Geophysical Research Abstracts
Vol. 21, EGU2019-12094-1, 2019
EGU General Assembly 2019

Large Stress Release during Normal Faulting Earthquakes in Western Turkey supported by Broadband Ground Motion Simulations

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Recent studies suggests that variation in stress drop may be dependent to faulting type. In addition, Akkar et al. (2018) performed residual analyses of strong-motion data compiled from the Marmara and Aegean regions in Turkey and stated that between-event residuals of the Aegean region indicate that the ground motion prediction equation tends to overestimate at 1 s and shorter periods. They explain such a discrepancy may be due to the fact that the regional differences in stress drop were not taken into account in the current ground motion prediction equations. These indications motivate us to examine the stress parameters of the well recorded normal faulting earthquakes. The Aegean region is one of the most rapidly moved and seismically active parts of the world. As a result, continuous seismic activity is observed at the region. We selected and analyzed three earthquakes, the 2011 Simav earthquake (Mw 5.8), the 2017 Lesvos earthquake (Mw 6.3) and the 2017 Bodrum-Kos earthquake, (Mw 6.6) in Western Turkey. Source characteristics of these three normal faulting events are investigated by performing empirical Green's function simulation in broadband frequency range. Relationship between strong motion generation area, rise time, and stress drop as a function of seismic moment are examined. Broadband ground motion simulations of the earthquakes revealed that the stress drop ratio between the mainshock as a large event and the aftershock as a small event, C, is relatively large in comparison to those previously calculated for strike slip events in Turkey. This indicates that the regional stress regime in Western Turkey may affect relative larger stress release during the normal-faulting potential mainshocks.