Geophysical Research Abstracts
Vol. 17, EGU2015-1432-1, 2015
EGU General Assembly 2015

Integrated Multidisciplinary Fault Observation System in the western part of the main Marmara Fault in the frame of an EU-FP7 project, titled as MARSITE

Oguz Ozel (1), Cansun Guralp (2), Suleyman Tunc (3), Esref Yalcinkaya (1), and Nurcan Meral Ozel (3)

(1) Istanbul University, Engineering Fac., Geophysical Dept., Istanbul, Turkey (oguzozel@istanbul.edu.tr, +902124737017), (2) Guralp Systems Limited, Reading, UK (cguralp@guralp.com), (3) Bogazici University, Kandilli Observatory & Earthquake Research Institute, Istanbul, Turkey (stunc@syy.com.tr)

The main objective of this study is to install a multi-parameter borehole system and surface array consisting of eight broadband sensors as close to the main Marmara Fault (MMF) in the western Marmara Sea as possible, and measure continuously the evolution of the state of the fault zone surrounding the MMF and to detect any anomaly or change which may occur before earthquakes by making use of the data from these arrays. The multi-parameter borehole system is composed of very wide dynamic range and stable borehole (VBB) broad band seismic sensor, and incorporate 3-D strain meter, tilt meter, and temperature and local hydrostatic pressure measuring devices. All these sensors are installed in 146m-deep borehole. All the sensor outputs are digitized; total of 11*24 bit-channels and 6*20 bit-channels. Real-time data transmission to the main server of the Marsite Project at Kandilli Observatory in Istanbul is accomplished. The multi-parameter borehole seismic station uses the latest update technologies and design ideas to record “Earth tides” signals to the smallest magnitude -3 events, as the innovative part of the Marsite Project. Bringing face to face the seismograms of microearthquakes recorded by borehole and surface instruments portrays quite different contents. The shorter recording duration and nearly flat frequency spectrum up to the Nyquist frequencies of borehole records are faced with longer recording duration and rapid decay of spectral amplitudes at higher frequencies of a surface seismogram. The main causative of the observed differences are near surface geology effects that mask most of the source related information the seismograms include, and that give rise to scattering, generating longer duration seismograms. In view of these circumstances, studies on microearthquakes employing surface seismograms may bring on misleading results. Particularly, the works on earthquake physics and nucleation process of earthquakes requires elaborate analysis of tiny events. It is obvious from the studies on the nucleation process of the 1999 earthquake that tens of minutes before the major rupture initiate noteworthy microearthquake activity happened. The starting point of the 1999 rupture was a site of swarm activity noticed a few decades prior the main shock. Nowadays, analogous case is probable in western Marmara Sea region, prone to a major event in near future where the seismic activity is prevailing along the impending rupture zone. Having deployed a borehole system at the eastern end of the Ganos fault zone will yield invaluable data to closely inspect and monitor the last stages of the preparation stage of major rupture.