

# PRELIMINARY REPORT

September, 17, 2013 Muş Earthquake  
(Eastern Part of Turkey)  
MI=5.1

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REPUBLIC OF TUKEY  
PRIME MINISTRY  
DISASTER AND EMERGENCY MANAGEMENT  
PRESIDENCY  
EARTHQUAKE DEPARTMENT

## September, 17, 2013 Muş Earthquake (Eastern Turkey) MI=5.1

An earthquake with magnitude MI=5.1 occurred at local time 23:40 on September, 17, 2013. Epicentral coordinates of the earthquake was determined as 39.0370 N - 41.4027 E. The magnitude of earthquake was identified with AFAD National Seismological Observation Network and Kandilli Observatory and Earthquake Research Institute. After this earthquake, 85 aftershocks were determined with magnitude range 1.2- 4.0 in 24 hours. (Fig.1, Graph 1).

This earthquake was also felt in Muş and surrounding region, Bitlis, Erzurum and Ağrı. It didn't caused loss of life and damage.

Focal Mechanism Solutions performed by considering first motion direction of P wave and moment tensor solution of MI=5.1 earthquake and MI=4.5 earthquake which occurred in September,16 are emerged from right lateral strike slip faulting (Fig.2,3,4). The fault which caused earthquake is thought to be Yorgançayır-Kaynarca Fault Zone which is identified as right lateral strike slip fault by MTA. Focal mechanism solutions support to this idea.

Instrumental period earthquakes that occurred in the last century are given as; 1903 M=6.3 Malazgirt, 1903 M=5.3 Bulanık, 1907 M=5.0 Muş, 1946 M=5.7 Varto-Hınıs and 1966 M=5.6, M=6.9 Varto.

September, 17, 2013 Muş Earthquake was recorded by accelerometers at 24 different locations within National Strong Ground Motion Observation Network operated by Earthquake Department at Disaster and Emergency Management Presidency of Turkey. Peak ground acceleration values recorded at Varto station 34.96 gal in NS direction, 32.15 gal in EW direction and 17.31 gal in up-down direction (Table 1, Fig.5,6,7).

Seismic intensity values and estimated shake map that can be created by September, 17, 2013 Muş earthquake in the earthquake-hit area and its vicinity are estimated and the maps showing the spatial distribution of these values are prepared (Fig.8,9).



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Earthquake activity of this region (and all of Turkey) has been observed in Disaster and Emergency Management Presidency, Earthquake Department Data Center Ankara 7 days/24 hours with 211 Seismic station and 429 accelerometer. Obtained results are shared with public, press and relevant authorized.

For your information.



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# September, 17, 2013 Muş Earthquake (Eastern Turkey) $M_I=5.1$

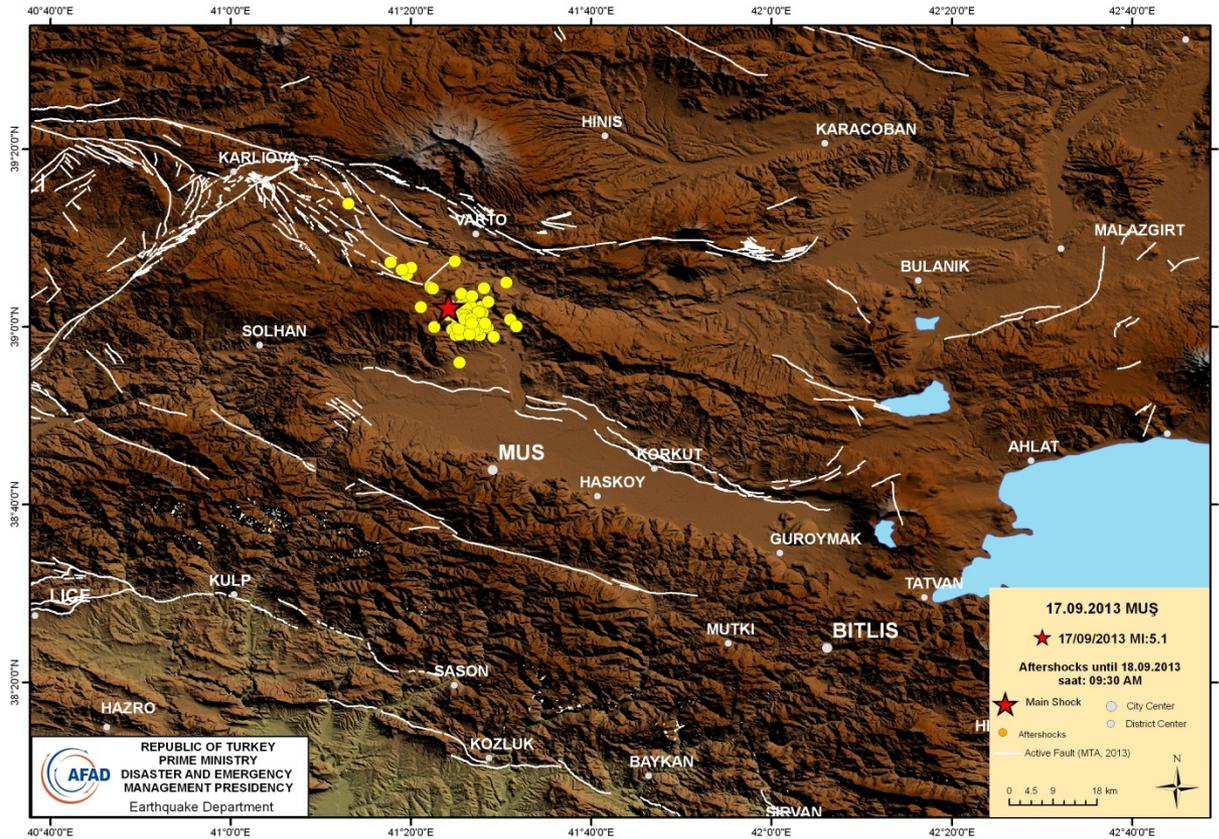
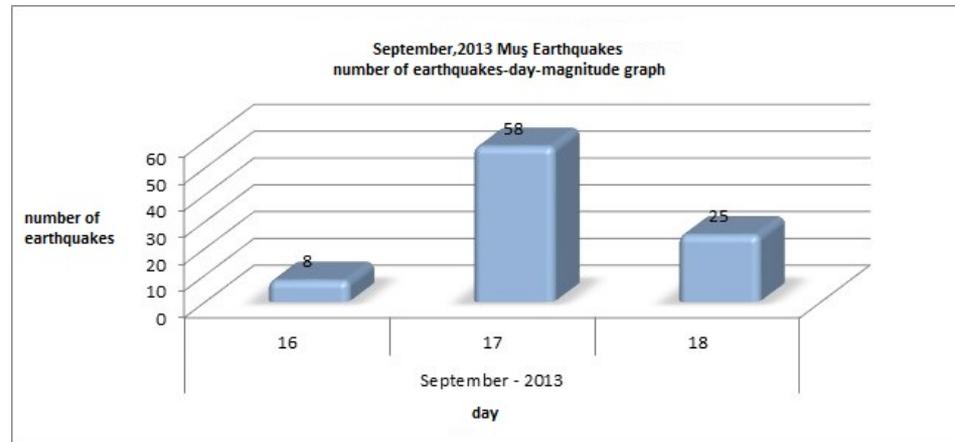
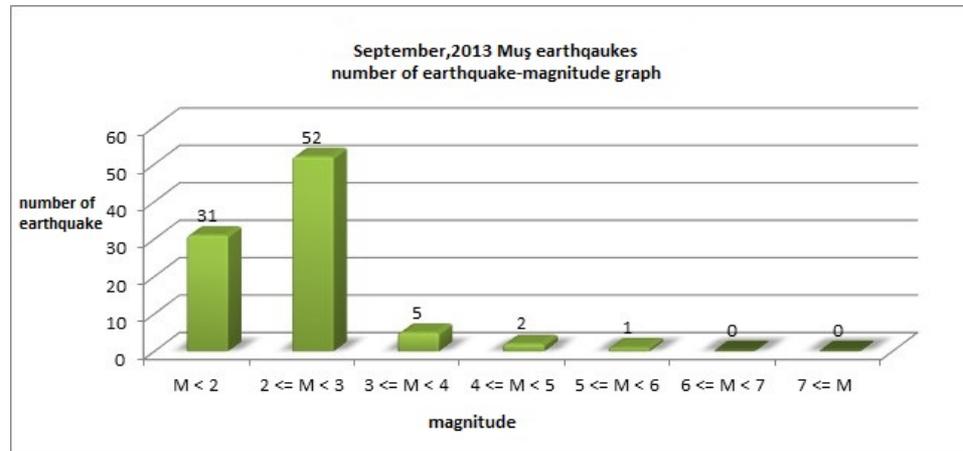


Figure. 1. 17/09/2013 Muş earthquake and aftershocks ( $M_I=5.1$ )



# September, 17, 2013 Muş Earthquake (Eastern Turkey) $M_l=5.1$



**Graph 1. Graphical distribution of aftershocks**



# September, 17, 2013 Muş Earthquake (Eastern Turkey) $M_I=5.1$

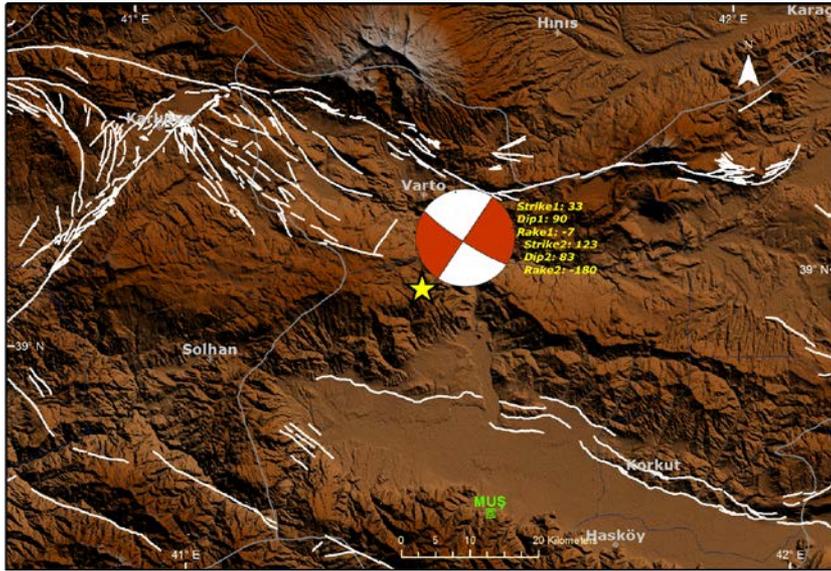


Figure.2. Focal mechanism solution of 16/09/2013 Muş earthquake ( $M_I=4.5$ ) according to p wave first motion

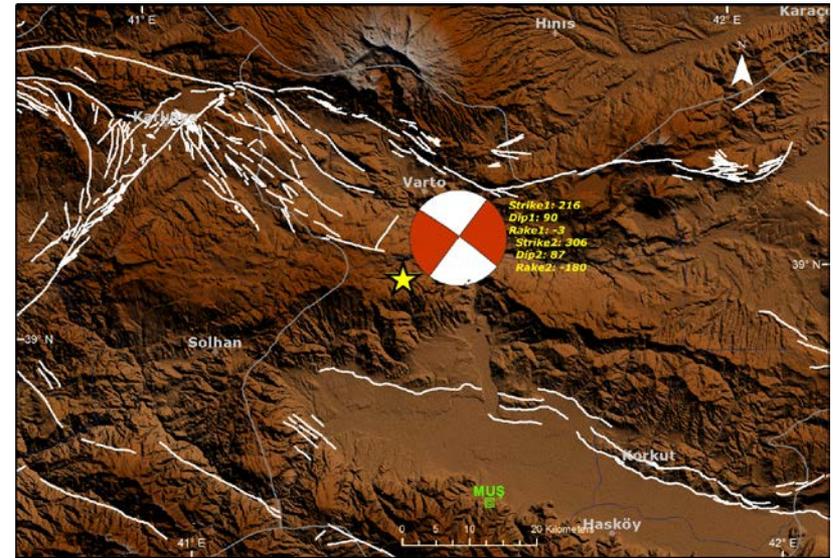


Figure.3. Focal mechanism solution of 17/09/2013 Muş earthquake ( $M_I=5.1$ ) according to p wave first motion

# September, 17, 2013 Muş Earthquake (Eastern Turkey) $M_l=5.1$

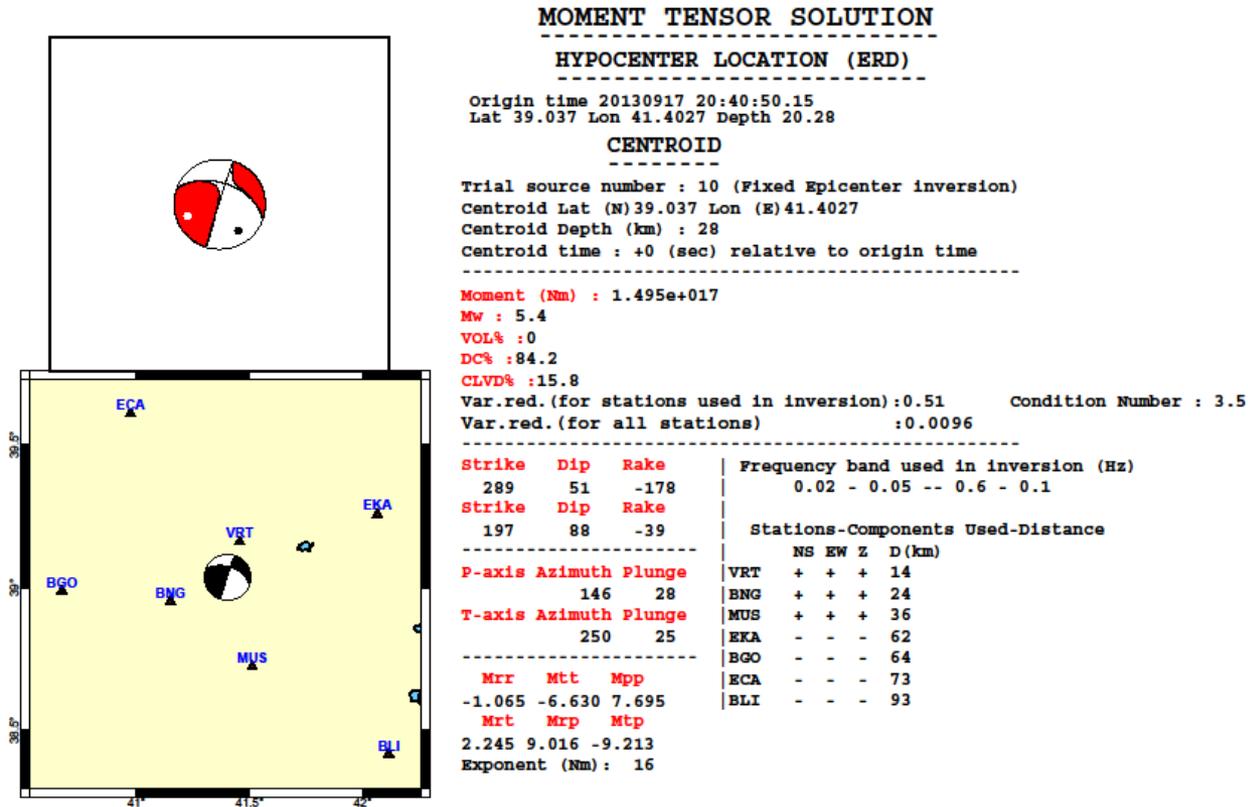


Fig. 4. Moment Tensor solution of  $M_l=5.1$  earthquake



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STATION			Lat	Lon	Altitude (m)	Type of Acc	Acceleration Values (gal)			Distance R <sub>epi</sub> (km)	Share Wave Velocity V <sub>s30</sub> (m/sec)
No	CITY	TOWN					NS	EW	UD		
1	Muş	VARTO	39.17639	41.44553	1494	CMG-5TD	34.96	32.15	17.31	16	
2	Muş	MERKEZ	38.76111	41.50394	1303	CMG-5TD	7.22	7.15	5.54	32	315
3	Bingöl	KARLIOVA	39.29345	41.00883	1825	CMG-5TD	12.31	9.81	4.43	44	
4	Muş	KORKUT	38.73555	41.77416	1300	CMG-5TD	28.65	16.23	5.99	46	
5	Muş	BULANIK	39.09281	42.27309	1481	CMG-5TD	3.98	4.2	2.29	75	
6	Bingöl	MERKEZ	38.89708	40.5032	1133	CMG-5TD	1.28	1.27	1.25	79	529
7	Bitlis	MERKEZ	38.4744	42.15913	1794	CMG-5TD	5.39	7.77	3.15	91	
8	Erzurum	MERKEZ_SS	39.87333	41.22269	1930	CMG-5TD	4.6	3.72	2.13	94	
9	Erzurum	MERKEZ	39.90316	41.26196	1908	CMG-5TD	4.08	4.31	3.09	97	375
10	Muş	MALAZGIRT	39.14385	42.5308	1519	CMG-5TD	3.48	3.2	1.46	98	311
11	Erzurum	ILICA	39.94292	41.11017	1755	CMG-5TD	3.96	3.36	1.3	104	
12	Erzurum	PASINLER	39.9748	41.67225	1657	CMG-5TD	2.98	3.33	1.15	107	
13	Elazığ	BEYHAN	38.72778	40.13103	600	CMG-5TD	0.35	0.35	0.24	116	
14	Erzurum	ASKALE	39.91733	40.68134	1639	CMG-5TD	0.74	0.94	0.41	116	
15	Bitlis	ADILCEVAZ	38.79978	42.76308	1678	CMG-5TD	0.97	0.72	0.41	121	
16	Erzurum	HORASAN	40.04151	42.17359	1544	CMG-5TD	0.98	0.76	0.4	130	316
17	Elazığ	KOVANCILAR	38.72096	39.86293	957	CMG-5TD	0.2	0.25	0.13	138	
18	Erzurum	NARMAN	40.34834	41.86263	1655	CMG-5TD	1.65	1.62	0.56	151	
19	Tunceli	MERKEZ	39.07473	39.53469	901	Gmsplus	0.35	0.3	0.24	161	
20	Diyarbakır	MERKEZ	37.93088	40.20278	692	CMG-5TD	1.24	0.82	0.39	162	
21	Bayburt	MERKEZ	40.2623	40.2101	1614	CMG-5TD	0.1	0.12	0.07	170	
22	Van	EDREMIT	38.4145	43.2682	1850	Gmsplus	0.27	0.28	0.16	177	
23	Erzurum	ŞENKAYA	40.56222	42.34558	1861	CMG-5TD	0.12	0.14	0.09	187	
24	Şırnak	MERKEZ	37.52122	42.45237	1341	CMG-5TD	0.93	1.1	0.26	192	

**Table 1. Acceleration values of Muş earthquake**



# September, 17, 2013 Muş Earthquake (Eastern Turkey) $M_I=5.1$

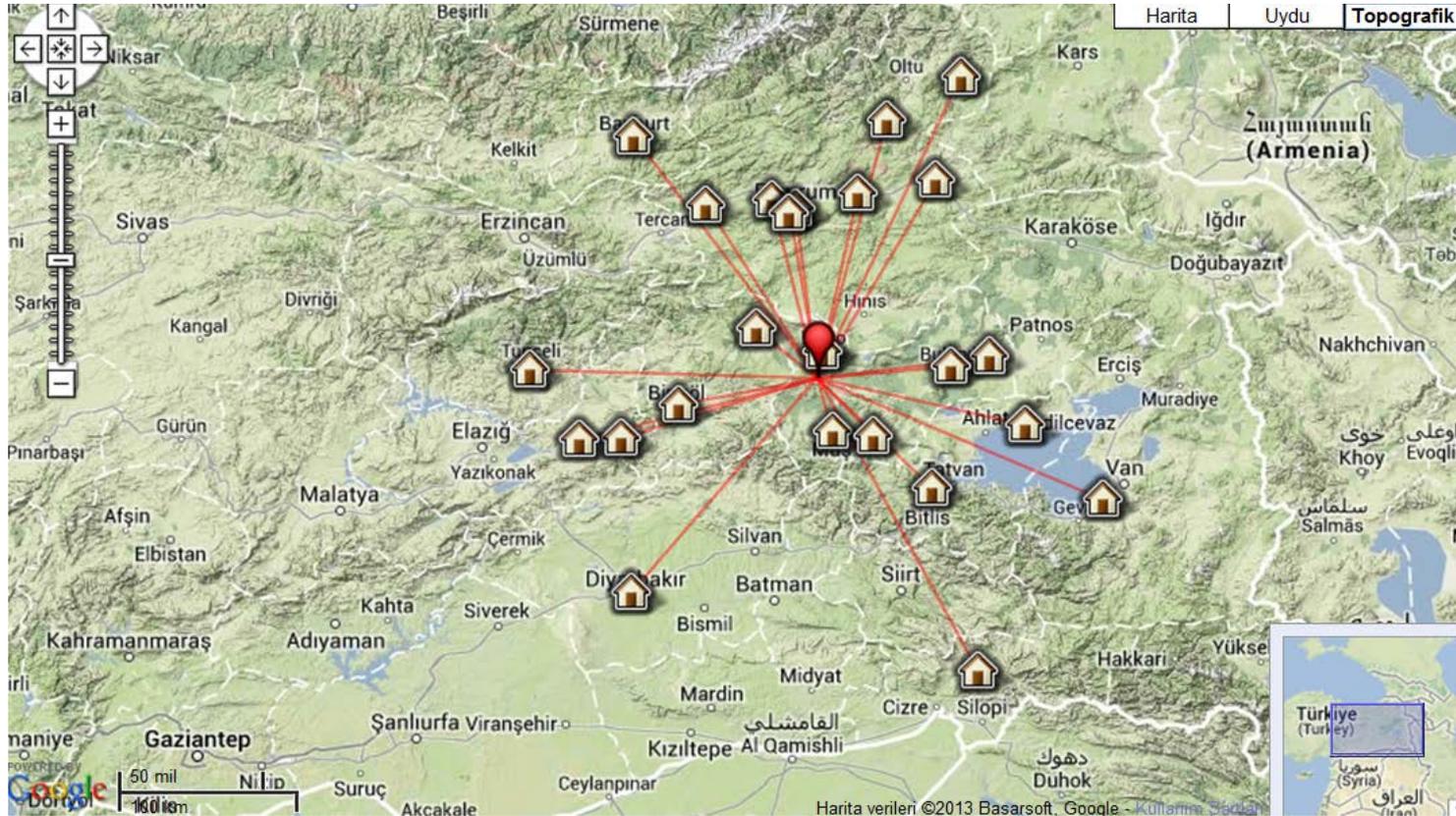
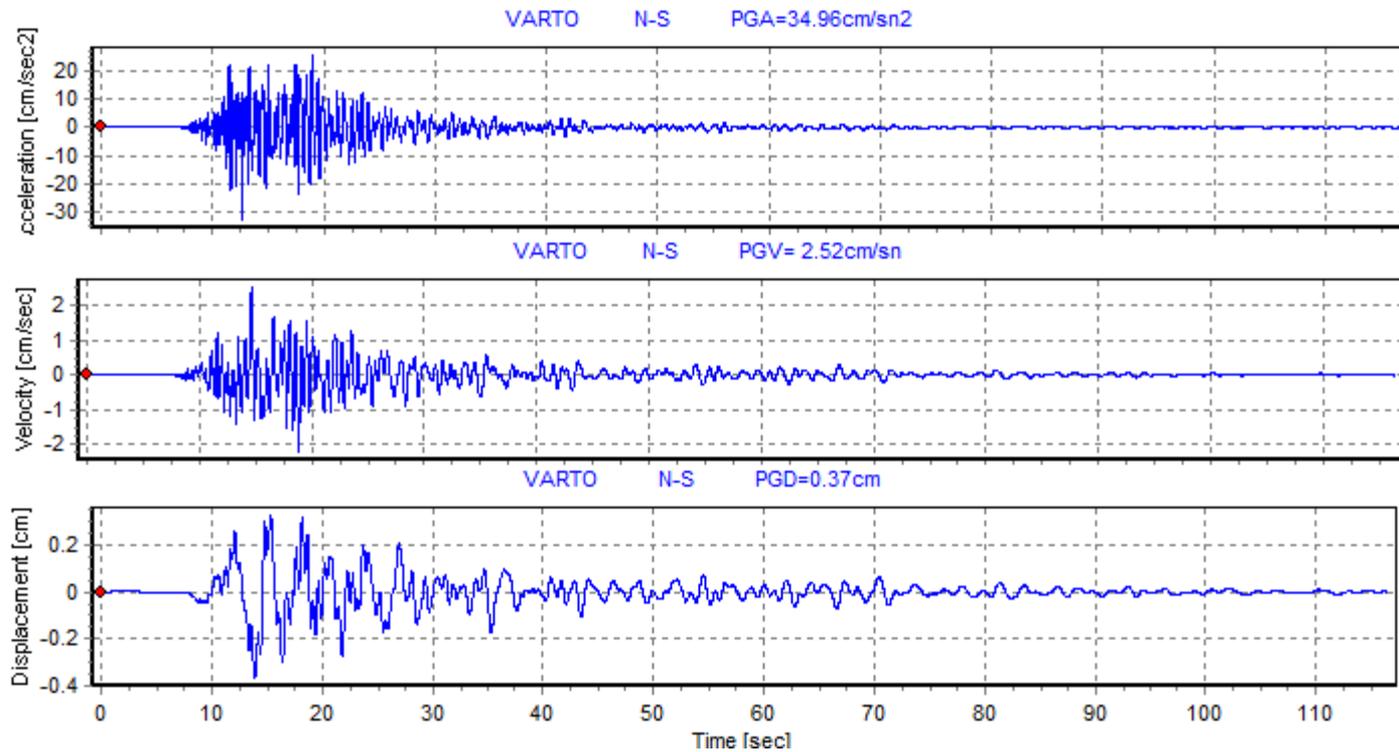


Figure 5. Distribution of accelerometer stations recorded during the Muş Earthquake (MI=5.1)



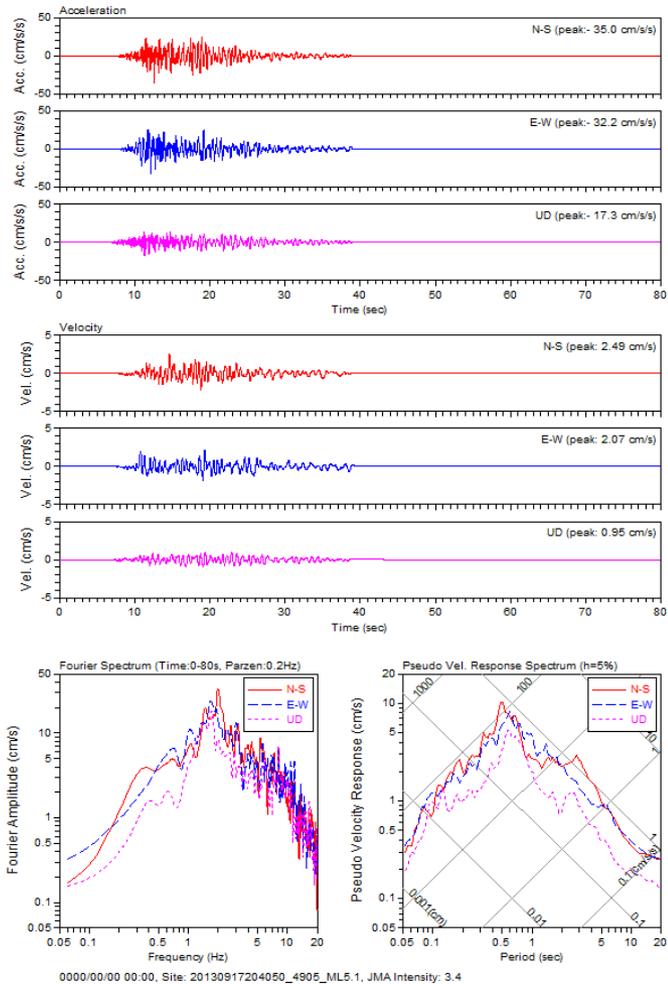
# September, 17, 2013 Muş Earthquake (Eastern Turkey) $M_l=5.1$



**Fig. 6. Wave forms of PGA, PGV and PGD applied base line correction and 0.1-25 Hz Butterworth Band Pass filter for Varto Station (N-S component).**



# September, 17, 2013 Muş Earthquake (Eastern Turkey) $M_L=5.1$



**Fig. 7. Wave forms of PGA, PGV and Fourier&Response Spectrum recorded by Varto Station**



# September, 17, 2013 Muş Earthquake (Eastern Turkey) $M_l=5.1$

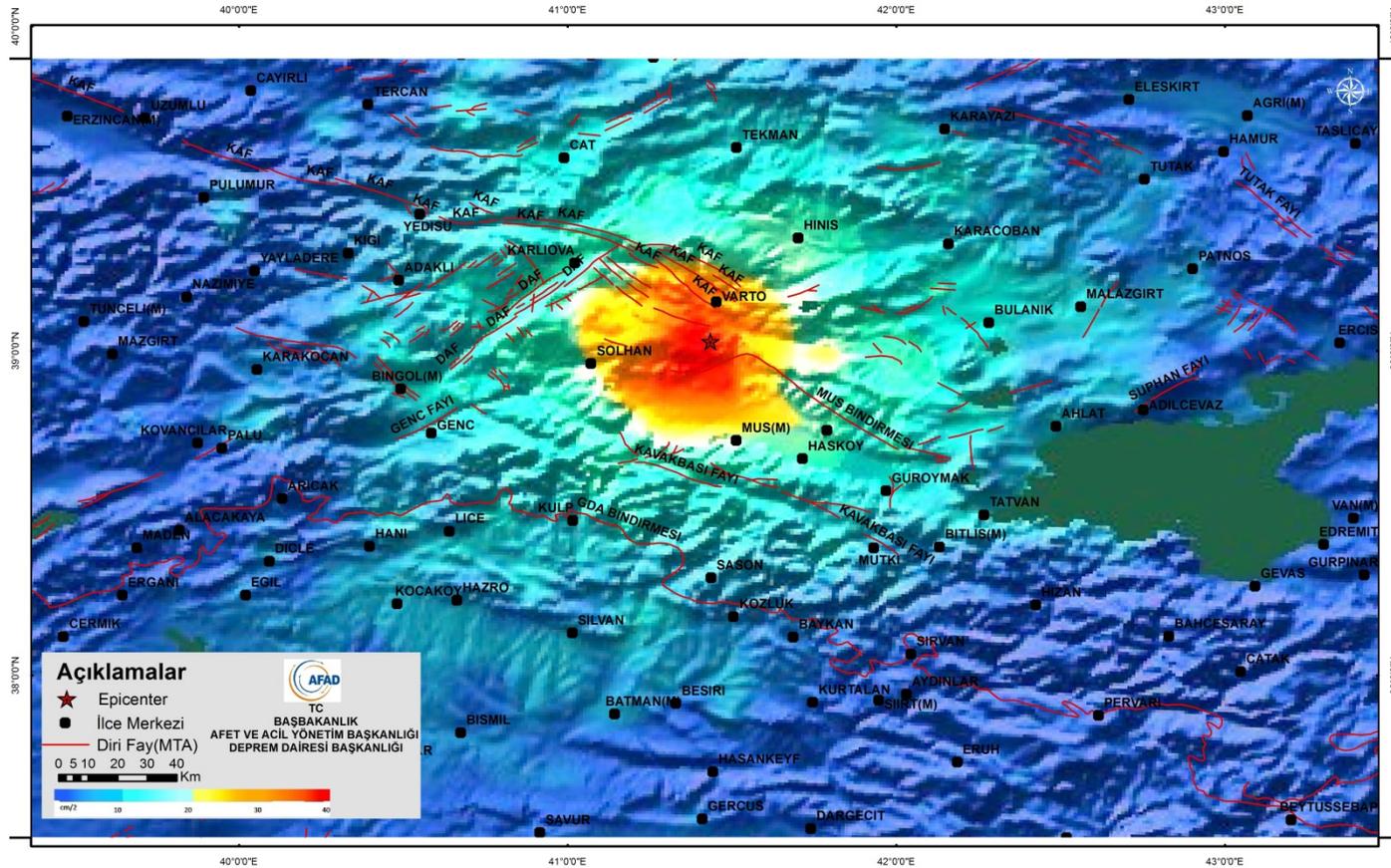
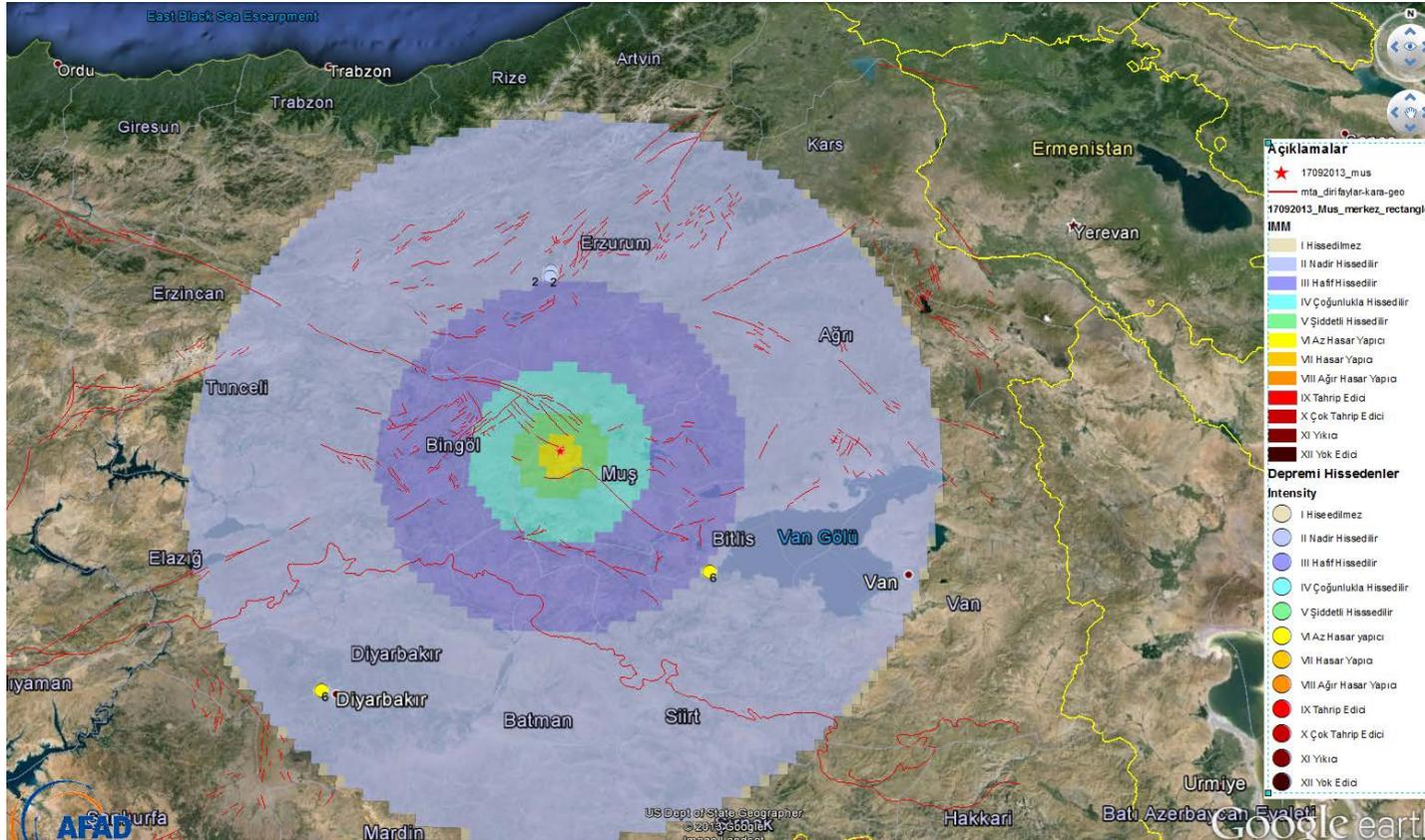


Figure 8. Estimated shake map for Muş Earthquake



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**Fig.9. Seismic Intensity Map of Muş Earthquake (MI=5.1) (yellow points show the results that come from eyewitness )**

### **REFERENCES**

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- EMRE,Ö., DUMAN, T.Y., ÖZALP, S., ELMACI, H., OLGUN, Ş ve ŞAROĞLU, F. (2013) Türkiye Diri Fay Haritası, Maden Tetkik ve Arama Genel Müdürlüğü, Özel Yayın Serisi-30, Ankara-Türkiye
- T.C. Başbakanlık, AFAD Deprem Dairesi Başkanlığı [www.deprem.gov.tr](http://www.deprem.gov.tr)
- Shake map was generated according to by utilizing attenuation relationship pertaining to **Campbell (1997)**

