



Seismicity along the Main Marmara Fault, Turkey: from space-time distribution to repeating events

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The North Anatolian Fault (NAF) poses a significant hazard for the large cities surrounding the Marmara Sea region particularly the megalopolis of Istanbul. Indeed, the NAF is presently hosting a long unruptured segment below the Sea of Marmara. This seismic gap is approximately 150 km long and corresponds to the Main Marmara Fault (MMF). The seismicity along the Main Marmara Fault (MMF) below the Marmara Sea is analyzed here during the 2007-2012 period to provide insights on the recent evolution of this important regional seismic gap. High precision locations show that seismicity is strongly varying along strike and depth providing fine details of the fault behavior that are inaccessible from geodetic inversions. The activity strongly clusters at the regions of transition between basins. The Central basin shows significant seismicity located below the shallow locking depth inferred from GPS measurements. Its b-value is low and the average seismic slip is high. Interestingly we found also several long term repeating earthquakes in this domain. Using a template matching technique, we evidenced two new families of repeaters: a first family that typically belongs to aftershock sequences and a second family of long lasting repeaters with a multi-month recurrence period. All observations are consistent with a deep creep of this segment. On the contrary, the Kumburgaz basin at the center of the fault shows sparse seismicity with the hallmarks of a locked segment. In the eastern Marmara Sea, the seismicity distribution along the Princes Island segment in the Cinarcik basin, is consistent with the geodetic locking depth of 10km and a low contribution to the regional seismic energy release. The assessment of the locked segment areas provide an estimate of the magnitude of the main forthcoming event to be about 7.3 assuming that the rupture will not enter significantly within creeping domains.