



Creeping and locked segments along the Main Marmara Fault

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It is known since the last 1999 Izmit earthquake that the North Anatolian Fault is hosting a final important seismic gap along a 150 km region that corresponds to the Main Marmara Fault (MMF) below the Sea of Marmara. The gap is owing to a major locking zone where slip along the fault is blocked despite a significant remote plate boundary loading (23 mm/yr). After about 250 years of quiescence the fault is now very close to failure. Unfortunately any attempt of prediction which relies on a very fine monitoring of the fault behavior, is strongly limited by the sea coverage. Direct observations in particular from geodetic measurements are indeed very difficult. However, local seismicity along the MMF provides crucial indirect evidences. The present work is based on this approach and includes precise geographical and depth locations from a large compilation of seismic stations around the Sea of Marmara. We aim at interpreting micro-earthquake spatial distribution in terms of regional geodynamical information and compare it to other approaches like geodesy. From the geographical and depth distribution of micro-seismicity between 2007 and 2012, three domains can be defined along the Main Marmara Fault (MMF) : the West Marmara (WM) zone which includes the Tekirdag and Central Basins where seismicity is abundant and well distributed in depth (from surface to 17 km) including several vertically extended clusters, the Kumburgaz basin (KB) in the center zone of the Marmara Sea where seismicity is very spare, and the Cinarcik basin (CB) where seismicity is uniformly distributed along the MMF but mostly at depth along a narrow zone (except at both ends of this basin where vertically extended swarms also exist). We evidence three different behaviors. The western Marmara segment is mostly creeping on the contrary to the central Kumburgaz Basin fault zone which is entirely locked as well as possible upper sub-regions of the Princess Island fault and/or the Tekirdag basin. Implications for regional seismic hazard are discussed.