault was inverted to a listric normal fault by the regional extensional regime during the middle Eocene-early Oligocene epoch. **D:** The extension was inverted to a compressional regime again during the late Oligocene and faults gained a oblique character by NW-SE compression, which started at early Miocene. The north dipping faults, located on and the south of the Ganos Mt. became nearly steep and were inverted to right lateral faults. The dextral system of the Ganos was the secondary branch of the Trakya-Eskişehir Fault Zone (TEFZ), which was extending from Trakya in the northwest and the Eskişehir in the southeast. **E:** GF became a part of the North Anatolian Fault (NAF) by the Pliocene and the Ganos Mt, Doluca Hill, Helvatepe, Tahtatepe and Gelibolu Peninsula resumed to uplift as a positive flower structure because of the system's obliquity. The present segmentation and historical earthquakes of the GF has developed according to its kinematic evolution. In this context, the GF doesn't extend as a straight line from the Sea of Marmara to the Gulf of Saroz and has two abutting, nearly parallel segments. The 1912 surface rupture corresponds to the 72-km-long segment named as Western Ganos Segment, which is located between the Western Marmara Ridge and Yeniköy-Ekzamil. Gutzwiller mapped the 1912 rupture just 21 months after the earthquake (April-May 1914) and defined it as rupture line (bruchlinean) on its map legend. Another rupture line was also mapped by Gutzwiller coincides with Tepeköy Fault, which is probably relevant with the 1912 earthquake. This 55-km-long second segment extends through the Evreşe Plain, Sofu Village and it ends in the Gulf of Saroz. The main fault bounds to the north edge of the trough and branches in to 10-15-km-long three segments. Another fault zone represented by many NWW-SEE echelon faults is at the south of these faults. The total motion is distributed on these parallel segments. The total slip rate for this section of the NAF is calculated 19 mm/a by using the offset of a last glacial canyon (14 mm/a) at the northern edge and shear zone reference points (5 mm/a) in the middle. The multi-segmented structure of the GF makes an alternative historical earthquake scenario. Considering the slip rate of 19 mm/a, 263 years of strain accumulation is needed to have the 5 m maximum horizontal offset of the 1912 Ganos Earthquake. In this case, 1659 historical earthquake is a more possible candidate for this segment rather than 1766b event. The 1659 earthquake mostly affected the eastern parts of the GF. The destructive effect of the 1766b earthquake in the region is the result of the ground amplification of the Miocene aged formations. 1999 İzmit Earthquake created destruction in the Avcılar and Yeşilköy (İstanbul), because of the same geologic units. Another important point is if the 1912 earthquake extended to the Gulf of Saroz or not. 70 cm deep trench on the fault reveals undeformed laminated sandy layers. An OSL sample, which is obtained from the 20 cm depth of this laminated sandy layer, is aged 46 ± 14 years BP. This 70 cm-thick and undeformed laminated sands are approximately 150 year old and they do not show any evidence of 1912 earthquake for the western segment. Additionally, the OSL age analysis performed from liquefactions near the fault indicates that the most recent earthquake occurred in the 1700s. These ages obtained from trench studies on the western segment (Rockwell et al., 2009) shows that the year of the earthquake suggested as 1766 coincides with the destruction of the 1756 Evreşe Castle. The Ganos segmentation also explains how 1344 and 1354 earthquakes were occurred on similar area. When 1344 earthquake created damage the region of Gaziköy-Mürefte, 1354 earthquake affected from Gelibolu to Gölcük.