

Source Characteristics and Coulomb Stress Change of the 19 May 2011 Mw 6.0 Simav-Kutahya Earthquake, Turkey

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Abstract

On 2011 May 19, Simav district of Kutahya province in northwest Anatolia was hit by a moderate size ($M_w=6.0$) earthquake. Centroid moment tensors for 41 events with moment magnitudes (M_w) between 3.5 and 6.0 are computed by applying a waveform inversion method on data from the Kandilli Observatory and Earthquake Research Institute broadband seismic network. The time span of data covers the period between 2011 May 19 and 2011 August 22. The mainshock is a shallow focus normal event at a depth of 10 km. Focal depths of aftershocks range from 5 to 20 km. The seismic moment (M_0) of the mainshock is calculated 1.15×10^{18} Nm. The estimated rupture duration of the Simav mainshock is 30 s. The focal mechanisms of the aftershocks are mainly normal faulting with a variable strike-slip component. The geometry of focal mechanisms reveals a normal faulting regime with NE-SW trending direction of T-axis in the entire activated region. A stress tensor inversion of focal mechanism data is performed to acquire a more accurate picture of the Simav earthquake stress field. The stress tensor inversion results indicate a predominant normal stress regime with a NW-SE oriented maximum principal compressive stress. According to variance of the stress tensor inversion, to first order, the Simav earthquake area is characterized by a homogeneous intraplate stress field. Eventually, Coulomb stress analysis is performed to calculate the stress transfer and correlate it with the activated region. Positive lobes with stress more than 3 bars are obtained, indicating that these values are large enough to increase the Coulomb stress failure towards NW-SE direction.

Keywords: Aftershock, Coulomb Stress Analysis, Focal Mechanism, Simav earthquake, Stress tensor inversion, Western Anatolia