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Source mechanism of the 2014 Aegean Sea earthquake

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Rapid determination of centroid moment tensor (CMT) of earthquakes, namely the source centroid location, focal mechanism, and magnitude is important for early disaster responses and issuing Tsunami warnings. In order to evaluate capability of Turkey seismic network for rapid determinations of CMT, I investigate the source mechanism of the 2014 Aegean Sea earthquake (Mw 6.9). Although this event occur out of Turkey seismic network, I obtained stable CMT solution. The CMT solution of this earthquake represents a strike-slip fault, consistent with the geometry of the North Anatolian Fault (NAF), and the source-time function indicates that this event comprised several distinct subevents. Each subevent is considered to have ruptured a different fault segment. This observation indicates the existence of a mechanical barrier, namely a NAF segment boundary, at the hypocenter. I also determined CMT solutions of background seismicity. CMT solutions of background seismicity beneath the Aegean Sea represent strike-slip or normal faulting along the NAF or its branch faults. The tensional axes of these events are oriented northeast–southwest, indicating a transtensional tectonic regime. Beneath the Sea of Marmara, the CMT solutions represent mostly strike-slip faulting, consistent with the motion of the NAF, but we identified a normal fault event with a tensional axis parallel to the strike of the NAF. This mechanism indicates that a pull-apart basin, marking a segment boundary of the NAF, is developing there. Because ruptures of a fault system and large earthquake magnitudes are strongly controlled by the fault system geometry and fault length, mapping fault segments along NAF can help to improve the accuracy of scenarios developed for future disastrous earthquakes in the Marmara region.