Japan Geoscience Union Meeting 2012
(May 20-25 2012 at Makuhari, Chiba, Japan)
©2012. Japan Geoscience Union. All Rights Reserved.

SCG67-07 Room:201A Time:May 25 10:45-11:00

The October 23, 2011 Van-Ercis Earthquake (Eastern Turkey, Mw=7.2) and Characteristics of its Aftershocks

PINAR, Ali[1*], Timur Ustaomer[2], KUGE, Keiko[3]

[1]Istanbul University, Department of Geophysics, [2]Istanbul University, Department of Geology, [3]Kyoto University, Department of Geophysics

The intraplate Van-Ercis earthquake took place about 100 km to the north of a suture zone undergoing N-S shortening resulting from the ongoing convergence of Arabian and Eurasian plates. The earthquake caused significant damage and loss of life in the cities of Ercis located on the hanging wall, 20 km to the north of the rupture zone, and Van, lying on the foot wall. No significant surface rupture was observed associated with the earthquake except some discontinuous displacements along a 20-25 km long trace extending N250E, between the Lakes Van and Ercek, where the northern block is uplifted a few centimeters.

Despite the large magnitude and the complex source region the teleseismic body waves are rather simple. The aftershock distributions and the finite source modeling depict a 60 km long rupture zone with average strike, dip and rake of 248, 36 and 56 degrees, respectively. The location of the epicenter and the extent of the aftershock area suggest that the rupture propagated bilaterally for about 30 km eastward and westward, mostly confined between the depth range of 20 km and just below the surface. The western part of the finite fault model zone show predominantly pure thrusting while the rest shows oblique reverse faulting that is approved by the mechanisms of the major aftershocks.

We retrieved 350 moment tensors for the aftershocks in the magnitude range 3.5<Mw<5.9. We investigate the source characteristics of the aftershocks and their kinematic and dynamic relation with the mainshock. The spatial distribution of the aftershocks and their focal mechanism portrays distinct features. In total, about 45% of the CMT solutions of the aftershocks show predominantly reverse faulting or transpression; 40% of them show predominantly strike-slip faulting; and, 15% show normal faulting or transtension. The aftershocks in the NE corner of the rupture zone experienced mostly strike slip faulting pointing out conjugate strike-slip fault system at the lower crust reaching 30-35 km depth range. We determined tens of aftershocks showing normal faulting mechanism or transtension. Most of them are to the west and to the south of the epicenter. The southern aftershocks reflect transtension within the foot wall. The largest aftershock in the transtensional region took place on November 9, 2011 with magnitude Mw=5.7 just a few km away from the city Van. It generated rather complex waveforms which we modeled with two subevents one of them showing normal faulting.

Keywords: Arabia-Eurasia Convergence, Eastern Turkey, 2011 Van earthquake, mainshock, aftershocks