Geophysical Research Abstracts
Vol. 13, EGU2011-1740, 2011
EGU General Assembly 2011

Identification of buried normal faults with GPR: a case study in the Büyük Menderes Graben, Western Turkey

Cahit Caglar Yalciner (1), Erhan Altunel (2), Maksim Bano (3), Mustapha Meghraoui (3), Volkan Karabacak (2), and H. Serdar Akyuz (4)

(1) Çanakkale Onsekiz Mart University, Çan Vocational College, Çan, Çanakkale, Turkey (caglaryalciner@gmail.com), (2) Eskisehir Osmangazi University, Department of Geology, Eskisehir, Turkey, (3) EOST – CNRS UMR 7516, 5 rue René Descartes, 67084 Strasbourg Cedex, France, (4) Istanbul Technical University, Department of Geology, Turkey

Location of a fault is important in active fault studies. Since the motion is vertical in normal faults, they are characterized by scarp in the field. However, scarps of normal faults in unconsolidated units are not resisted for a long time and are removed as a result of either geological processes (such as erosion, sedimentation) or man-made activity (such as agriculture, modification). In such environments, it becomes difficult to locate the fault on the basis of geological and geomorphological observations.
Ground Penetrating Radar (GPR) is a shallow geophysical method and this method has widely been used in active fault studies but most studies have been concerned with the location of buried structures. The GPR method works on the basis of recording of the reflections of the electromagnetic waves from the interfaces by a horizontal receiver which were transmitted to the ground with high velocity by using a horizontal antenna. Data collected is filtered to eliminate the environmental and instrumental noise by using computers and then interpreted to determine the buried structures in high resolution and sensitivity. New types of shielded GPR antennas provide more rapid and reliable results with high resolution, providing that the following parameters can be considered to get significant GPR data in paleoseismology: i – The thickness of young sediments which in general, are conductive; ii - topographic differences between the beginning and the end points of profiles; iii - the reflection characteristics from surface objects (e.g. electrical poles, vegetation, trees); iv - the GPR profiles should be perpendicular to the fault zone.
In this study, we performed GPR in two sites in the Büyük Menderes Graben that is one of the most active tectonic structures of western Turkey. Boundary faults of the Büyük Menderes graben reactivated in historical times. However, in some places, surface ruptures of historical events are not visible at the surface as a result of sedimentation, erosion and modification. The GPR method was applied to locate the ruptures of historical events where they do not provide any evidence at the surface. Without performing GPR, field observations alone would not be capable of recognizing fault traces. In addition to locate the fault, we tried to identify borders of offset stratigraphic units from contrasting electrical properties, such as grain size distribution (sorting, clay content), porosity and water content that would help to estimate vertical offset on the fault. On the basis of GPR studies, trenches were conducted in these locations to compare the GPR results with exposed evidence. Comparison of trench data with the GPR results showed a good correlation especially in planar surfaces (faults) and main stratigraphic units.