# The North Anatolian Fault in the broader Istanbul/Marmara region: Seismic monitoring of a seismic gap

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The North Anatolian Fault Zone (NAFZ) in Turkey represents an about 1400 km long plate boundary that slips at an average rate of 20-30 mm/yr separating the westward moving Anatolian block in the South from Eurasia in the North. The 1999 Mw=7.4 Izmit earthquake represents the latest of a series of westward migrating mainshocks along the NAFZ starting near Erzincan, Eastern Anatolia, in 1939.

The western termination of the Izmit rupture is located in the eastern Marmara Sea near the Prince Islands in direct vicinity to the Istanbul Metropolitan region with its 14 million inhabitants. There, five seismic events with M$>$6 occurred since 1509. The events in 1509, 1754, 1766, and 1894 have generated tsunamis with waves exceeding 6 m height in some cases. Also, the 1999 Izmit earthquake reflecting pure strike-slip faulting generated a minor tsunami with local wave heights $>$2 m. The Marmara segment of the NAFZ today represents the eastern termination of a $>$100 km long seismic gap below the Sea of Marmara where a slip deficit of 4-5 m might have accumulated since the last major earthquake in 1766. It is believed being capable of generating two M$\geq$7.1 earthquakes within the next decades or could even rupture in a large single event.

The detection threshold of the permanent seismic network in NW Turkey is presently around M=2.5. To monitor the ongoing microseismic activity in the broader eastern Marmara region down to M=1 an amphibious seismic campaign was conducted for a period of two months in winter 2005/06. However, to better understand the physics at the eastern seismic gap and to distinguish seismically active and inactive branches of the fault, long-term recordings at short distance to the fault are needed. In summer 2006 we installed a permanent seismic network (PIRES) offshore Istanbul on the two outermost islands of Sivriada and Yassiada at only 4 km distance to the main branch of the NAFZ.

PIRES recordings allow to decrease the detection threshold for microseismic activity in this region by two orders of magnitude and thus to resolve the present seismotectonic setting with unprecedented detail. Furthermore, PIRES will also serve towards

an improved online monitoring of the Istanbul Metropolitan region, especially in the light of an expected major earthquake within the next decades.