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The Armutlu Network - a contribution to seismic hazard assessment in the Marmara region

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The North Anatolian Fault Zone (NAFZ) represents one of the most prominent continental transforms and slips at an average rate of 20-30 mm/yr. During the 20th century, the NAFZ has ruptured over about 900 km of its more than 1,500 km length by ten devastating earthquakes with magnitudes above Ms $>$ 6.5. Today, a segment inside the Marmara Sea just south of the megacity of Istanbul represents a seismic gap that is believed being capable of generating a M $\geq$7 earthquake within the next decades. East of this segment the western end of the 1999 Kocaeli earthquake rupture is located next to the northern shoreline of the Armutlu Peninsula depicted by distinct clusters of micro-seismic activity.

As a contribution to hazard assessment the local seismic network ARMNET had been set-up in 2005 in co-operation between Kocaeli University, and GFZ, to monitor the chronological evolution of seismicity, and to investigate the deformation of the Armutlu Peninsula, as well as possible interactions between seismic waves and pore-pressure variations in geothermal systems. The installation was strongly supported by local governments, and lead to a strong interest and an increasing knowledge transfer to local authorities. The ARMNET contributes to the implementation of an Anatolian plate boundary observatory (PBO) belonging to a series of GFZ-operated Earth System Observatories to systemically study coupled Earth processes, and is imbedded in the framework of the CEDIM (CEnter for DIsaster Management and Risk Reduction Technology) project “Megacity Istanbul”, which involves the analysis of the seismicity of the Greater Istanbul region.

At present, ARMNET consist of 12 short period and 10 broadband stations. Additionally, a borehole seismometer has been installed in a 100 m borehole close to Yalova. Most of the detected events occurred in a depth range of 5 to 15 km, and determined duration magnitudes are in a range 0.4 and 5.3 with a magnitude of completeness of 1.3. Besides seismic observations water parameters like pressure and temperature are recorded at the thermal fields of Yalova and Armutlu. First examples have shown dynamic and static response after events. The static pressure increase is attributed to an interaction between the seismic wave and the reservoir.