Geophysical Research Abstracts
Vol. 18, EGU2016-7446-1, 2016
EGU General Assembly 2016

Imaging the conductivity anomalies at the vicinity of Ganos Fault, northwest Turkey by magnetotellurics

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Audio-frequency magnetotelluric (AMT: 10400 Hz. – 1 Hz.) data were collected across Ganos Fault, near Mürefte, at the western part of North Anatolian Fault, Turkey. The twelve observation points were densely distributed to form a north – south aligned continuous profile that aims to reveal the electrical resisitivity structure to a depth of 1500 m. Ganos Fault is inactive since 1912 Mürefte Earthquake (Ms: 7.4) and acts as a locked segment with the potential to generate a significant event in the near future. Preliminary dimensionality analyses of the AMT data were performed by using three approaches; strike angle determination following Groom and Bailey decomposition (N70ºE), phase tensor analyses (N70ºE) and induction vectors (N60ºE). All of these methods gave results that are in good agreement with present geological (N70ºE) and seismological (N70ºE) values. Following the dimensionality analyses, two- and three- dimensional numerical modeling routines were utilized to perform inverse modeling. The inversions were performed by different methods such as Rodi and Mackie, WinGLink, (2001) and Ogawa and Uchida, ABIC, (1996) for 2D and Siripunvaraporn et al., WSINV3DMT (2005) and Egbert and Kelbert, ModEM (2012) for 3D. All modeling attempts ended up with similar models suggesting that: (i) A significant low resistivity anomaly was detected just below the fault's trace representing the so-called "fault zone conductor" with 400 m width and 500 m depth, (ii) An asymmetric damage zone is present involving the fault's core concentrated to the south, (iii) A resistivity contrast between the two sides of the fault, representing a geological boundary between Eocene aged Keşan Formation in the north and Miocene aged Çengelli Formation in the south (iv) Opiholitic basement appears as a high resistivity block at a depth of 800 m.