High resolution seismicity catalog of the Marmara Sea region during the 2009-2014 period using template matching

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A massive template-matching approach is successfully applied in Marmara Sea region along the North Anatolian Fault, during the 2009-2014 period to enrich the description of the time and space evolution of the seismicity. Detection of events are performed on the continuous data recorded from 2009 to 2014 combining two types of catalogs as templates: a finely constructed catalog for the three first year (2009-2011) (Schmittbuhl et al, 2016) and a raw catalog from KOERI for the last three years (2012-2014). Magnitudes (Ml) are estimated for all detected events using relative amplitudes of the highly coherent waveforms between new events and template events. The template database provides a nearly threefold increase of the number of small events (more than 15000 earthquakes compare to the 4673 events of the initial catalog). Combined with a double-difference relocation based on cross-correlation differential travel-time data, the database is shown to be a relevant framework for the long term monitoring of specific remanent structures like seismic swarms or repeating earthquakes. The obtained catalog confirms the strong contrast of behaviors along the Main Marmara Fault (MMF): deep creeping to the west (Central Basin), fully locked in the center (Kumburgaz Basin) and dominated by fluid and off-fault activity to the east (Cinarcik Basin).