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# MONITORING SEISMIC ACTIVITY IN DAMGHAN AND ADJACENT REGIONS BY A SMALL-APERTURE SEISMIC ARRAY

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In the aftermath of a series of moderate earthquakes which shook Damghan city and the neighboring townships in July 2019 a very small aperture seismic array was designed and deployed to Damghan city to monitor earthquakes. Preliminary analysis of data acquired relates to the reactivation of Astaneh and northern Damghan fault zones and possible rejuvenation of faults in the desert south of the city. Although the earthquake swarm did not cause substantial damage, it raised the alarm for a region which has been demolished in 856 AD after the most devastating earthquake in the Iranian plateau according to the historical records, suffered large casualties during 1953 earthquake and therefore stressed the need for monitoring seismic and geodetic stations currently absent in the region and also delineating seismogenic faults in the region. The rather small city of Damghan with about 60,000 inhabitants rests on a plain surrounded to north by a section of the Eastern Alborz mountains and to the south by traces of heights, bordering Great Kavir which are both seismically active and their activities are related to Astaneh and Torud fault zones (Figure 1). Astaneh fault is believed to be the cause of 856 AD which left 200,000 dead and injured tens of thousands people and has been recognized as the worst and most disastrous earthquake in history of Iran (Ambrasseys and Melville, 1981). Torud fault was also responsible for a deadly earthquake which occurred in 1953 that killed around 1000 people and destroyed city of Torud altogether.

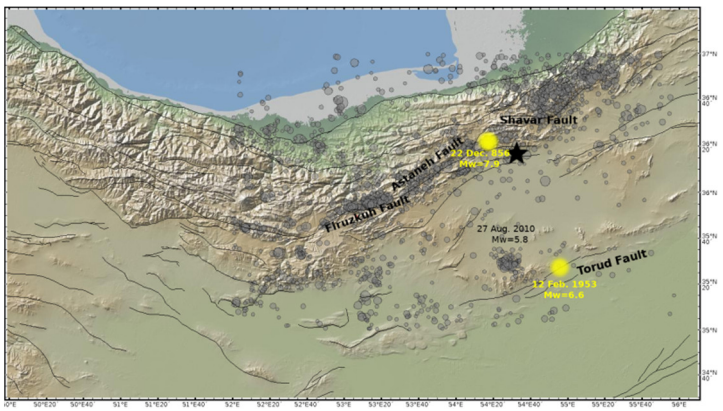


*Figure 1. Seismicity of Damghan region according to Iran Seismological Center from 2006 through 2019. Obvious clusters of seismic activity are located around Firuzkuh, Astaneh, Shavar and Torud fault zones (Hessami et al, 2003). Two major catastrophic events are marked by yellow circles (NOAA) and the fatal 27 August, 2010 events cluster is also shown. City of Damghan is designated by a black star.*

On July 4, 2019 an earthquake (Mw=4.8) shook city of Damghan and its outskirts that caused widespread panic. A visit to the city and collaboration with Damghan University, School of Earth Sciences led to design and installation of a temporary tripartite seismic array in Damghan (Figure 2).

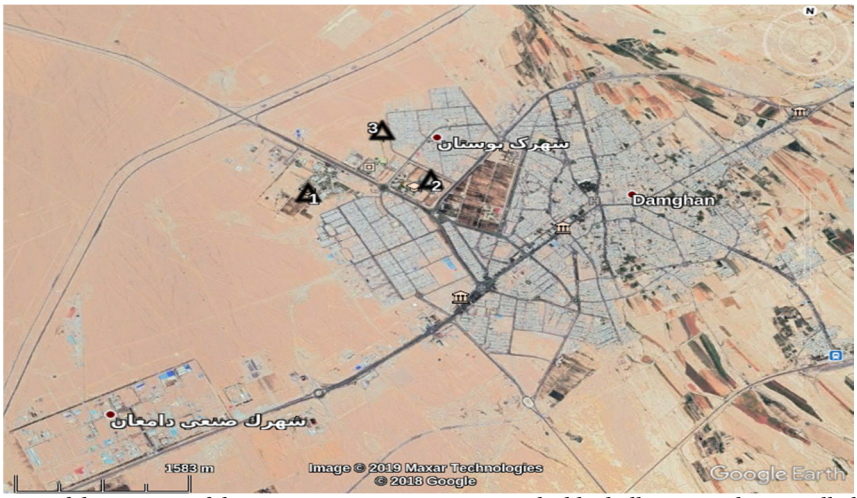


*Figure 2. Distribution of the stations of the temporary seismic array, marked by hollow triangles, installed in Damghan city.*

The ongoing analysis of the events recorded by regional and global stations and also by our temporary array during its one month of operation shows that the aforementioned event belonged to a seismic cluster which originated from activity of Astaneh fault. Although USGS has placed the event 20 km south of Damghan city, near Haj-Aligholi depression, it is located in reality close to Astaneh fault zone and hence large location error needs further investigation into its cause.

**REFERENCES**

Ambraseys, N.N. and Melville, C.P. (1982). *A History of Persian Earthquakes*, Cambridge University Press, Cambridge.

Hessami, K., Jamali, F., and Tabassi, H. (2003). *Major Active Faults of Iran, Scale 1:2,500,000*. International Institute of Earthquake Engineering and Seismology.

Iranian Seismological Center, bulletin search, http://irsc.ut.ac.ir/bulletin.php.

National Geophysical Data Center/World Data Service (NGDC/WDS): NCEI/WDS Global Significant Earthquake Database. NOAA National Centers for Environmental Information.

U.S. Geological Survey, 2019, Search Earthquake Catalog, https://earthquake.usgs.gov/earthquakes/search.