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Source Parameters of Bala-Sırapınar (Central Turkey) Earthquakes of 2005-2008: Implications on Internal Deformations of the Anatolian Plate

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Active tectonics of central Anatolia are governed by the collision between African, Arabian and Anatolian plates which causes westwards escape of Anatolia along the North and East Anatolian fault zones, and responsible for the counterclockwise rotation of Kırşehir block with slight internal deformation. Although central Anatolia region has not been known with destructive earthquakes, many small and moderate size earthquakes ($2.5 \leq Mw \leq 6.0$) have been observed in last decade or so. These earthquakes are crucial as they also contribute to better understanding of shallow crustal deformation in the central Anatolian block. The intense earthquake activity in the Balâ-Afşar-Sırapınar (Ankara, central Turkey) region during 2005-2008 such as July 30, 2005 (Mw=5.2); December 20, 2007 (Mw=5.7) and December 26, 2007 (Mw =5.6) earthquakes are mainly correlated with mapped faults of whose lengths varies between 1-25 km. In the present study, we have obtained source parameters, and estimated centroid depths of 27 earthquakes with magnitudes ranging between $3.5 \leq ML \leq 5.6$ by using regional moment tensor (RMT) inversion method. Complete broad-band waveforms recorded at near-field epicenter distances ($0.45^\circ \leq \Delta \leq 3.6^\circ$) distributed by KOERI-UDIM were analyzed. The importance of moment tensor inversion arises to give faulting mechanisms of smaller to moderate size earthquakes even in case of sparse networks with reliable depth information. Our results reveal both NW-SE directed right-lateral strike slip faulting and NE-SW directed left-lateral strike-slip faulting mechanisms which are clearly correlated with the conjugate fault systems in the Balâ-Afşar-Sırapınar region. However, some earthquakes also have E-W directed normal faulting components. We conclude that the major characteristics of 2005-2008 earthquake activity have been dominantly represented by right-lateral strike slip faulting mechanism. Furthermore, our results are also consistent with the neotectonic features and available reported geophysical data (e.g: gravity, aeromagnetic and paleomagnetic). The seismogenic depth is found to be about 8-10 km. This result implies that earthquakes occurred in the upper crust which accommodates strain by brittle deformation. Increasing number of detailed crustal structure and InSAR observations in the central Anatolia will be crucial input to manifest the complex deformation processes in future studies.