



Dependency of near-field ground motions on the structural maturity of the North Anatolian Fault Zone

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Until now, many studies have been carried out in considering the influence of site-specific parameters on recorded ground motions but just a few in source-parameters like the long-term fault properties (Radiguet et al., 2009). In this study we empirically examine the regional variations of strong ground-motions in Turkey and the potential influence from the structural maturity of ruptured parts of the North Anatolian Fault Zone. According to Manighetti et al. (2007) we classified the entire fault zone based on the age, slip rate, cumulative slip and length of the fault into three different parts (immature, intermediate and mature). We used 249 strong ground motion recordings of 41 shallow crustal earthquakes (Mw 4.0 – Mw 7.6) and various style of faulting to analyze the influence of the fault structural maturity with respect to other source and site properties. All events have a maximum distance of 20km to the main fault. We compare the recorded ground motions to empirical Ground Motion Prediction Equations of Chiou & Youngs (2010), Akkar & Bommer (2010), Akkar et al. (2014) and Bindi et al. (2014). The results show clearly, that earthquakes generated on the immature part of the fault zone produce larger ground motions than those on the mature part. Further residual analysis shows a large misfit between the chosen GMPE's and the ground motion recordings of the mature part. We have changed different dependent variables to see which parameter might have the biggest influence on these recorded ground motions. In all cases, the fault maturity has the largest influence on recorded ground motion amplitudes; hence we conclude that future GMPEs should include this important source parameter.