Geophysical Research Abstracts
Vol. 21, EGU2019-14750-1, 2019
EGU General Assembly 2019

Modeling the sources of the Azgeleh (12 November 2017) and Tazehabad (25 August 2018) earthquakes, Western Iran

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Nine months after the deadly earthquake of Azgeleh on Iran-Iraq border (western Iran) with magnitude 7.3, an earthquake of magnitude 5.9 struck Tazehabad region 45 km to the southeast of the Azgeleh epicenter with at least 3 casualties and more than 240 injuries. Using HypoDD software, we employed double-difference earthquake location technique to select and relocate aftershocks recorded by our local seismic stations installed after the Azgeleh earthquake. The distribution of the 1100 relocated aftershock demonstrates at least two specific perpendicular seismic clusters. The NNW-SSE cluster is associated with the main zone of the Azgeleh seismic source and the smaller cluster distributes more densely on an east-west trend within which the Tazehabad earthquake of August 25, 2018 occurred.

In the wake of an Event Supersite proposal to the Geohazard Supersites and Natural Laboratories (GSNL), we acquired 100 x-band COSMO-SkyMed SAR data including three stacks of ascending and descending STRIPMAP mode images covering the aftershock epicenters and meizoseismal zone of Azgeleh earthquake. Thanks to the EVER-EST project, providing virtual machine and license of ENVI-IDL and Sarscape© software, we used Copernicus Sentinel-1 and COSMO-SkyMed SAR data to study the co- and post-seismic deformation of the Azgeleh earthquake. The preliminary results derived from InSAR analysis indicate a low-angle north-striking coseismic thrust fault dipping 16° to the east with a maximum slip distribution of 3.8 m at 13 to 18 km depth. Utilizing the InSAR Small Baseline Subset (SBAS) method, the post-seismic deformation retrieved from a stack of 28 ascending COSMO-SkyMed images shows at least 50 cm/yr of mean velocity in the line of sight (LOS).

We also implemented InSAR analysis for the coseismic deformation of the Tazehabad earthquake. The preliminary results of the InSAR analysis and the source model are consistent with the E-W trend of the smaller seismicity cluster, indicating a sinistral fault with a strike of 267° and dip of 76° to the north. The maximum slip on the fault surface is about 1.8 m.

We requested ultra-high-resolution stereo Pleiades imagery, as well, to generate high-resolution DEM and subtract the local topography in our InSAR time-series analyses. This may also be feasible to study the mass movements within the study area.