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The November 15, 2000 Lake Van Earthquake (Mw=5.6) in Eastern Turkey: Seismotectonic Implications for Arabia-Eurasia Collision Zone

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Detailed source process of the November 15, 2000 Lake Van (Eastern Turkey) earthquake (Mw=5.6) was retrieved using the method of Kikuchi and Kanamori (1991) for source inversion of complex body waveforms. The event has been reported by USGS as a deep (67 km) sub-crustal earthquake resulting from a rupture on a normal fault beneath the Bitlis Suture zone where continental collision is in action between the Arabian and Eurasian plates. However, our source model based on the analysis of complex body-waveforms suggests that the earthquake is a shallow crustal event comprised of two subevents on a predominantly reverse fault at depths of 12.5 and 15 km with a time interval of about 18 seconds. The seismic moment of the second subevent (Mo=1.6x10^{17} Nm; strike=76^o, dip=55^o, rake=120^o) is larger than the first subevent (Mo=1.0x10^{17} Nm; strike=87^o, dip=62^o, rake=110^o). Visual inspection of the strong ground motion records and waveform inversion analysis of the near-field records from four broadband stations confirm the occurrence of the two subevents at shallow depths. We examined whether or not the observed complex waveforms of the mainshock can be modeled in terms of a single point source embedded at an intermediate depth, and the result turned out to be further evidence for the multiple rupture. The plausibility of the focal depths and mechanisms of the two subevents was also examined by retrieving the source parameters of 14 aftershocks from near-field waveform data. Most of the aftershocks were relocated at depths around 15 km, which agrees with the shallow

mainshock. In addition, the analysis of near-field waveform data indicates subcrustal earthquake activity neither in the source region of the Lake Van earthquake nor in the Turkey-Iran border region. In the Turkey-Iran border region, an event on February 19, 1999 was reported to have taken place at a depth of 66 km (USGS) and 77 km (ISC), which also conflicts with our focal depth (18 km) determined through CMT inversion analysis of the broadband records at the station GNI.