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The geodetic impact of the Van earthquake from 23 October 2011

Y. Altiner (1), W. Söhne (1), and C. Güney (2)
(1) Federal Agency for Cartography and Geodesy, Frankfurt on Main, Germany, (2) Technical University of Istanbul, Turkey

The area where the Van earthquake occurred on Sunday, October 23, 2011, with a moment magnitude of 7.2, is located in Eastern Turkey at a tectonic active zone including complex fault structures. Some permanent GNSS stations of the CORS-TR network were established in the surroundings of the Van earthquake epicenter (Lat/Lon 38.67 / 43.58 degree). Using high-rate (1 second) GPS data, the co-seismic displacements of 11 stations during the earthquake were determined applying the method of precise point positioning. Considering the time series of coordinate changes of 14 CORS-TR stations calculated on a daily basis with 30 seconds GPS data, the crust movements before and after the earthquake were demonstrated and the possibility of earthquake prediction as an option of case study discussed. With respect to the internal and external deformation measures, which were estimated applying the analytical surface deformation theory, internal and external crust deformations within the study area were illustrated.

According to the geodetic results, we conclude for the Van earthquake a mainshock-effect of a duration of 30 seconds followed by a block-swing of about 35 seconds. Aftershocks and the earthquakes occurred along Bitlis-Zagros suture zone from October 26, 2011 to October 29, 2011, caused crust movements, mainly in high change with an amount of 0.5 to 2.5 cm. Drawing a horizontal line along the north of Van Sea from east to the west with a length of about 150 km, the northern part of this line subjects to an extension of 0.2-1 ppm mainly in east-north-east, and the southern part subjects to shortening of 0.5-1.5 ppm in west-south-west. The Van earthquake and aftershocks, considered up to November 04, 2011, caused within the external geometry a decreasing of 2-10 mm with an inclination in direction south-west and north-east stretching from Sirnak in the south to Siirt in the south-west, respectively. The north of Van Sea inclined 0.5-5 mm in north-east.