

Preliminary report on Ahar-Varzaghan Earthquake, August 11, 2012 NW- Iran

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Two relatively large shallow earthquakes devastated NW- Iran, about 60 km northwest of Tabriz city, on August 11, 2012. It caused about 306 dead and 3037 wounded people (reported from the health minister of Iran).

The first earthquake (Mw 6.4) occurred at 16:53 in local time and the second one (Mw 6.3) happened with about 11 minutes later (Tables 1 & 2).

Table 1: Earthquake reports by different agencies for the first quake.
(For local time of the events you may add +04:30:00 to UTC time)

| Ref. | UTC time | Lat. | Long. | Mag. type | Mag. | Depth | No. of stations |
|-------|------------|--------|--------|-----------|------|-------|-----------------|
| USGS | 12:23:17.0 | 38.322 | 46.888 | Mw | 6.4 | 9.9 | |
| IRSC | 12:23:15.3 | 38.495 | 46.865 | Mn | 6.2 | 10 | |
| IIEES | 12:23:16.2 | 38.55 | 46.87 | mb | 6.1 | 15 | |

Table 2: Earthquake reports by different agencies for the second quake.
(For local time of the events you may add +04:30:00 to UTC time)

| Ref. | UTC time | Lat. | Long. | Mag. type | Mag. | Depth | No. of stations |
|-------|------------|--------|--------|-----------|------|-------|-----------------|
| USGS | 12:34:35 | 38.324 | 46.759 | Mw | 6.3 | 9.8 | |
| IRSC | 12:34:34.8 | 38.449 | 46.731 | Mn | 6.0 | 10 | |
| IIEES | 12:34:35.0 | 38.58 | 46.78 | mb | 6.1 | 16 | |

The epicentral locations of the mainshocks, their mechanisms (Harvard GCMT) and aftershock distribution (IIEES databases) (Fig.1) show that, the recent large earthquake in Iran, Ahar-Varzaghan earthquake, may have other source(s) than Tabriz and Ahar faults which are two main active faults in NW-Iran. The strike of the earthquake fault(s) seems to be nearly E-W in contrast of NW-SE strike of

Tabriz and Ahar faults. On the other hand, it seems that there are no any other mapped faults in this area for referring this event(s) (Tabriz map, 1:100000 and Ahar map, 1:250000; Geological survey of Iran).

Using satellite images I found a linearity that may be considered as a causative fault! (Figs.2&3) But this is very inaccurate and some field investigations should be done to clear it. Also we may think about a new surface rupturing too.

I make a 3D aftershocks distribution in two different views (25° and 6° in Fig. 4a & b, respectively), nearly parallel to the strike of the fault to find any surface configuration of it. However, it shows that depth determination by IIEES has fixed to some depth and needs more consideration.

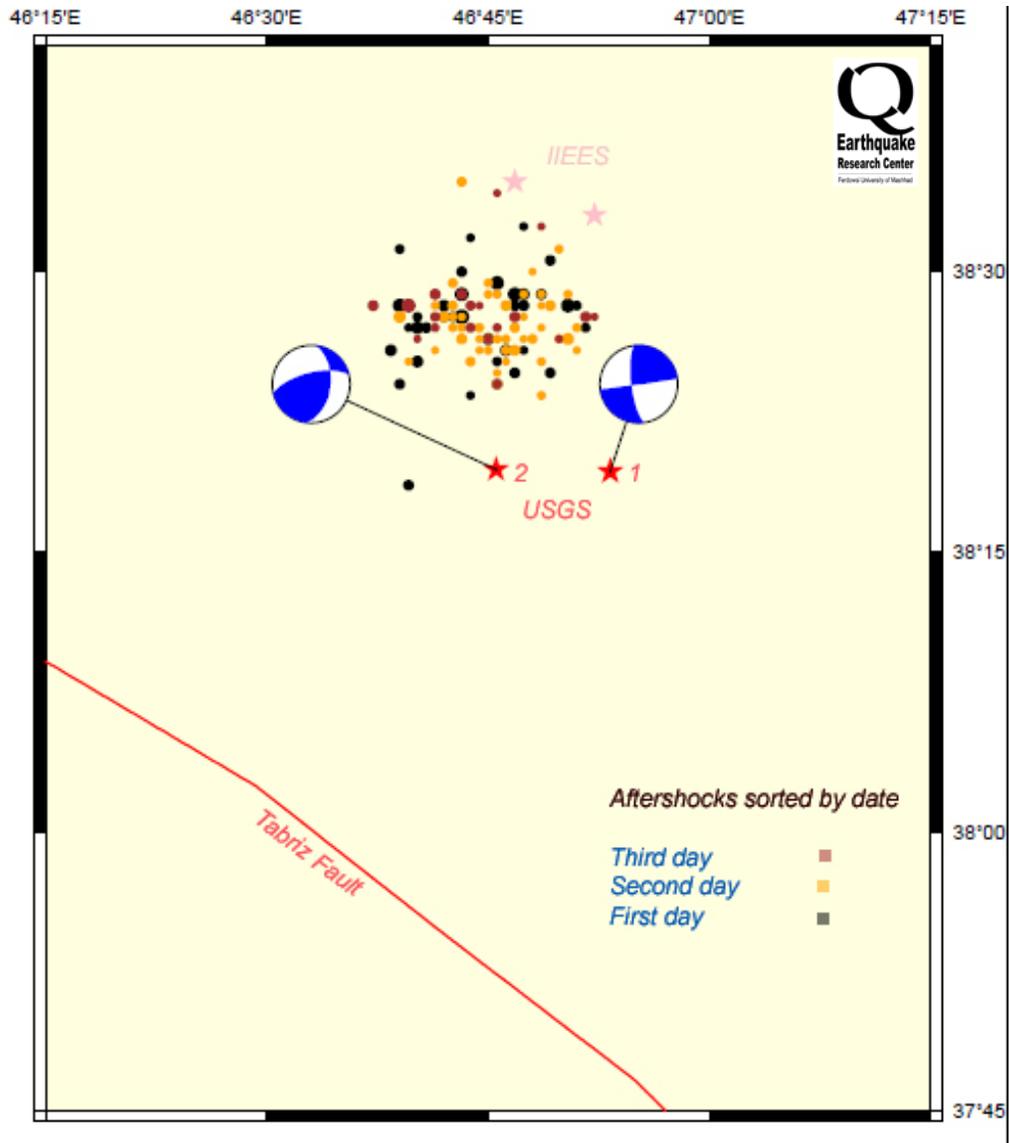


Figure 1: Aftershock distribution of Ahar earthquake. Numbers 1 & 2 refers to the first (Mw 6.4) and second earthquake (Mw 6.3), respectively. Red stars show the epicenters of mainshocks located by USGS and pink stars show ones by IIEES.

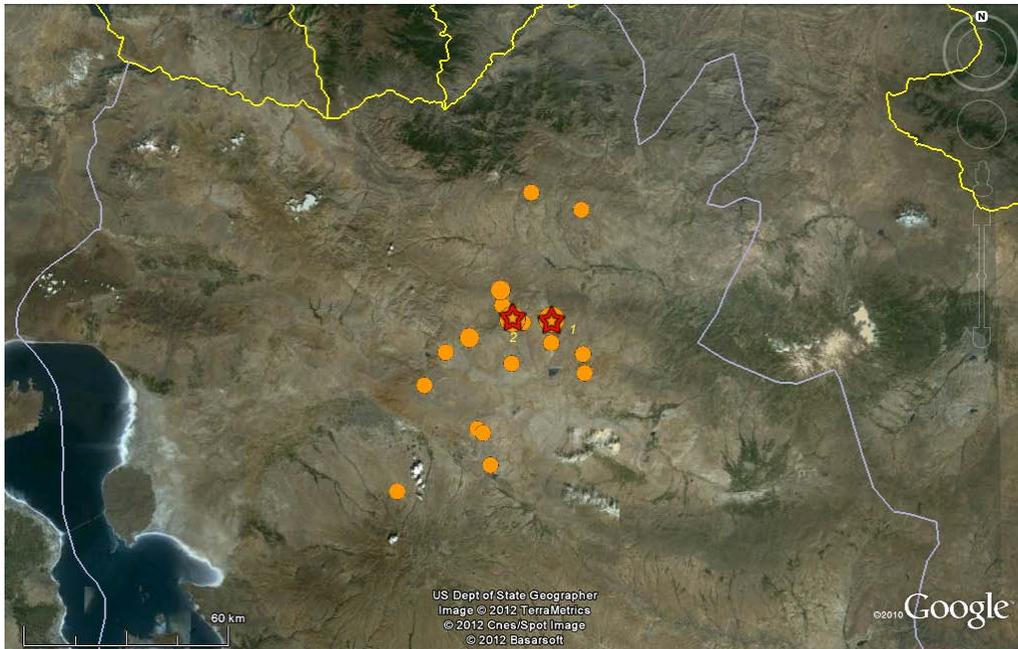


Figure 2: Satellite images from earthquake area, NW-Iran. Two main shocks are shown by red stars. Some aftershocks ($M_w > 4.0$) also shown by orange circles located by USGS.

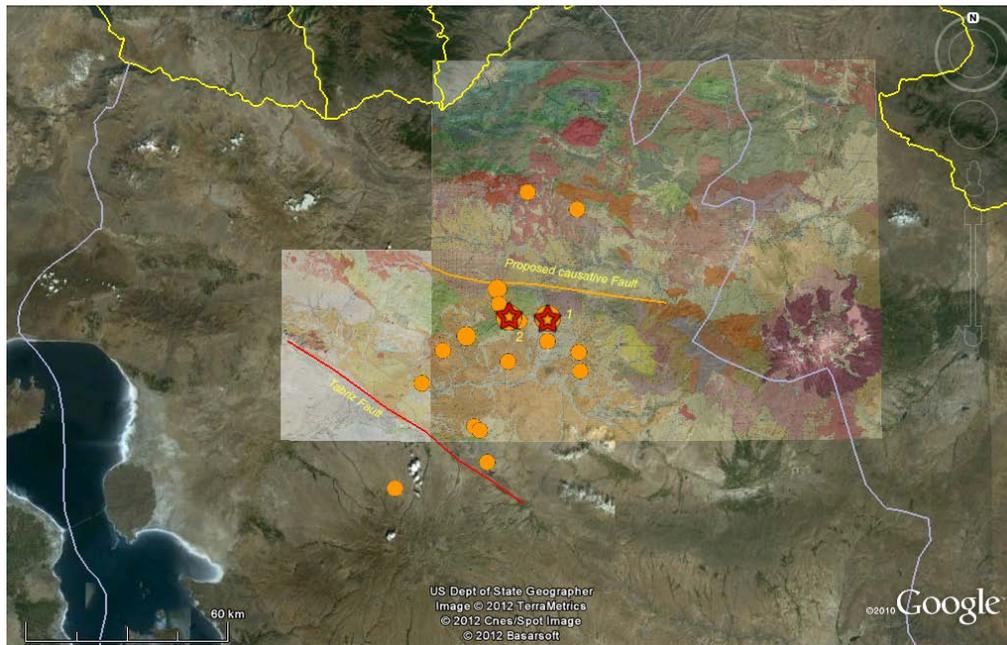
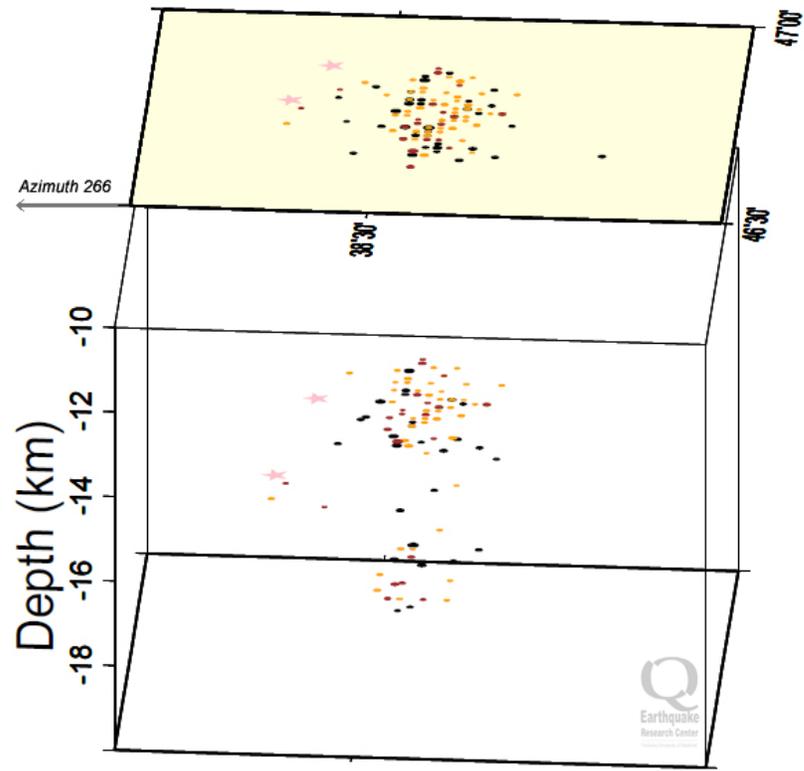
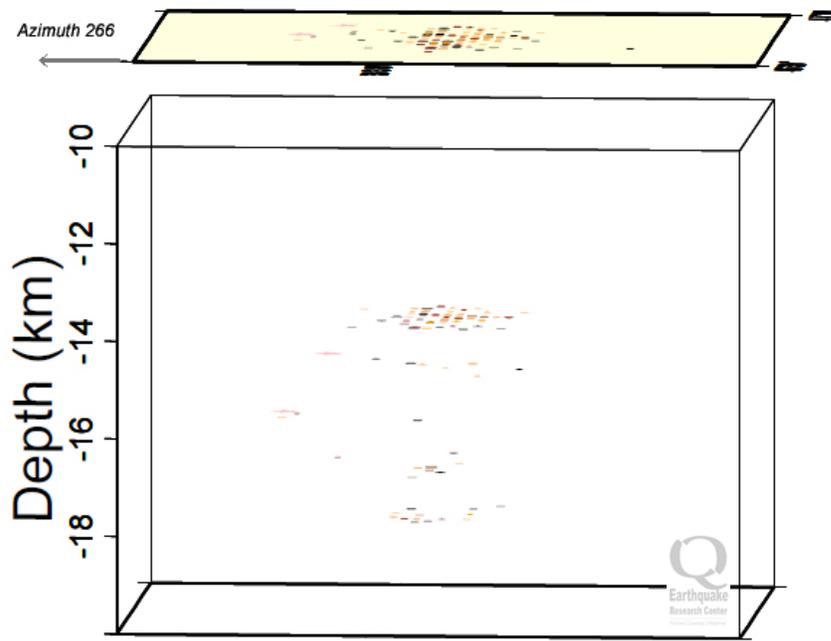


Figure3: Satellite image of earthquake area (fig.2) overlaid by geological maps. The orange line may be considered as a fault, however it was not shown on geology map. You may find other probable faults in the area too.



(a) view: 25°



(b) view: 6°

Figure 4: 3D aftershock distribution of Ahah earthquake using IIEES database. An example in two different views rotated on horizontal axes, nearly parallel to the fault.