

# PRELIMINARY REPORT

## MARMARA SEA EARTHQUAKE MI=5.1 (Western Turkey)

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EARTHQUAKE DEPARTMENT

## **MARMARA SEA EARTHQUAKE (WESTERN TURKEY) (MI=5.1)**

An earthquake with magnitude  $ML=5.1$  occurred at local time 23:54 on June, 07, 2012. Epicentral coordinates of the earthquake was determined as 40.86 N - 27.90 E with focal depth 26.90 km. The magnitude of earthquake was identified with AFAD National Seismological Observation Network and Kandilli Observatory and Earthquake Research Institute. After this earthquake, 23 earthquakes were determined with magnitude range 1.9 – 3.2 in first 10 hours (Fig.1).

This earthquake was also felt in, Balıkesir, Tekirdağ, İstanbul, Yalova, Bursa ve Kocaeli and it didn't caused loss of life and damaged.

Focal Mechanism Solutions performed by considering first motion direction of P wave and moment tensor solution of  $MI=5.1$  earthquake is emerged from strike slip faulting with normal component (Fig.2). The fault which caused earthquake is located in the middle of Tekirdağ hollowness and middle hollowness of western part of North Anatolian Fault Zone (Fig.3)

This region is very active in terms of seismicity. Marmara region has been exposed to destructive earthquakes during the historical and Instrumental times. Destructive earthquakes that occurred in the last century are given as; 1912  $M=7.4$ , 1942  $M=5.7$  Marmara Sea, 1963  $M=6.3$  Çınarcık, 1964  $M=7.0$  Manyas, 1988  $M=5.1$  North Marmara, 1999  $M=7.4$  Kocaeli and 2011  $MI=5.2$  earthquakes (Fig.4,5).

June 07, 2012 Marmara Sea Earthquake was recorded by accelerometers at 46 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 Tekirdağ Marmara Ereğlisi station which is located at nearest distance (about 13 km) to epicenter of this earthquake are 55.6 gal in EW direction, 28.9 gal in NS direction and 1.61 gal in up-down direction (Table 1, Fig. 6).



## **MARMARA SEA EARTHQUAKE (WESTERN TURKEY) (MI=5.1)**

**Peak ground acceleration and seismic intensity values that can be created by June,07, 2012 Marmara Sea earthquake in the earthquake-hit area and its vicinity are estimated and the maps showing the spatial distribution of these values are prepared (Fig.7,8).**

**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 205 Seismic station and 371 accelerometer. Obtained results are shared with public, press and relevant authorized.**

**For your information.**



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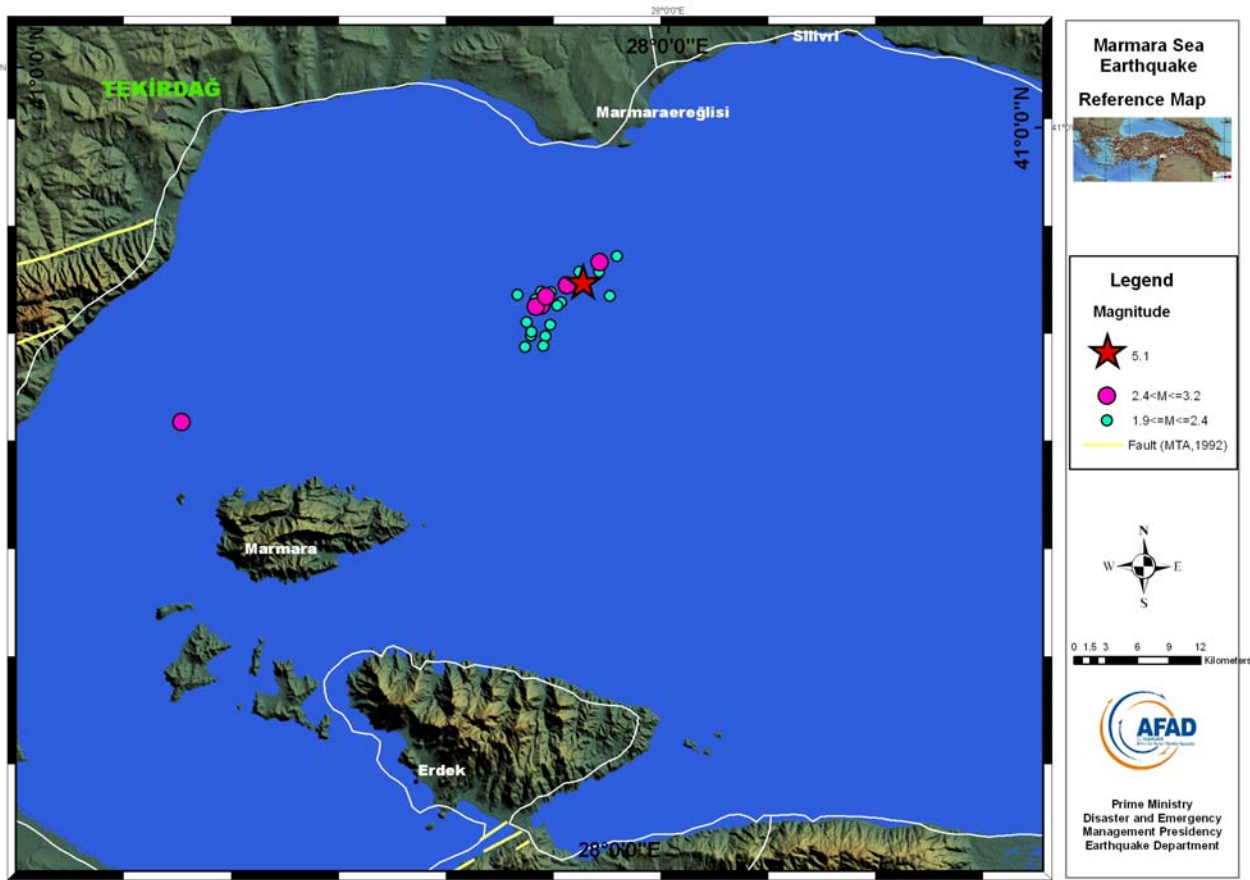


Fig. 1. 07/06/2012 Marmara Sea earthquake and aftershocks



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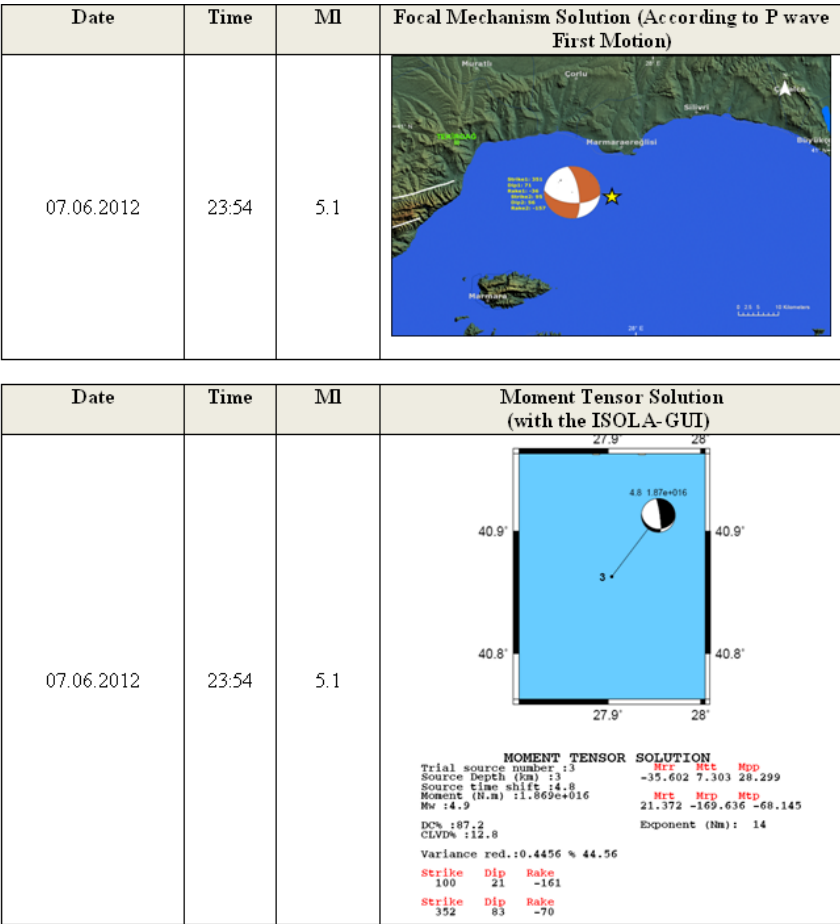
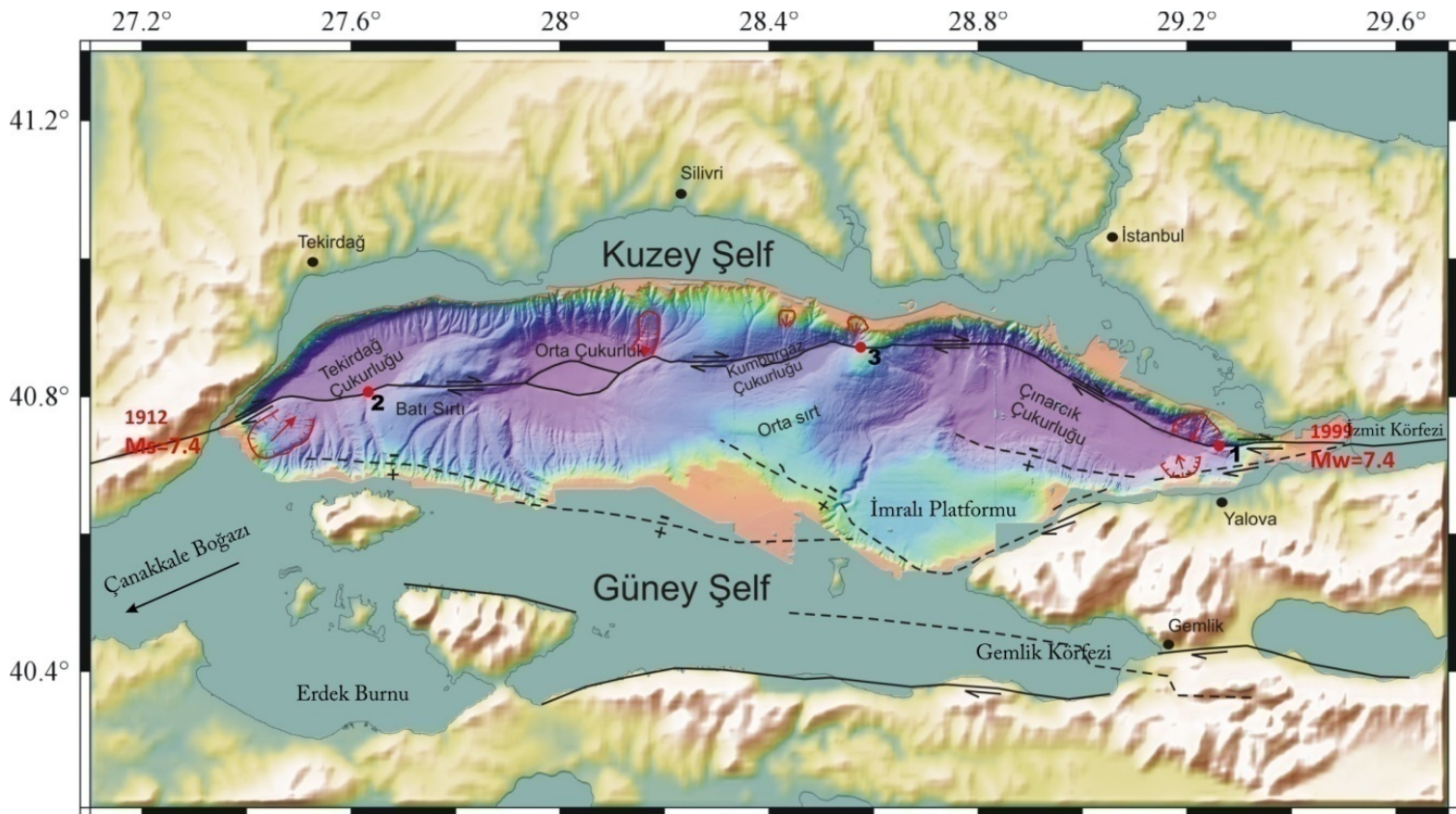


Fig. 2. Focal Mechanism Solutions of Marmara Sea earthquake



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**Fig. 3. Tectonic Structure of Marmara Sea (taken from ESONET NoE - Marmara Sea Observatory )**



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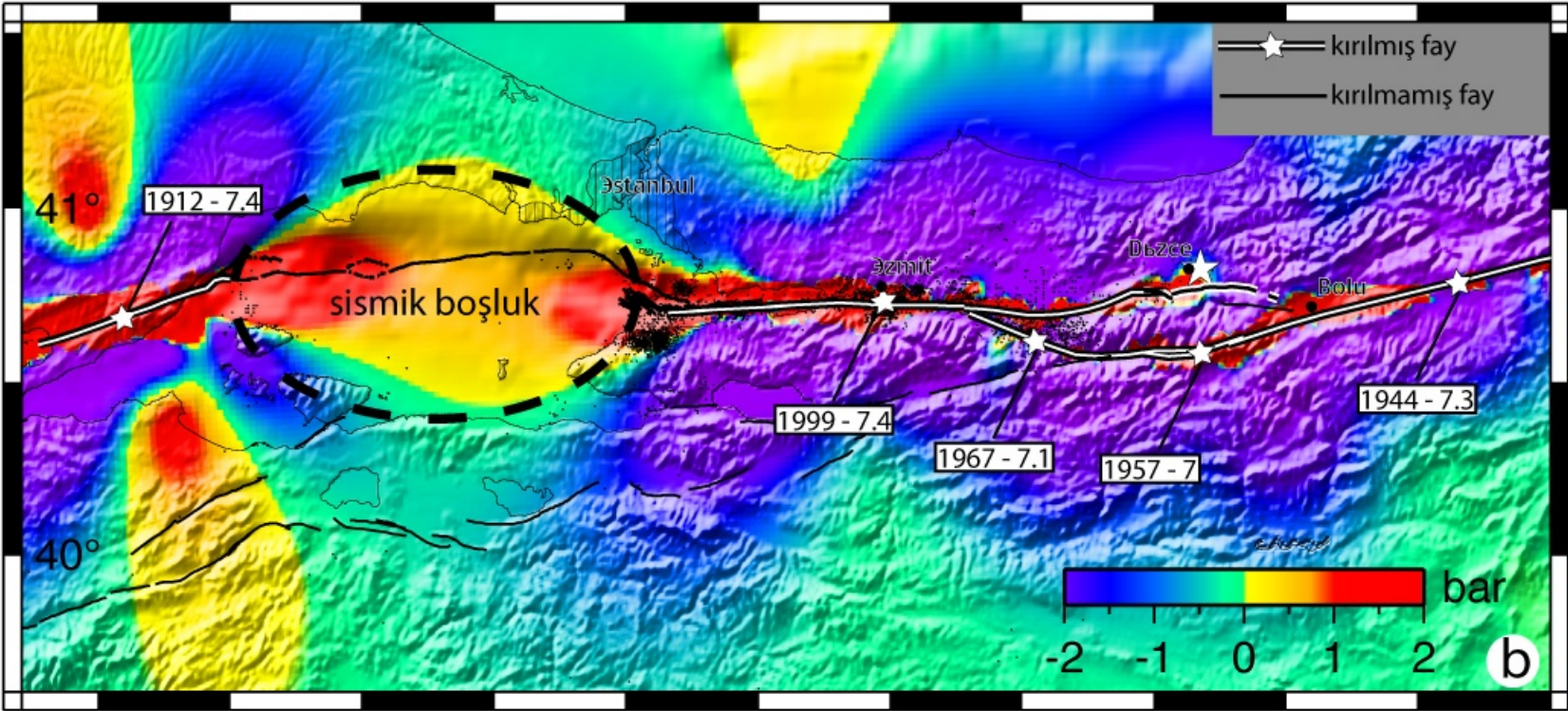


Fig. 4. Instrumental period earthquakes on the North Anatolian Fault Zone and Seismic Gap in Marmara Region that clarified with Coulomb Stress changes (Çakır v.d., 2003).

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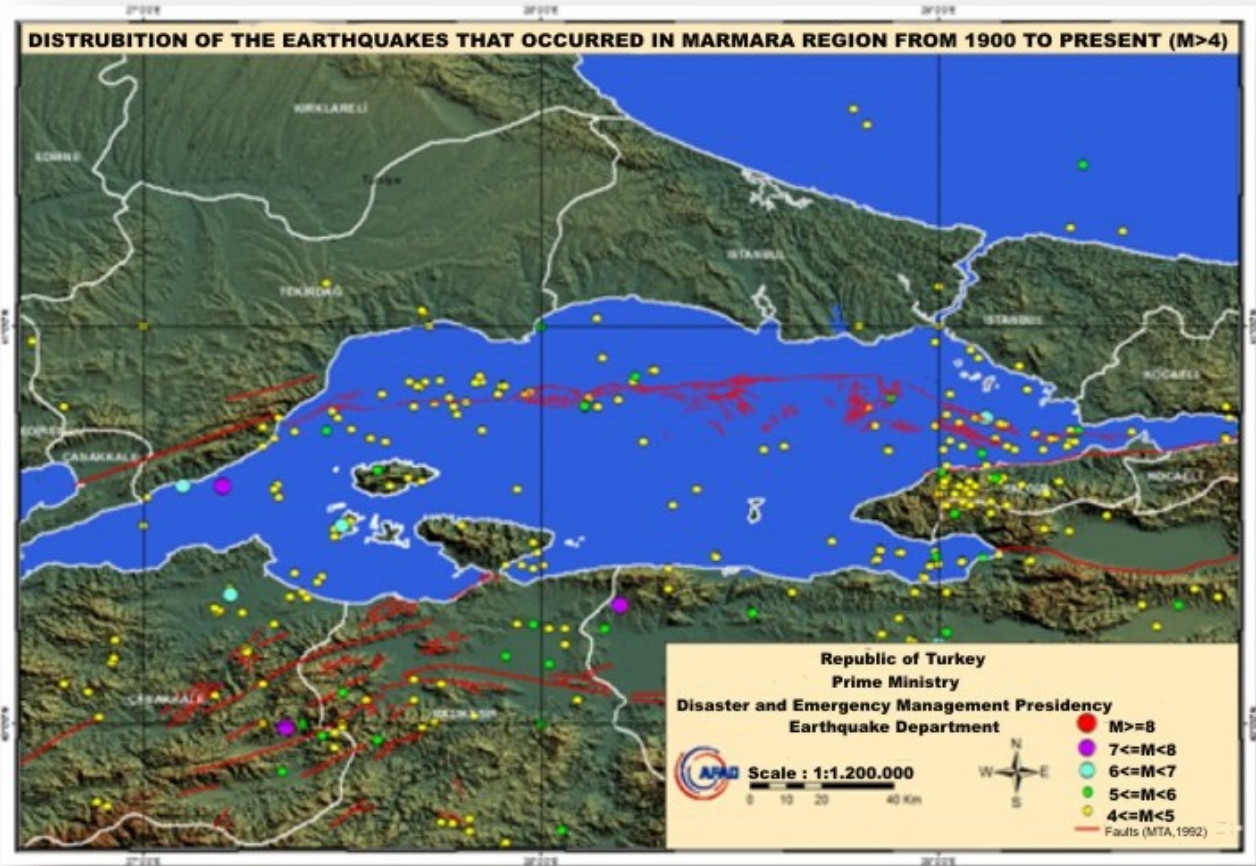


Fig. 5. Marmara and Surrounding Region Earthquakes From 1900 to Present





# MARMARA SEA EARTHQUAKE (WESTERN TURKEY) (MI=5.1)

STATION			Lat	Lon	Type of Accelerometer	ACCELEROMETER VALUES (gal)			Distance R <sub>ep</sub> (km)	Share Wave V <sub>s30</sub> (m/sn)
N	CITY	TOWN				NS	EW	UD		
1	TEKIRDAG	MARMARA EREGLISI	40.973	27.9503	GeoSig gsr16	28.9	55.6	1.61	13	325
2	TEKİRDAĞ	MERKEZ	40.9821	27.5479	Guralp cmg5td	17.9	16.9	6.78	33	
3	TEKİRDAĞ	MERKEZ	40.9793	27.515	GeoSig gsr16	19	26.3	3.85	35	409
4	TEKİRDAĞ	SARKOY	40.6149	27.1226	Guralp cmg5td	7.63	6.73	5.83	72	225
5	BALIKESİR	BANDIRMA	40.3319	27.9966	Guralp cmg5td	2.83	4.08	2.16	60	321
6	BALIKESİR	SAVASTEPE	39.3804	27.6544	Guralp cmg5td	1.45	1.15	0.49	166	
7	İSTANBUL	KUCUK CEKMECE	41.0265	28.7588	Guralp cmg5td	5.72	5.59	2.34	74	283
8	ÇANAĞKALE	BİGA	40.2318	27.2629	Guralp cmg5td	3.76	3.85	1.56	89	304
9	EDİRNE	MERKEZ	41.6705	26.5859	Guralp cmg5td	3.62	5.53	1.31	142	
10	KIRKLARELİ	MERKEZ	41.7377	27.2151	Guralp cmg5td	1.44	1.99	1.14	113	
11	KOCAELİ	KORFEZ	40.7768	29.7335	Guralp cmg5td	0.35	0.46	0.27	154	300
12	KOCAELİ	KARAMURSEL	40.6844	29.5888	Guralp cmg5td	0.56	0.36	0.33	143	300
13	KOCAELİ	KANDIRA	41.0691	30.1525	Guralp cmg5td	0.16	0.19	0.13	190	380
14	KOCAELİ	GEBZE	40.7863	29.45	Guralp cmg5td	0.53	0.36	0.35	130	701
15	KOCAELİ	MERKEZ_BASISKELE_YUVACIK KOYU_B	40.6804	29.97	Guralp cmg5td	0.1	0.12	0.07	175	757
16	KOCAELİ	MERKEZ_KARABAS_KBB_B	40.7602	29.9324	Guralp cmg5td	0.34	0.37	0.32	171	305
17	KOCAELİ	GOLCUK	40.7245	29.84	Guralp cmg5td	0.48	0.42	0.25	164	352
18	KOCAELİ	BASISKELE	40.7196	29.8658	Guralp cmg5td	0.43	0.61	0.15	166	
19	KOCAELİ	DILOVASI	40.7729	29.5206	Guralp cmg5td	0.52	0.51	0.23	136	
20	KOCAELİ	HEREKE	40.733	29.6064	Guralp cmg5td	0.52	0.51	0.38	144	
21	KOCAELİ	KARTEPE_ARSLANBEY	40.6699	30.0267	Guralp cmg5td	0.29	0.31	0.12	180	
22	KOCAELİ	KOSEKOY	40.7483	30.0263	Guralp cmg5td	0.28	0.27	0.12	179	

STATION			Lat	Lon	Type of Accelerometer	ACCELEROMETER VALUES (gal)			Distance R <sub>ep</sub> (km)	Share Wave V <sub>s30</sub> (m/sn)
N	CITY	TOWN				NS	EW	UD		
23	KOCAELİ	KARTEPE_TEPETARLA	40.7216	30.0781	Guralp cmg5td	0.84	0.69	0.3	184	
24	KOCAELİ	MERKEZ_ALIKAHYA	40.7676	30.0274	Guralp cmg5td	0.44	0.41	0.18	179	
25	KOCAELİ	KULLAR	40.7228	29.9699	Guralp cmg5td	0.44	0.38	0.24	175	
26	KOCAELİ	MERKEZ_BASISKELE_YUVACIK KOYU_G	40.6744	29.9694	Guralp cmg5td	0.39	0.49	0.36	175	289
27	KOCAELİ	MERKEZ_KARABAS_KBB_C	40.7602	29.9329	Guralp cmg5td	1.09	0.96	0.39	171	
28	İZMİR	PINARBASI	38.4213	27.2563	Guralp cmg5td	0.14	0.15	0.08	277	
29	İZMİR	DIKILI	39.0739	26.8883	Guralp cmg5td	1.51	1.68	0.86	217	193
30	İZMİR	BORNOVA	38.453	27.2244	Guralp cmg5td	0.36	0.32	0.15	274	270
31	İZMİR	BAYRAKLI	38.4762	27.1581	Guralp cmg5td	0.19	0.3	0.12	273	
32	İZMİR	BALCOVA	38.409	27.043	Guralp cmg5td	0.3	0.28	0.1	283	
33	İZMİR	GUZELBAHCE	38.3706	26.8907	Guralp cmg5td	0.23	0.23	0.09	291	
34	İZMİR	KARSIYAKA	38.4525	27.1112	Guralp cmg5td	0.56	0.63	0.3	277	
35	İZMİR	MANAVKUYU	38.478	27.2111	Guralp cmg5td	0.22	0.2	0.15	272	
36	İZMİR	YAMANLAR	38.4969	27.1073	Guralp cmg5td	0.34	0.34	0.12	272	
37	İZMİR	MAVİŞEHİR	38.4679	27.0764	Guralp cmg5td	0.77	0.65	0.69	276	
38	İZMİR	KONAK	38.4312	27.1435	Guralp cmg5td	0.45	0.58	0.28	278	
39	İZMİR	BOSTANLI	38.4649	27.094	Guralp cmg5td	0.49	0.48	0.32	276	
40	DÜZCE	AYDINPINAR	40.7671	31.1124	Guralp cmg5td	0.1	0.13	0.09	270	
41	DÜZCE	BEYCILER	40.8611	31.1804	Guralp cmg5td	0.07	0.08	0.05	276	
42	DÜZCE	KONURALP	40.9028	31.152	Guralp cmg5td	0.1	0.1	0.04	273	
43	ESKİŞEHİR	MERKEZ_EMİRCE KOYU	39.8801	30.4534	Guralp cmg5td	0.05	0.06	0.03	243	629
44	BURSA	KURTUL	40.363	29.1221	Kinematics etna	1.22	1.03	0.42	117	274
45	BURSA	ENGURUCUK	40.3944	29.098	Kinematics etna	1.45	1.46	0.71	114	370
46	BURSA	MUDANYA	40.351	28.9282	Guralp cmg5td	1.21	0.81	0.48	104	

Table 1. Acceleration Values of Marmara Sea earthquake



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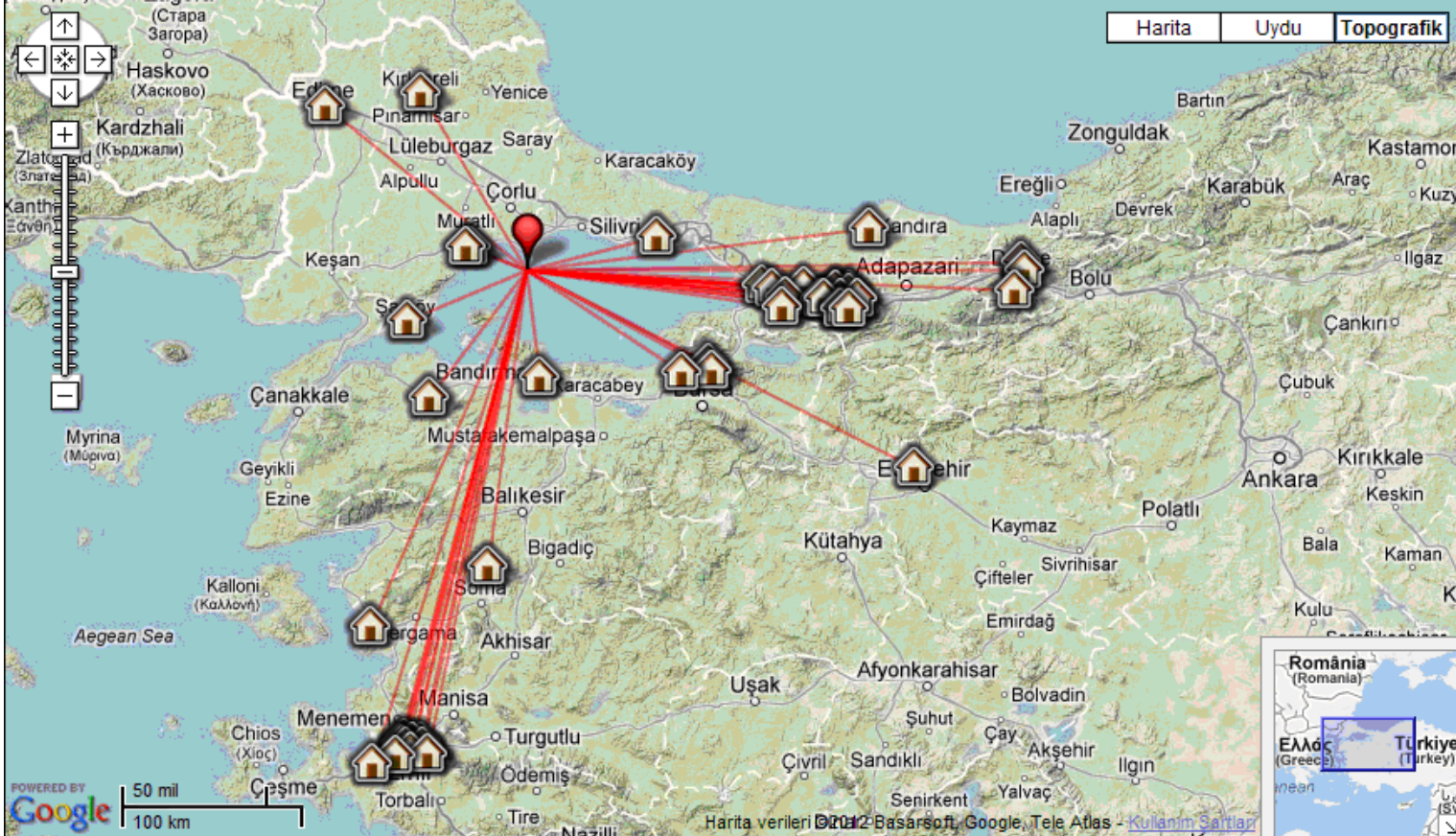


Fig.6. Distribution of the accelerometers that recorded Marmara Sea earthquake

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Fig.7. Peak Ground Acceleration Distribution of Marmara Sea Earthquake (MI=5.1)

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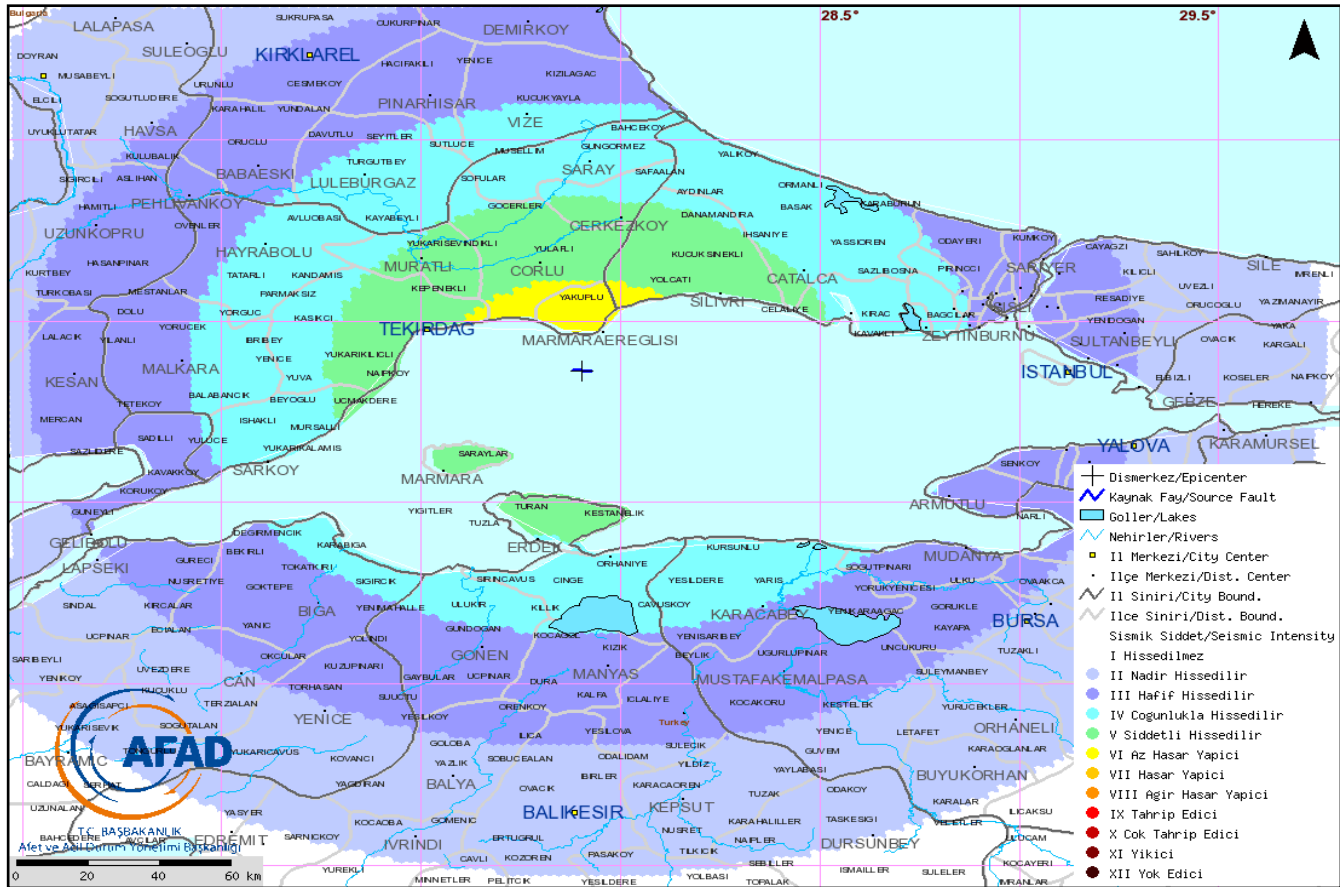


Fig.8. Seismic Intensity Map of Marmara Sea Earthquake (MI=5.1) (according to Yoshimitsu Fukushima and Teiji Tanaka, 1990) (Arioğlu E., Arioğlu B. M., Girgin C. (2001))

## MARMARA SEA EARTHQUAKE (WESTERN TURKEY) (MI=5.1)

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