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Three-Dimensional Velocity Model Of Lake Van

Mehveş Feyza Akkoyunlu[1], Bülent Kaypak[2], and Bülent Oruç[3]
[1]Bogaziçi University, Kandilli Observatory and Earthquake Institute, Regional Earthquake-Tsunami Monitoring Center, Istanbul, Türkiye (feyza.akkoyunlu@bogazici.edu.tr)
[2]University, Ankara, Turkey, (Bulent.Kaypak@eng.ankara.edu.tr)
[3]University, Kocaeli, Turkey, (Bulent.Oruc@kocaeli.edu.tr)

The Mw 7.1 earthquake east of Lake Van on 23 October 2011 triggered intense aftershock activity, with over 10,000 earthquakes recorded between 2011 and 2015. Accurate earthquake locations are essential for reliable seismological studies, and they depend on station coverage, phase-picking quality, and the use of robust velocity models. In this study, waveform data from temporary and permanent seismic networks were combined into a unified dataset. P- and S-wave phases were manually picked, and earthquakes were systematically relocated. A high-quality subset of events was used to derive a one-dimensional (1-D) velocity model, which served as the reference for three-dimensional (3-D) VP and VP/VS inversion. The resulting 3-D velocity models reveal strong lateral and vertical variations along fault zones. Near the mainshock, high- and low-velocity anomalies are observed at multiple depths and extend predominantly in east–west and NE–SW directions. These anomalies reflect the influence of the compressional tectonic regime, complex faulting, and magmatic structures in the region. Our results highlight the value of integrated earthquake relocation and 3-D velocity modeling for understanding seismicity and crustal structure in complex continental collision zones such as Lake Van. **Keywords:** Earthquake relocation, seismic tomography, inversion, three-dimensional velocity model, seismicity