

Source Mechanism of the November 15, 2000 Lake Van Earthquake ($M_w=5.6$) in Eastern Turkey and Its Seismotectonic Implications

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Detailed source process of the November 15, 2000 Lake Van (Eastern Turkey) earthquake ($M_w=5.6$) was retrieved using the method for source inversion of complex body waveforms developed by Kikuchi and Kanamori (1991). The event has been modeled by USGS as a deep (67 km) sub-crustal earthquake resulting from rupture of a normal fault beneath the Bitlis Suture zone where continental collision has been in action between the Arabian and Eurasian plates. However, our source model based on the analysis of complex body-waveforms indicates a shallow crustal event consisting of two subevents with about 18 second interval at 12.5 km and 15 km depths on a predominantly reverse fault. Visual inspection of near-field strong ground motion records undoubtedly confirms the second subevent. Using a stress triggering technique, we show fault interactions between the two subevents. We also examined whether the observed complex waveforms of the mainshock can be modeled in terms of a single source embedded at an intermediate depth, but the result turned out to provide further evidence for the multiple events. The plausibility of the focal depths and the mechanisms of the two subevents for the mainshock was examined by correlating them with the source parameters of 14 aftershocks determined from near-field data recorded at four local broadband stations. The correlations are satisfactorily good. Moreover, the near-field data indicate that subcrustal earthquake activity occurred neither in the deep source region of the Lake Van earthquake, as reported by USGS, nor in the Turkey-Iran border region where an event was reported to have taken place on February 19, 1999 at 66 km and 77 km depths by USGS and ISC, respectively.