



The multi-parameter borehole system and high resolution seismic studies in the western part of the main Marmara Fault in the frame of MARSITE Project.

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

(1) Istanbul University, Engineering Fac., Geophysical Dept., Istanbul, Turkey (oguzozel@istanbul.edu.tr), (2) Consultant, Gaiacode. UK, (3) Kandilli Observatory&Earthquake Research Institute; Bogazici University, Istanbul, Turkey

The main objective of this study is to install a multi-parameter borehole system and surface array 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 the arrays already running in the eastern part of the Marmara Sea. The multi-parameter borehole system is composed of very wide dynamic range and stable borehole (VBB) broad band seismic sensor, and incorporate strain meter, tilt meter, and temperature and local hydrostatic pressure measuring devices. The borehole seismic station uses the latest update technologies and design ideas to record "Earth tides" signals to the smallest magnitude -3 events. Additionally, a surface microearthquake observation array, consisting of 8-10 seismometers around the borehole is established to obtain continuous high resolution locations of micro-seismicity and to better understand the existing seismically active structures and their roles in local tectonic settings. 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. Deploying a borehole system eastern end of the Ganos fault zone may yield invaluable data to closely inspect and monitor the last stages of the preparation stage of major rupture.