

Heterogeneity of resistivity structures along the 1944 Bolu-Gerede earthquake rupture, North Anatolian Fault, Türkiye

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SUMMARY

The North Anatolian Fault Zone is an approximately 1,000 km long transform fault in northern Türkiye where cascading large earthquakes occur in approximately 500 year cycles (e.g. Stein et al., 1997). One such large earthquake was the 1944 Bolu-Gerede earthquake (Mw 7.2), the rupture of which was reported to comprise five segments (Kondo et al., 2005). Furthermore, the 1944 earthquake ruptured different segments than the previous cycles (Ambraseys, 1970), and the İsmetpaşa segment, located in the eastern part of the 1944 rupture, was confirmed to be in continuous creep motion by recent InSAR analysis (Kaneko et al., 2013). In 2022, we performed broadband MT observations around the rupture zone of the 1944 Bolu-Gerede earthquake to determine whether there are structural features that would dominate multi-segment rupture and creep motion. Electromagnetic field data were acquired at 36 locations, yielding very good quality MT responses. Preliminary inversion analysis revealed the following structural features. (1) The eastern segments, where the creep event is currently occurring, have a thick low resistivity region to a depth of 5 km, in contrast to the western segments. (2) Several high resistivity zones in the seismogenic zone, thought to correspond to the locked patches along the fault plane, are majorly bounded by a low resistivity zone to the east of the Gerede segment. (3) Below some segments, there are notable low resistivity bodies in the lower crust.

Keywords: resistivity structure, heterogeneity, the 1944 Bolu-Gerede Earthquake, multi-segment faults, creep
