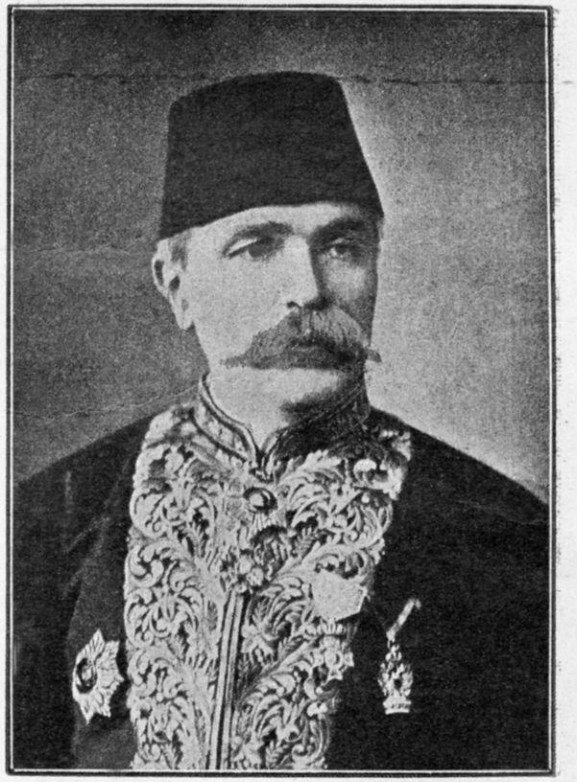
The Devastating Earthquake doublet of February 6, 2023 in Türkiye : An overview

Prof.Dr. Haluk ÖZENER

Congreso Internacional "Terremotos y Vulnerabilidad"
22-25 junio 2023
Punta Cana

KOERI

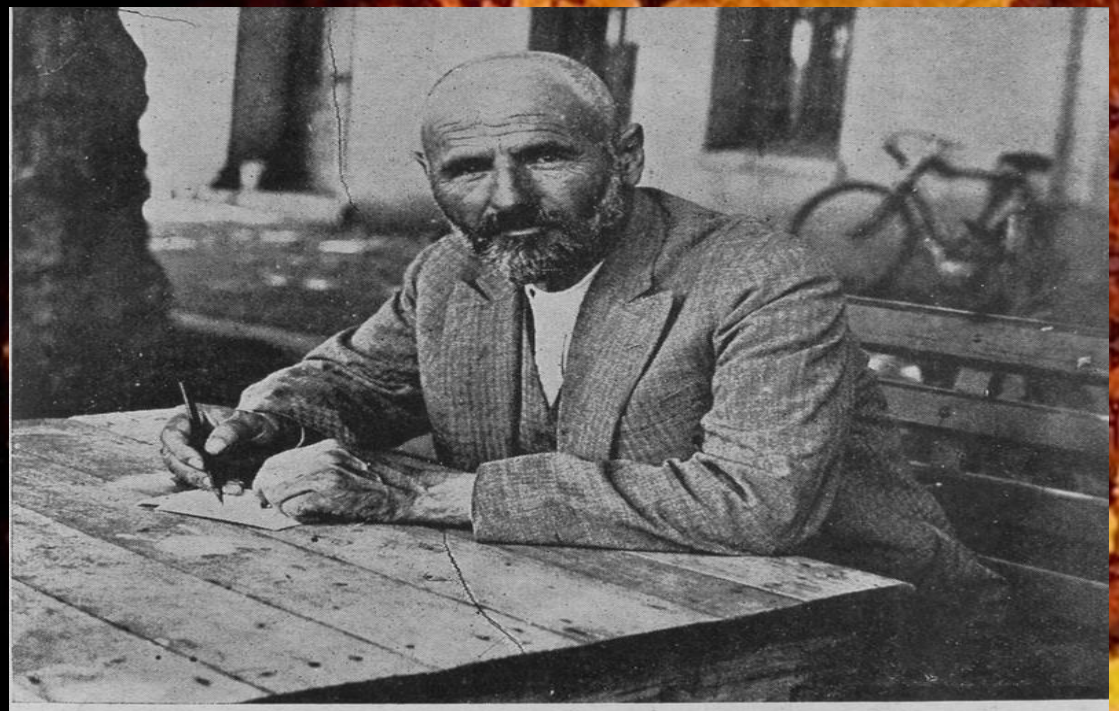


[عبداه برادرلرك فوطوغرافندن]

رصدخانهٔ عامره مديرى متوفى قومبارى افندى

Combary, directeur de l'Observatoire Impériale, mort le 17 Janvier 1896.

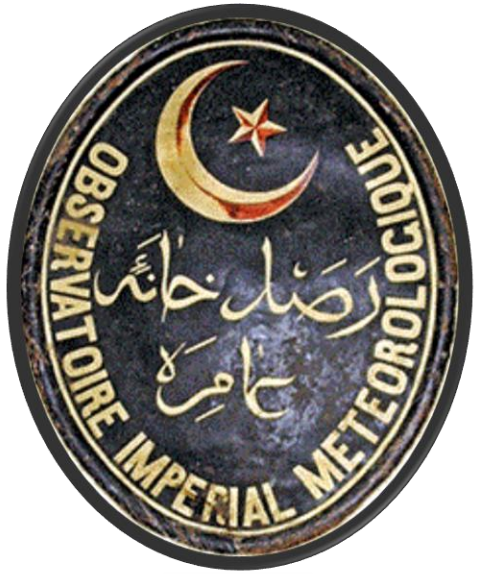
- Abdülaziz
- Aristide Coumbary
- Pera
- Köstence, Beyrut, Bağdat, Diyarbakır
- Salih Zeki Bey
- 31 Mart Vakası (12 Nisan 1909)



Kendisini rasathanenin zarif parkında hesaplarile meşgul bulduk -FotoYedigün-

- Maarif Nazırı Emrullah Efendi
- 21 Haziran 1910
- Fatin Gökmen – Astronomer-geophysicist
- İcadiye Tepesi, Topçu Birliği, Köşkçüler

- 1868: Rasathane-i Amire
- 1895: First Seismometer (Pera ve Yıldız Palace)
- 21 June 1910: Appointment of Fatin Gökmen
- 1 July 1911: Meteorological Observations
- 26 Aralık 1925: Definition of Religious Days
- 1926: Modern Seismometers
- 1927: Magnetic Observations
- 1935: Astronomical Observations
- 1936: Ministry of Culture
- 1940: Ministiry Of Education
- 1982 Boğaziçi University - Institute
- **1868-2018 (155 th. Anniversary)**



ORGANIZATION

Boğaziçi Universitesi (1863, Robert College) → **RECTOR**

KOERI (1868, Rasathane-i Amire) → **DIRECTOR**

Earthquake Preperedness Laboratory

ACADEMICAL UNITS

- Earthquake Engineering
- Geodesy
- Geophysics

CENTERS

- Regional Earthquake and Tsunami Monitoring Center
- Belbaşı Nukleer Monitoring Center
- Iznik Disaster Center

LABORATORIES

- Solar Physics (Astronomy)
- Meteorology
- Geomagnetism

METEOROLOGY

- Pressure 1964'den bugüne kadar
- Temparature (Max., Min, Ort .) 1911'den bugüne kadar
- Rain 1911' den günümüze
- Humidity 1911' den günümüze
- Wind (Şiddeti ve Yönü) 1934' den günümüze
- Sun 1934' den günümüze

WEATHER CLIMATE WATER

WORLD
METEOROLOGICAL
ORGANIZATION

KANDILLI OBSERVATORY

RECOGNIZED AS A LONG-TERM OBSERVING STATION BY THE WORLD METEOROLOGICAL ORGANIZATION IN SEPTEMBER 2020 FOR MORE THAN 100 YEARS OF METEOROLOGICAL OBSERVATIONS

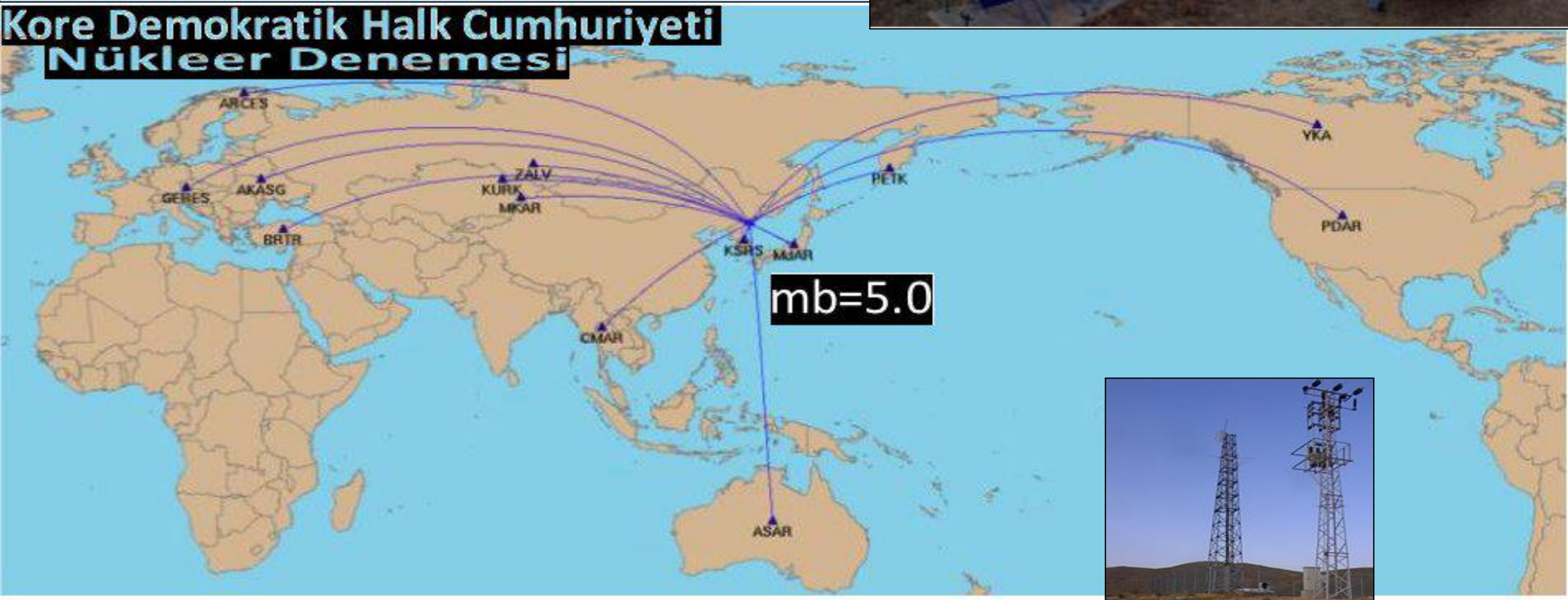
Prof. Petteri Taalas
Secretary-General of WMO

Long-term meteorological observations are part of the irreplaceable cultural and scientif c heritage of mankind that serve the needs of current and future generations for long-term high quality climate records. Their continued future maintenance will ensure that these unique sources of consistent past and contemporary information about atmospheric parameters serve as references for climate variability and change assessments and as prerequisites for ef cient climate services. By recognizing long-term observing stations according to a list of criteria, WMO promotes sustainable observational standards and best practices that facilitate the generation of high-quality long-term time series data.

This certif cate refers to Resolution 7 (EC-72), September 2020; the recognition will be reviewed every 10 years.

Astronomy – Solar Physics

BELBAŞI NMC



NDIM çözümünde kullanılan sismik dizinimler ve nükleer deneme lokasyonu

Akdeniz'de tarihsel tsunamiler

- Yüksek seviyede yıkım
- Orta seviyede yıkım
- Düşük seviyede yıkım

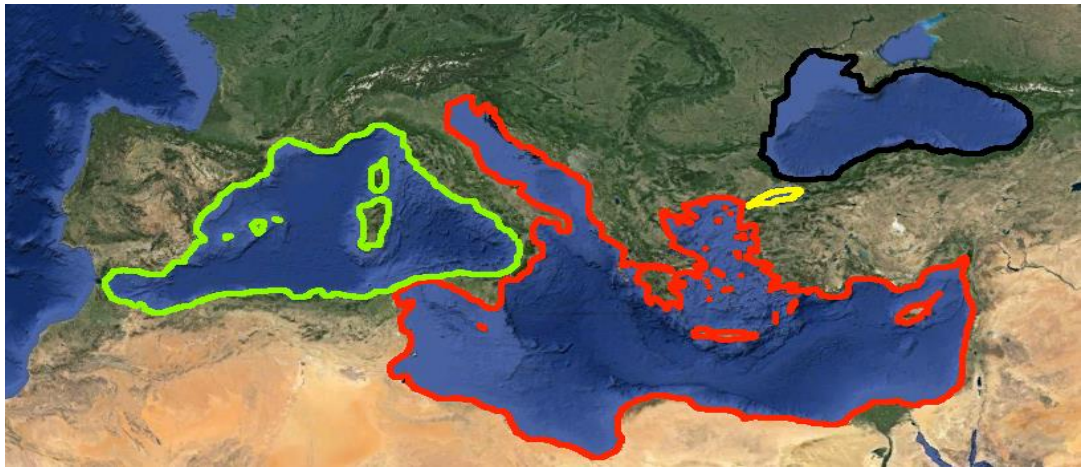
Doğu Akdeniz-Ege-Karadeniz Tsunami Uyarı Merkezi

KOERI as UNESCO – IOC - NEAMTWS REGIONAL CENTER

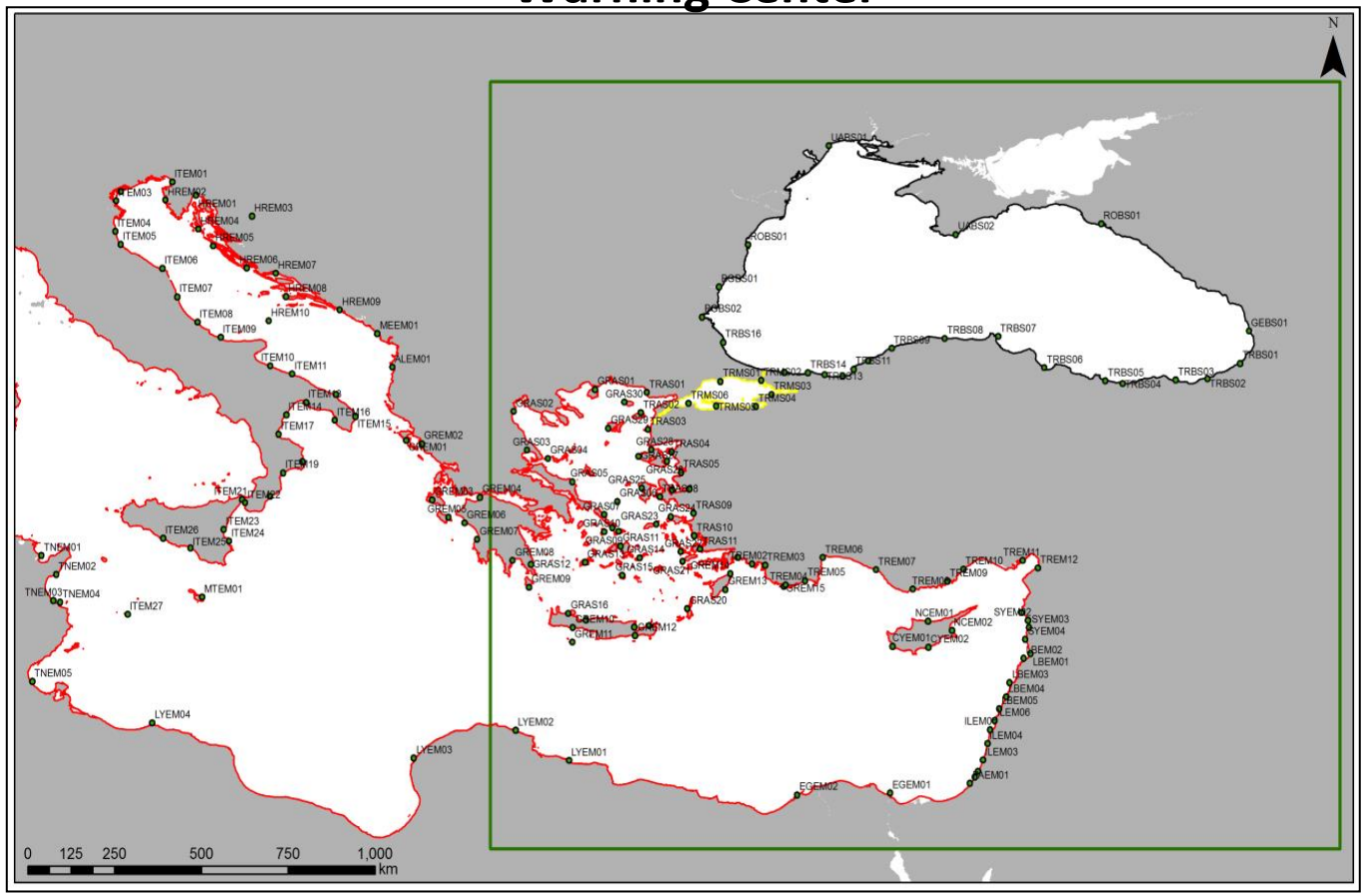
Noktalar tsunamiye neden olan deprem merkez üslerini göstermektedir.

Tsunami Institute (2009)'dan uyarlanmıştır.

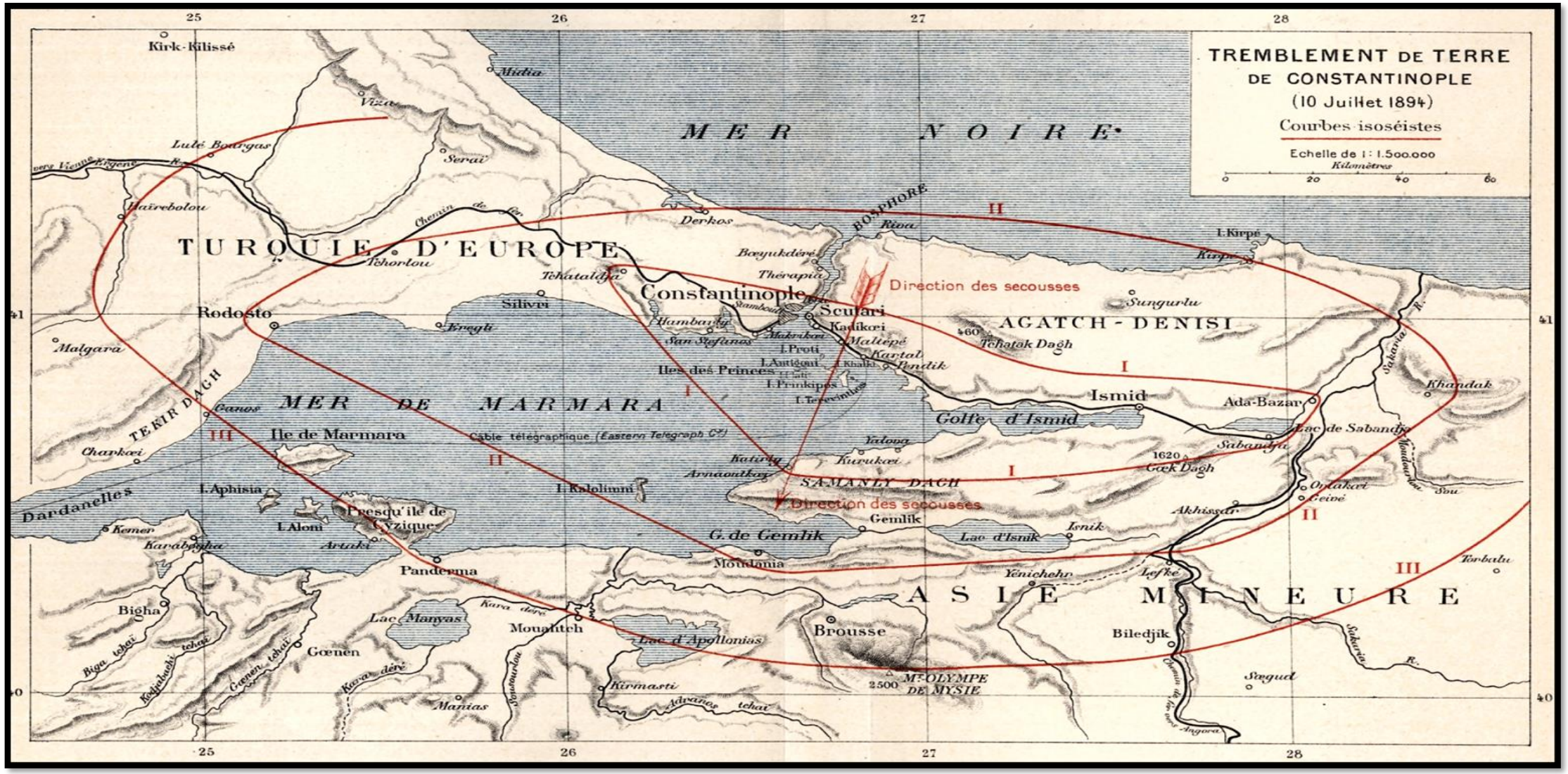
Operational Region



East Mediterranian Aegean and Black Sea Tsunami Warning Center



1894 İstanbul Earthquake Intensity Map
(Kandilli ve Athens Observatories))



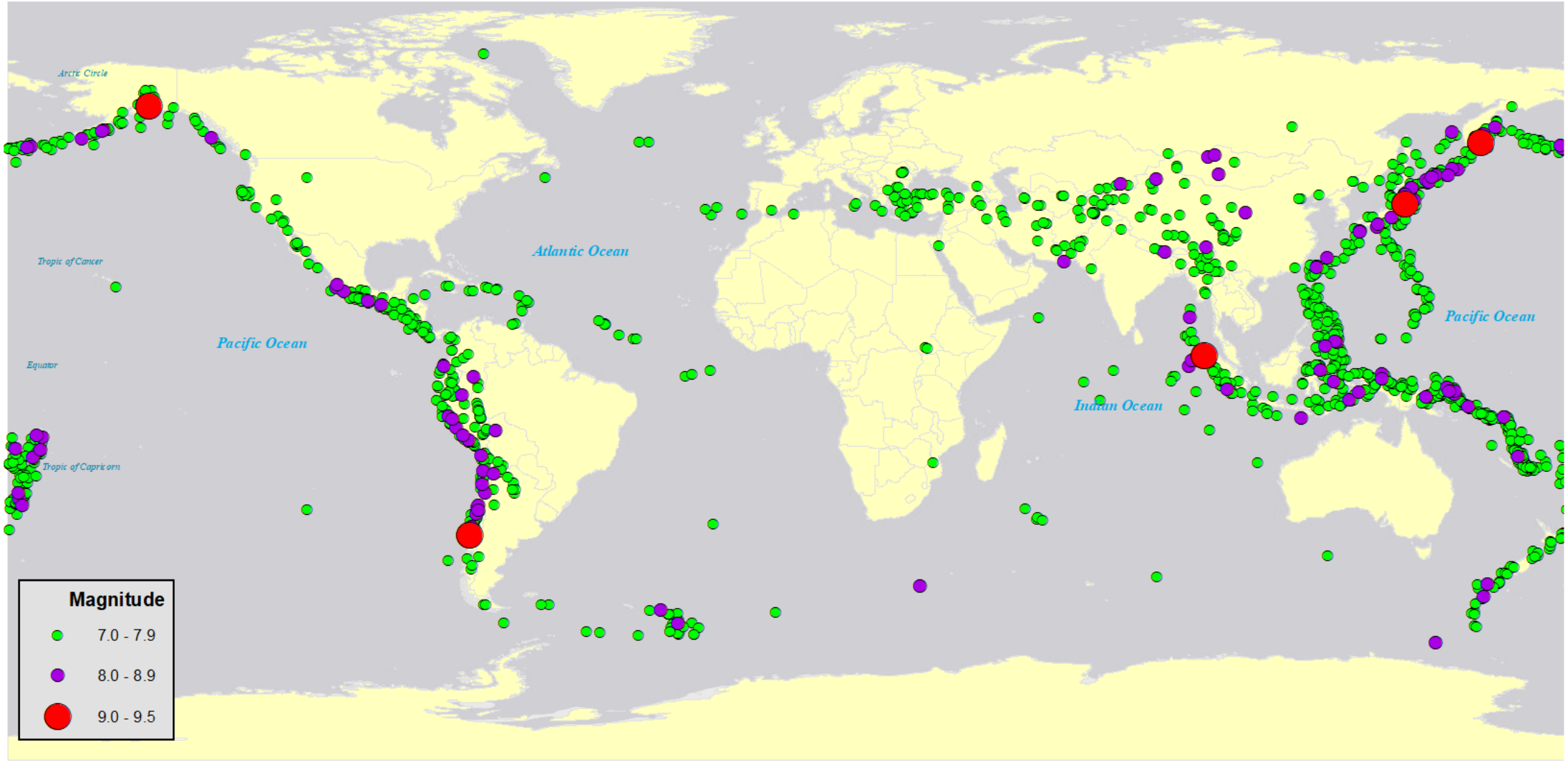
1875 Italy – First modern seismometers (Roma)

1881 Japon (Tokyo) 1895 Ottoman Empire (Pera ve Yıldız Palace)

1897 US (San Jose)

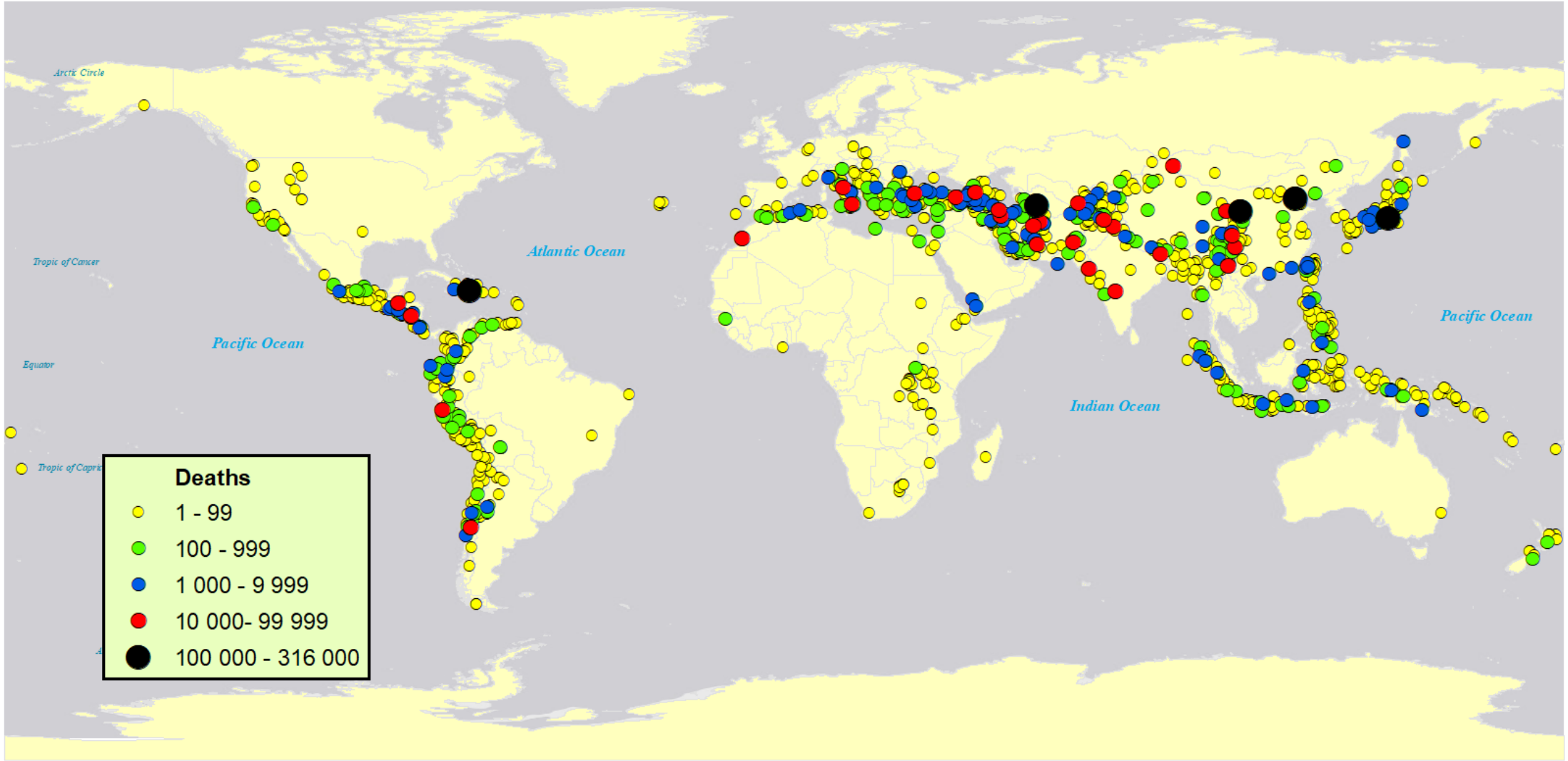
WORLD

Distribution Of Earthquakes Greater Than M≥7.0 Between 1900- 19 June 2023 in The World; 1492 Earthquakes (USGS)



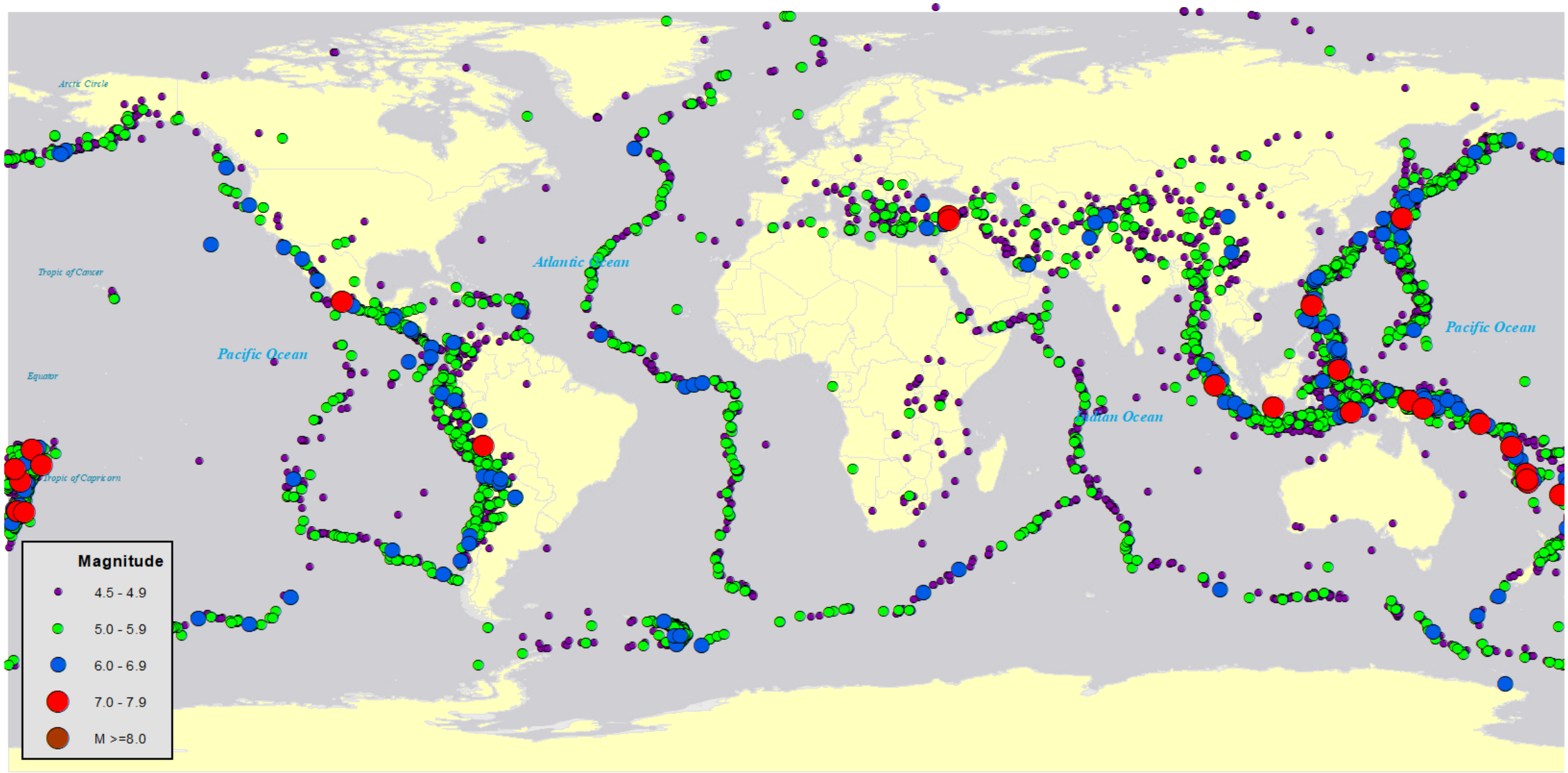
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Earthquakes Caused Deaths Between 1900 - 19 June 2023 (1523 Earthquakes; 2.231.227 Deaths, NOAA)



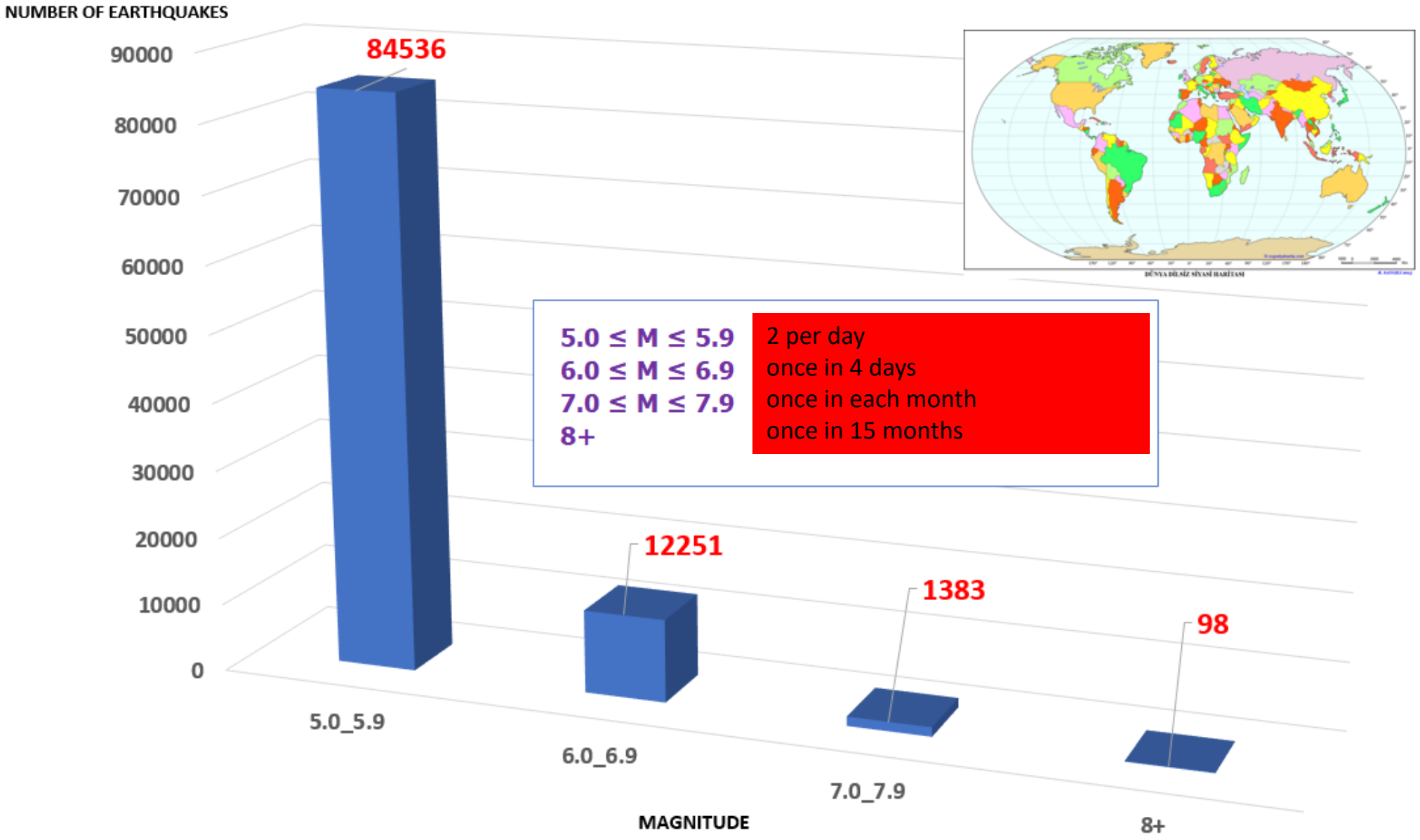
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

Distribution Of Earthquakes Greater Than M≥4.5 Between 2022-19 June 2023 in The World; 11160 Earthquakes (USGS)



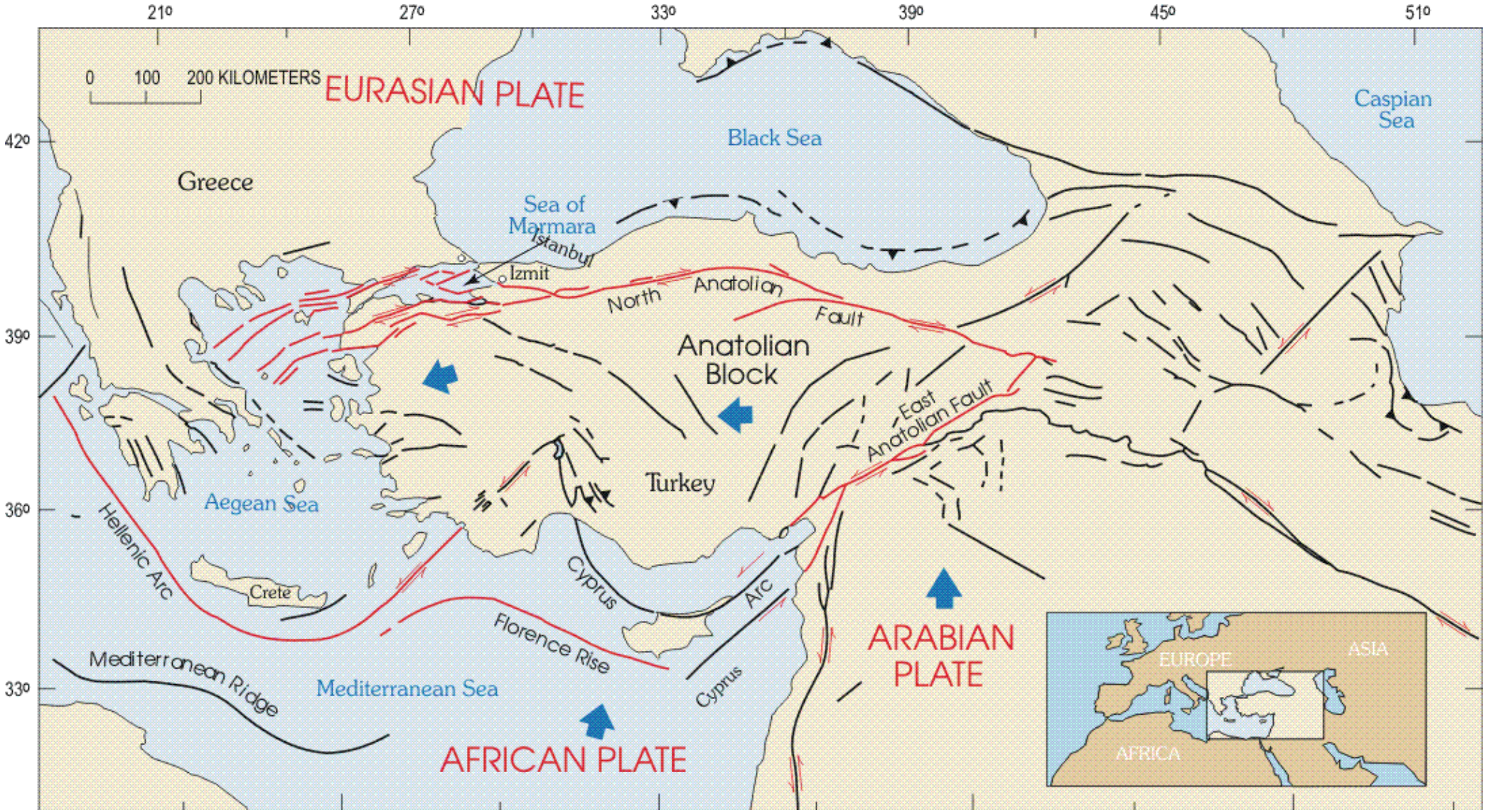
Esri, HERE, Garmin, (c) OpenStreetMap contributors, and the GIS user community

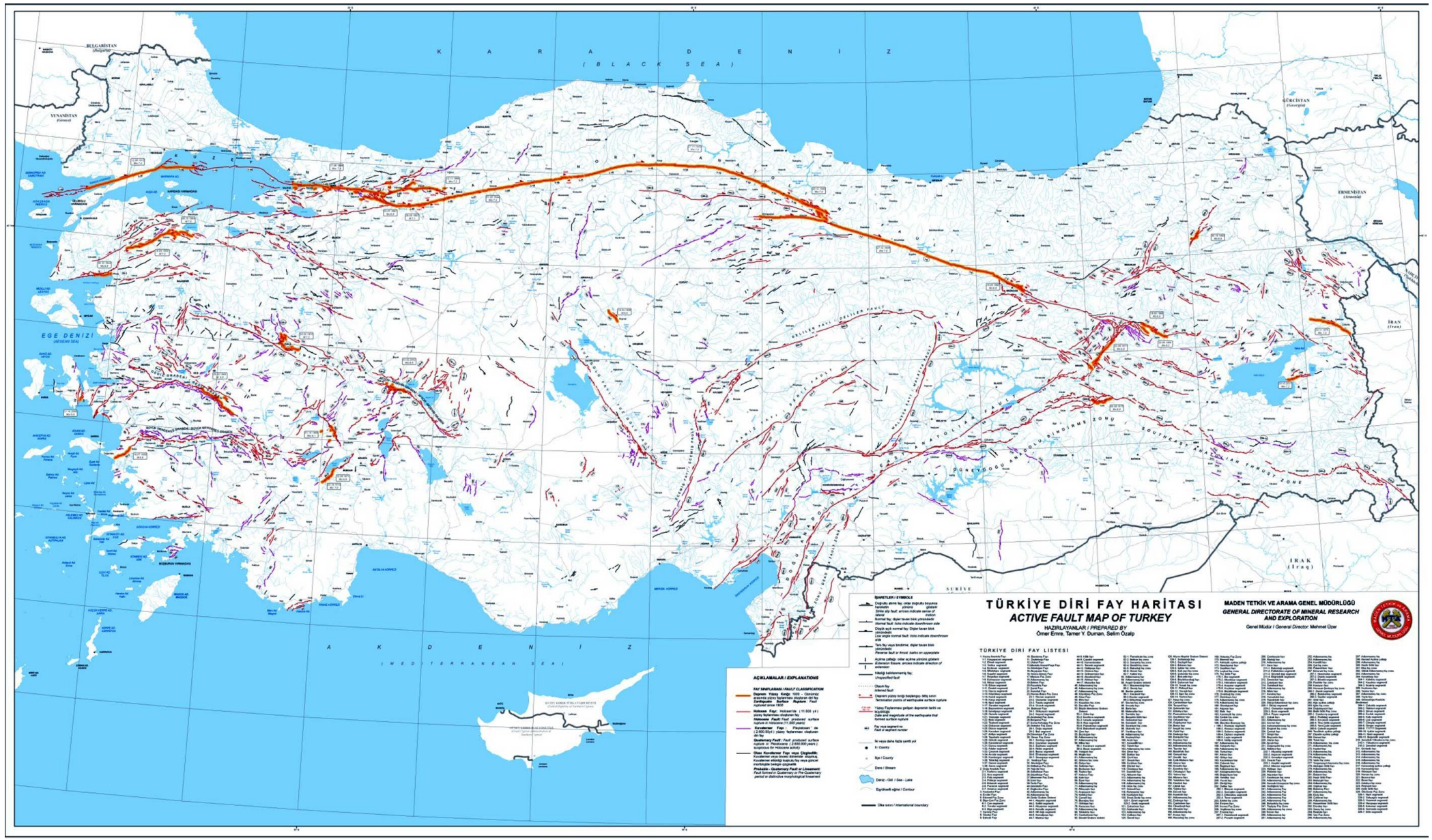
Distribution Of Earthquakes Greater Than M≥5.0 Between 1900- June 2023 in The World



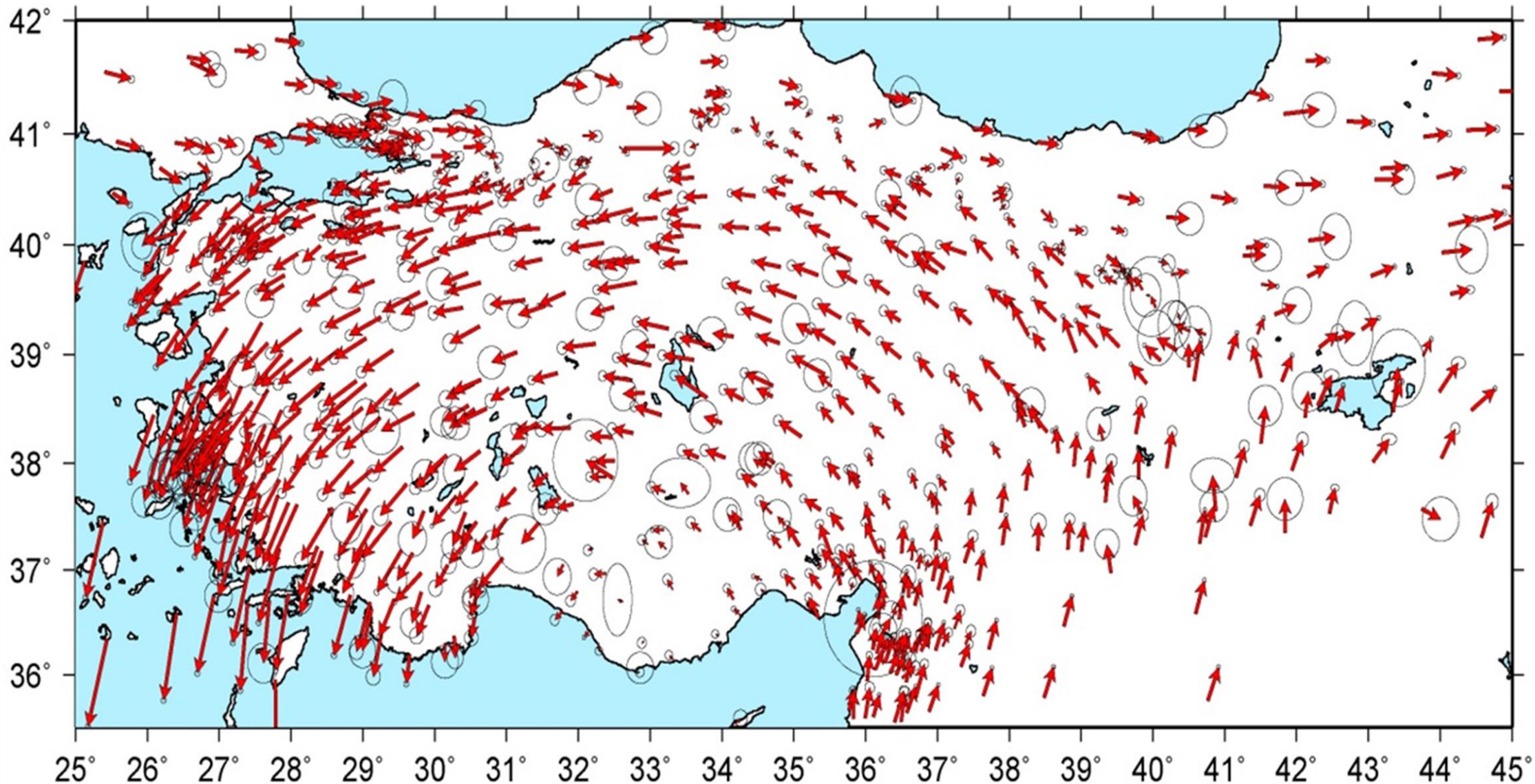
TÜRKİYE

Main Tectonic Units and Plates in Türkiye and Surrounding Area

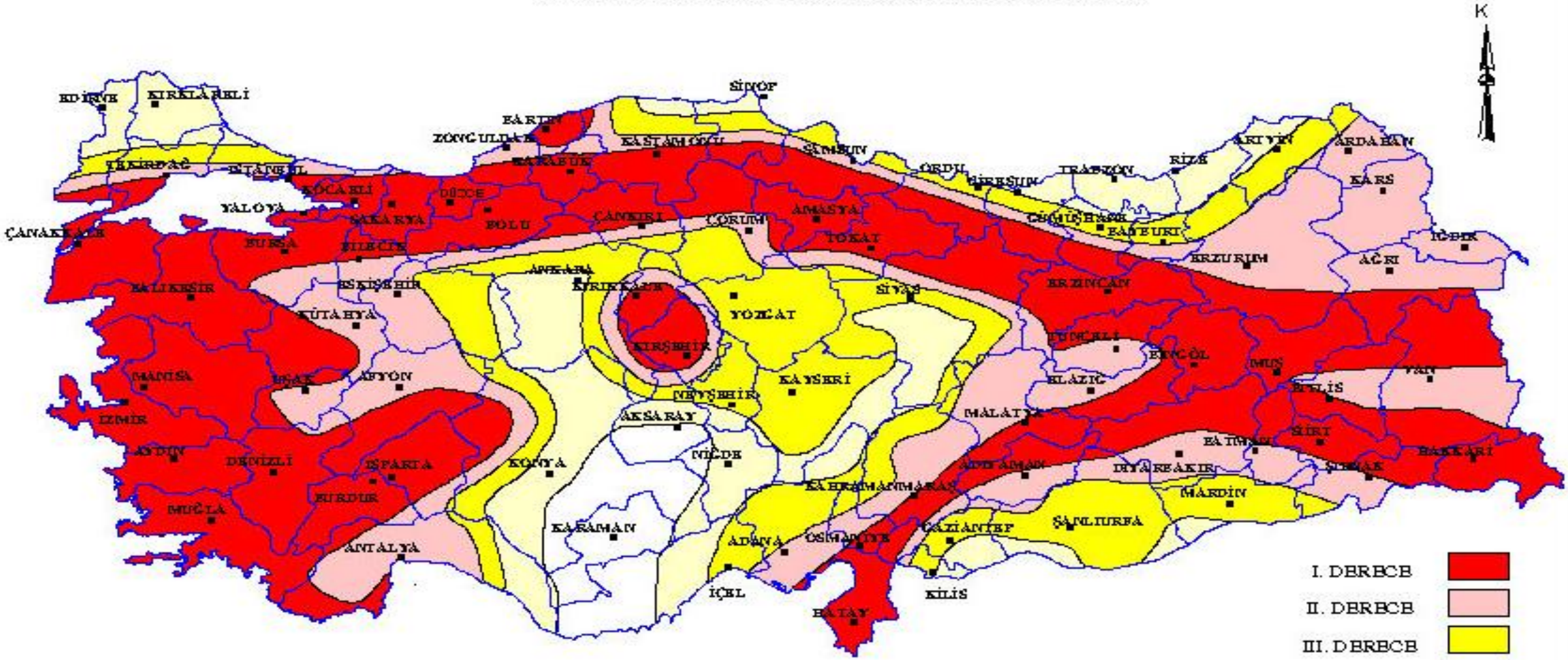




General Directorate of Mineral Research and Exploration


42°
41°
40°
39°
38°
37°
36°
25°
26°
27°
28°
29°
30°
31°
32°
33°
34°
35°
36°
37°
38°
39°
40°
41°
42°
43°
44°
45°

DEPREM BÖLGELERİ HARİTASI*

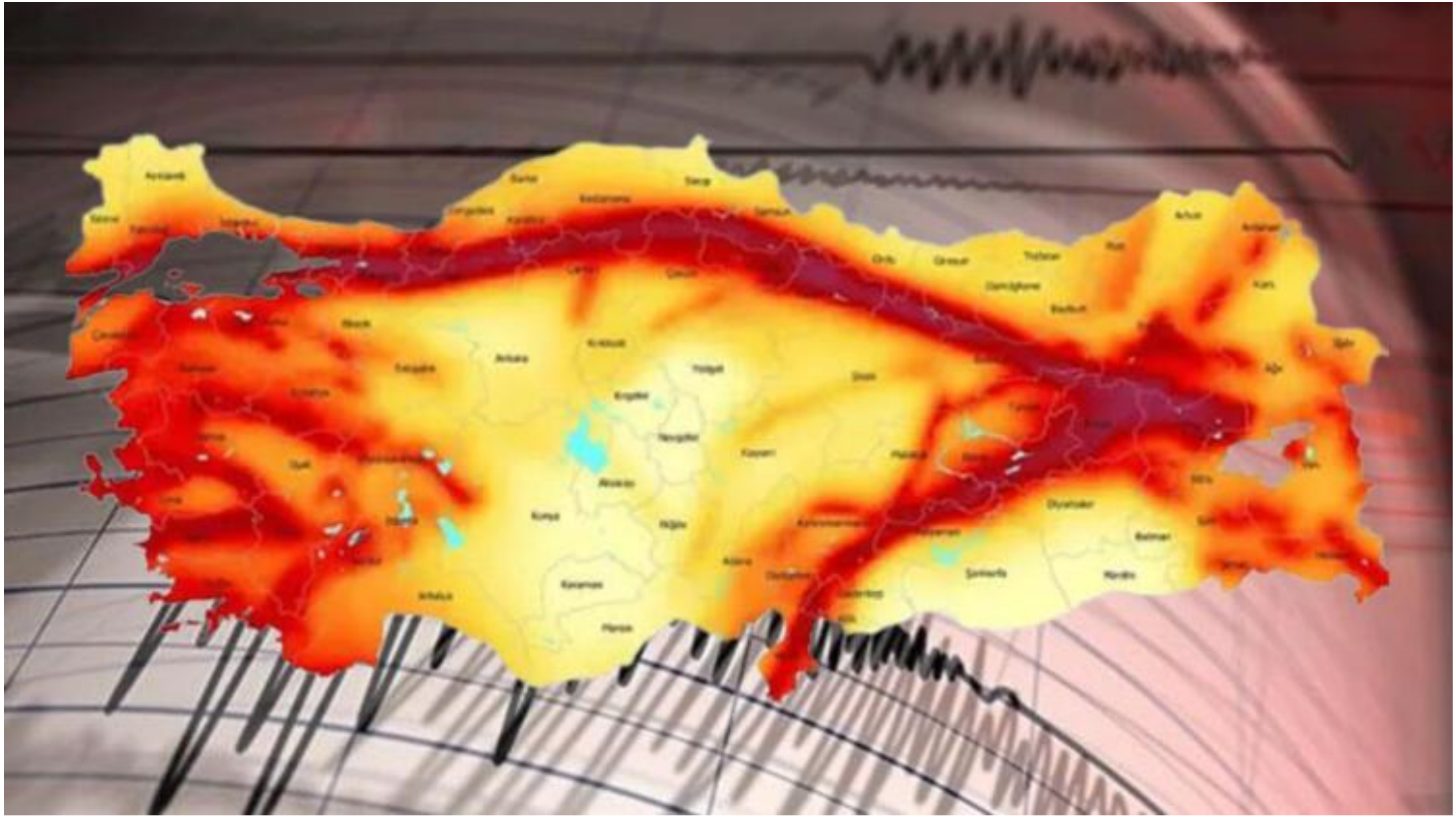


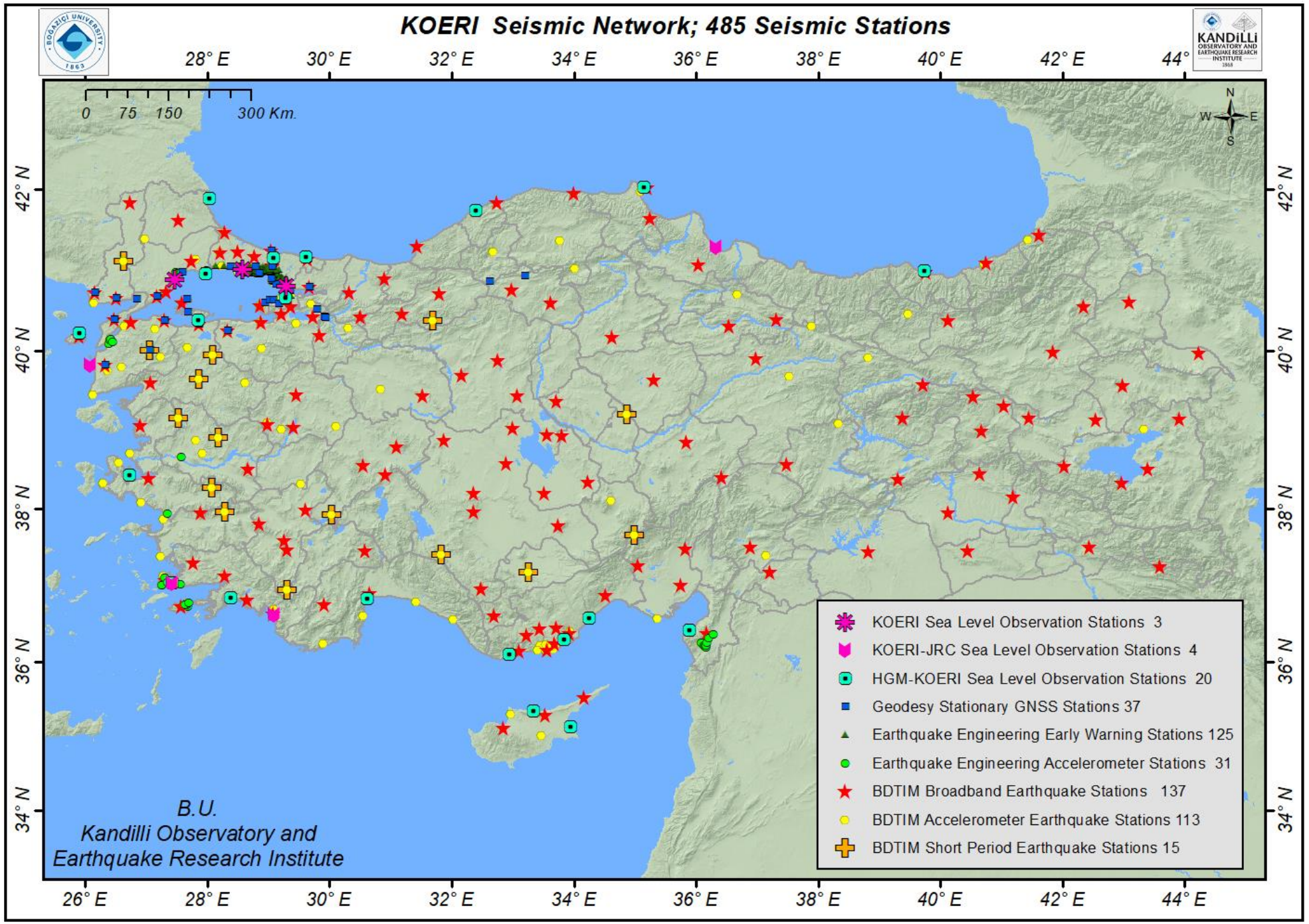
* T.C Bayındırlık ve İskan Bakanlığı, 1996

B.Özmen, M.Nurlu ve H.Güler'in 1997 yılında hazırladıkları, "Coğrafi Bilgi Sistemi ile Deprem Bölgelerinin İncelenmesi" kitabından alınmıştır.

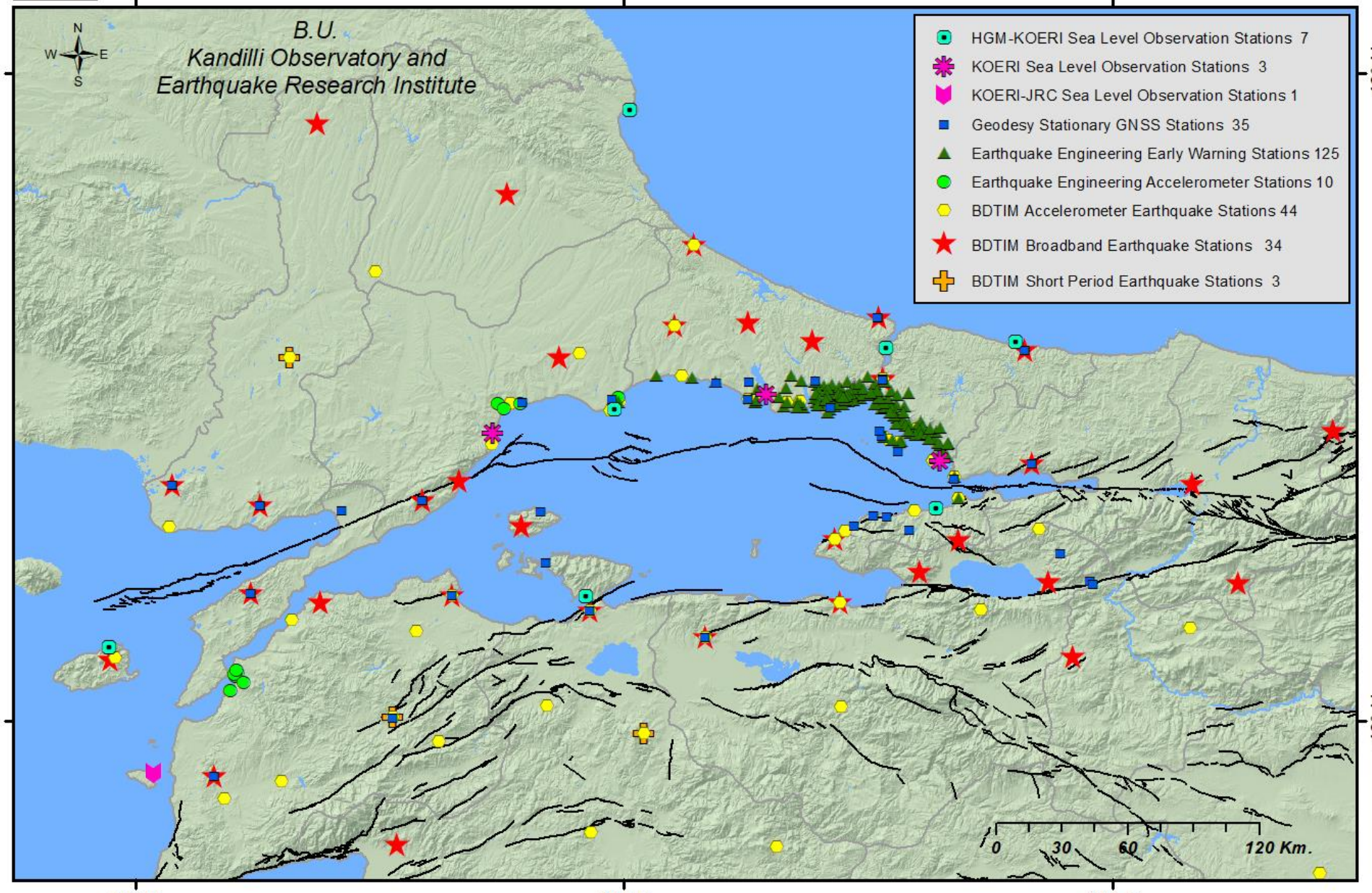
AFET İŞLERİ GENEL MÜDÜRLÜĞÜ
DEPREM ARAŞTIRMA DAİRESİ
ANKARA-TÜRKİYE

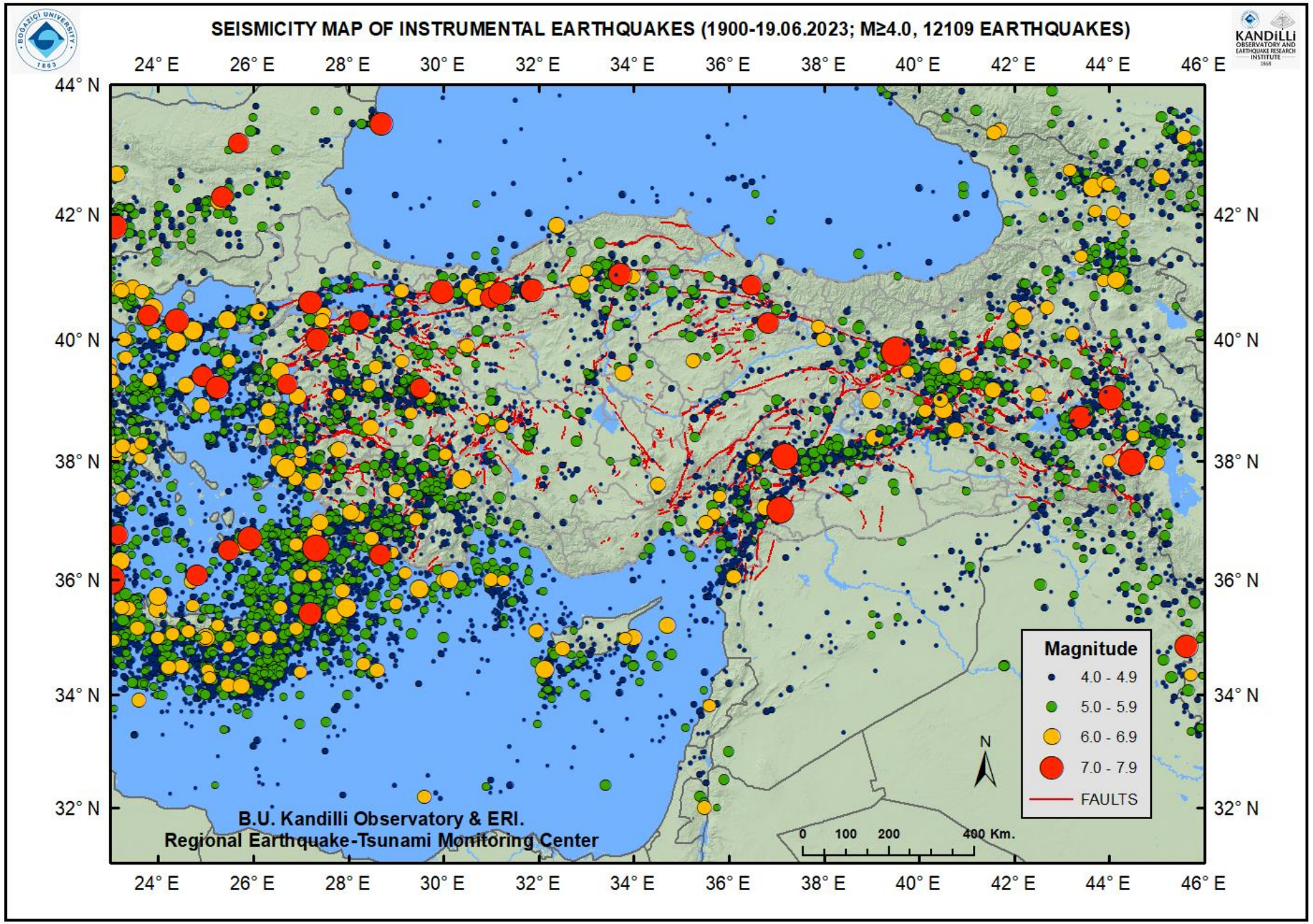
Seismic Hazard Map of Türkiye (https://en.afad.gov.tr)




KOERI Seismic Network; 485 Seismic Stations
0 75 150 300 Km.
N
W
E
S
KOERI Sea Level Observation Stations 3
KOERI-JRC Sea Level Observation Stations 4
HGM-KOERI Sea Level Observation Stations 20
Geodesy Stationary GNSS Stations 37
Earthquake Engineering Early Warning Stations 125
Earthquake Engineering Accelerometer Stations 31
BDTIM Broadband Earthquake Stations 137
BDTIM Accelerometer Earthquake Stations 113
BDTIM Short Period Earthquake Stations 15
B.U.
Kandilli Observatory and
Earthquake Research Institute

Seismic Stations Around The Marmara Region; 262 Seismic Stations

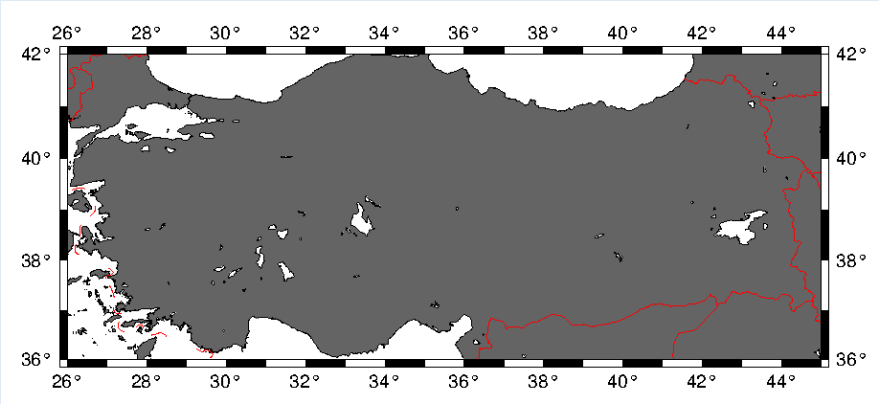



SEISMICITY MAP OF INSTRUMENTAL EARTHQUAKES (1900-19.06.2023; M≥4.0, 12109 EARTHQUAKES)
KANDILLI OBSERVATORY AND EARTHQUAKE RESEARCH INSTITUTE
24° E
26° E
28° E
30° E
32° E
34° E
36° E
38° E
40° E
42° E
44° E
46° E
44° N
42° N
40° N
38° N
36° N
34° N
32° N
Magnitude
4.0 - 4.9
5.0 - 5.9
6.0 - 6.9
7.0 - 7.9
FAULTS
N
0
100
200
400 Km.
B.U. Kandilli Observatory & ERI.
Regional Earthquake-Tsunami Monitoring Center

DATE	ORIGIN TIME (L.T)	LOCATION	INTENSITY	MAGNITUDE	DEATHS	DAMAGED BUILDINGS
09.08.1912	03:29	Mürefte (TEKİRDAĞ)	X	7.3	216	5540
07.05.1930	00:34	TÜRK –İRAN SINIRI	X	7.2	2514	?
27.12.1939	01:57	ERZİNCAN	X-XI	7.9	32968	116720
20.12.1942	16:03	Erbaa (TOKAT)	IX	7.0	3000	32000
27.11.1943	00:20	Ladik (SAMSUN)	IX-X	7.2	4000	40000
01.02.1944	05:22	Gerede-Çerkeş (BOLU)	IX-X	7.2	3959	20865
18.03.1953	21:06	Yenice (ÇANAKKALE)	IX	7.2	265	6750
25.04.1957	04:25	FethiyeRodos(MUĞLA)	IX	7.1	67	3200
26.05.1957	08:33	Abant (BOLU)	IX	7.1	52	5200
28.03.1970	23:02	Gediz (KÜTAHYA)	IX	7.0	1086	19291
24.11.1976	14:22	Muradiye (VAN)	IX	7.5	3840	9232
17.08.1999	03:01	Gölcük (KOCAELİ)	X	7.4	17480	73342
12.11.1999	18:57	DÜZCE	IX	7.2	763	35519
23.10.2011	13:41	VAN	VIII	7.2	644	17005
06.02.2023	04:17	GAZİANTEP	X	7.7	50399	518009
06.02.2023	13:24	KAHRAMANMARAŞ	IX	7.6		

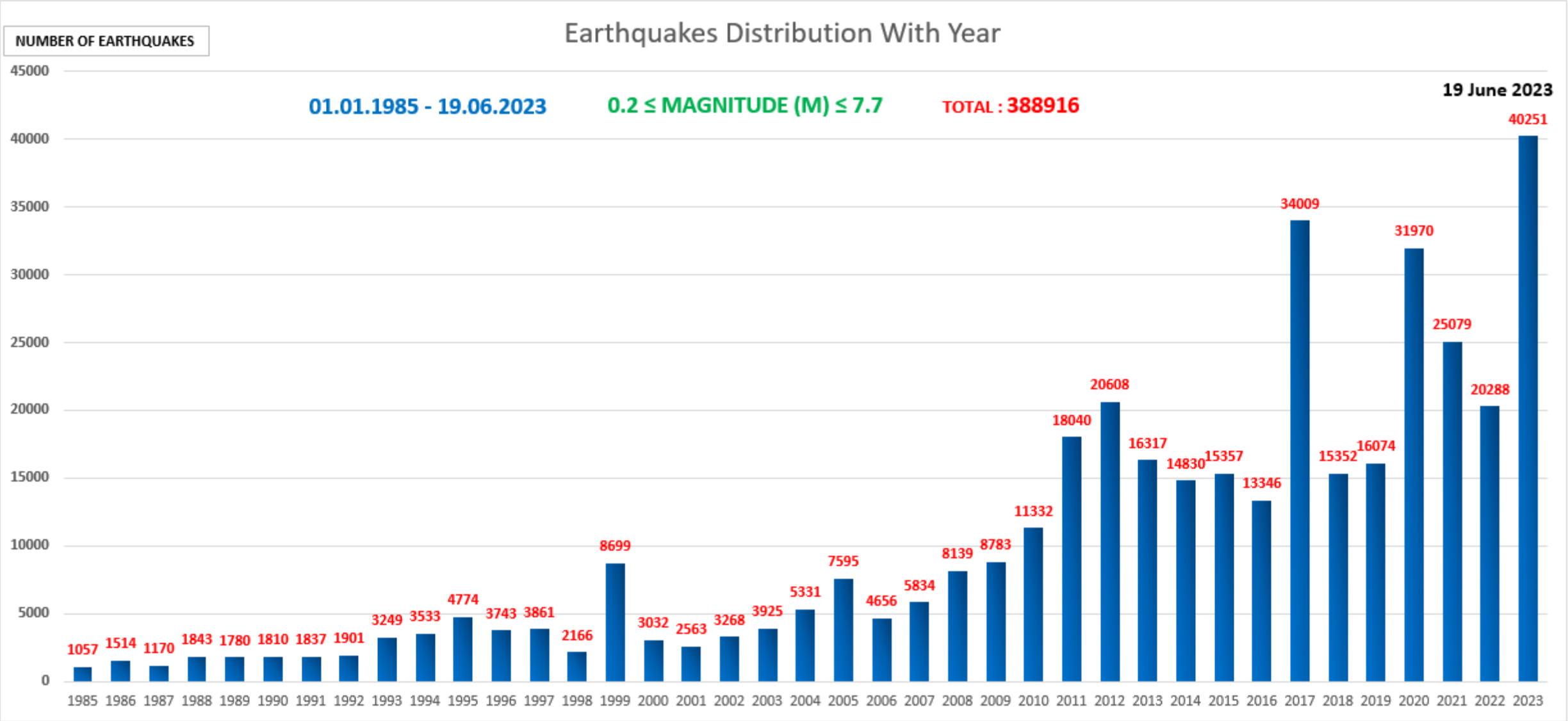
1900 - 19 June 2023

(36-42 N , 26-45 E)

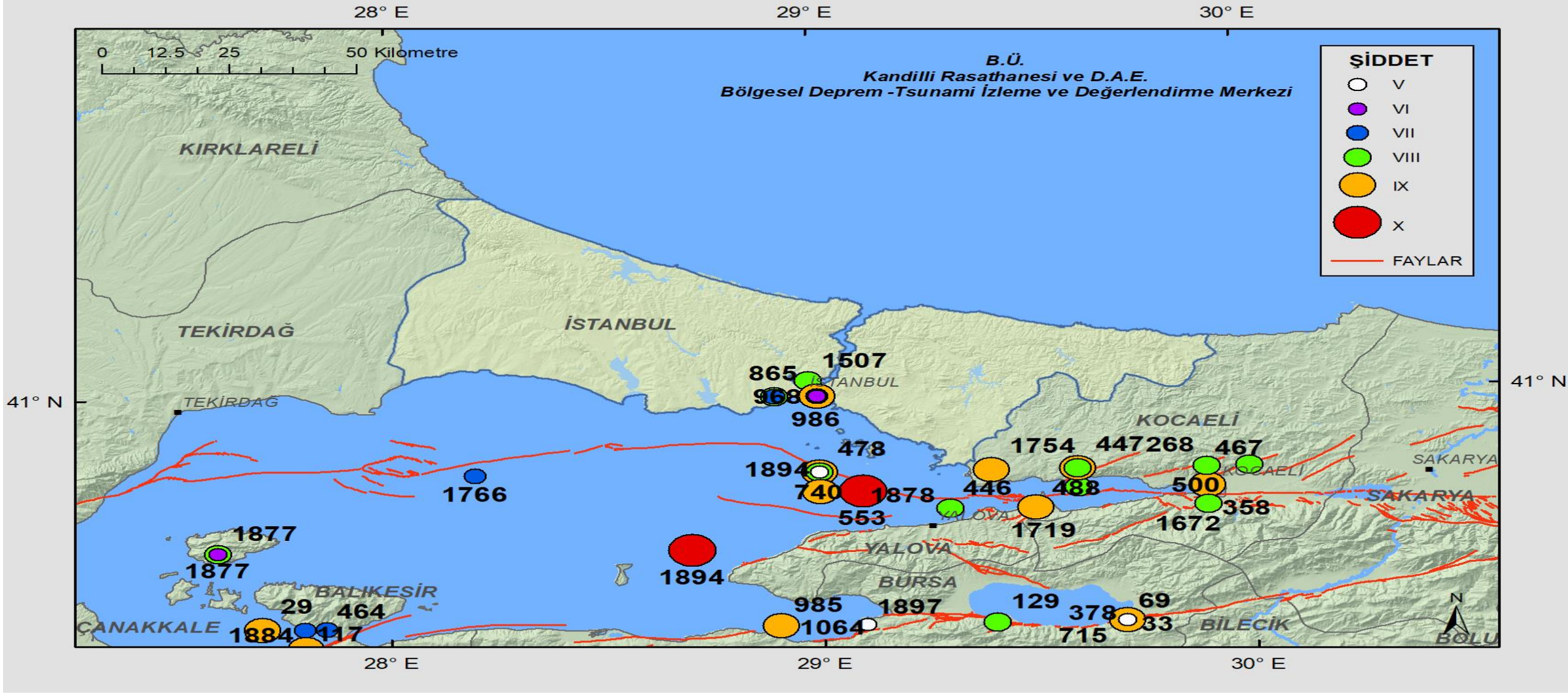


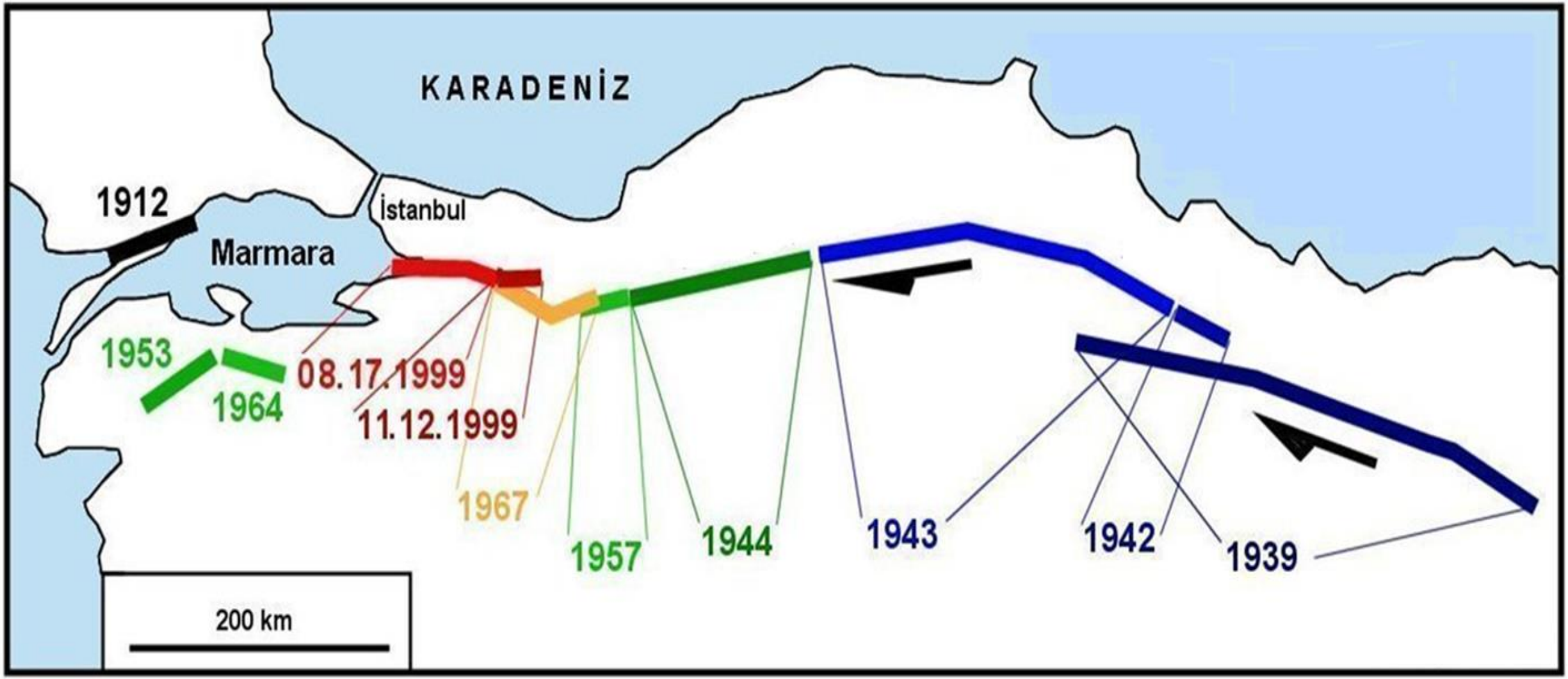
- 3.0< M < 3.9 52100 Earthquakes (once each day)
- 4.0< M < 4.9 5645 Earthquakes (once in every 8 days)
- 5.0< M < 5.9 968 Earthquakes (once in every 46 days)
- 6.0< M < 6.9 86 Earthquakes (once in every 17 months)
- 7.0< M < 7.9 20 Earthquakes (once in every 6.2 years)

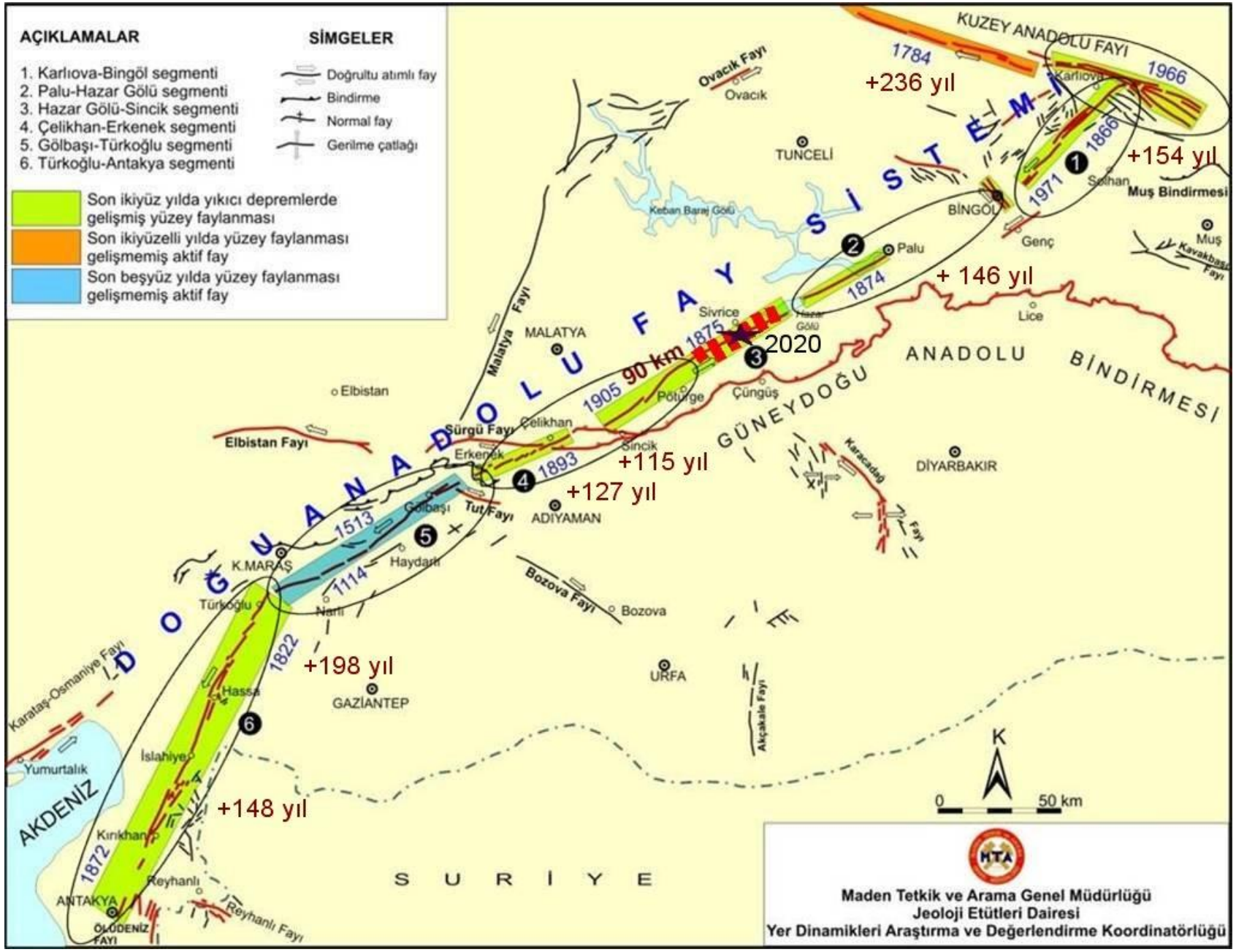
earthquakes


Earthquakes Distribution With Year
NUMBER OF EARTHQUAKES
01.01.1985 - 19.06.2023
0.2 ≤ MAGNITUDE (M) ≤ 7.7
TOTAL : 388916
19 June 2023
45000
40000
35000
30000
25000
20000
15000
10000
5000
0
1057 1514 1170 1843 1780 1810 1837 1901 3249 3533 4774 3743 3861 2166 8699 3032 2563 3268 3925 5331 7595 4656 5834 8139 8783 11332 18040 20608 16317 14830 15357 13346 34009 15352 16074 31970 25079 20288 40251
1985 1986 1987 1988 1989 1990 1991 1992 1993 1994 1995 1996 1997 1998 1999 2000 2001 2002 2003 2004 2005 2006 2007 2008 2009 2010 2011 2012 2013 2014 2015 2016 2017 2018 2019 2020 2021 2022 2023

Historical Earhquakes

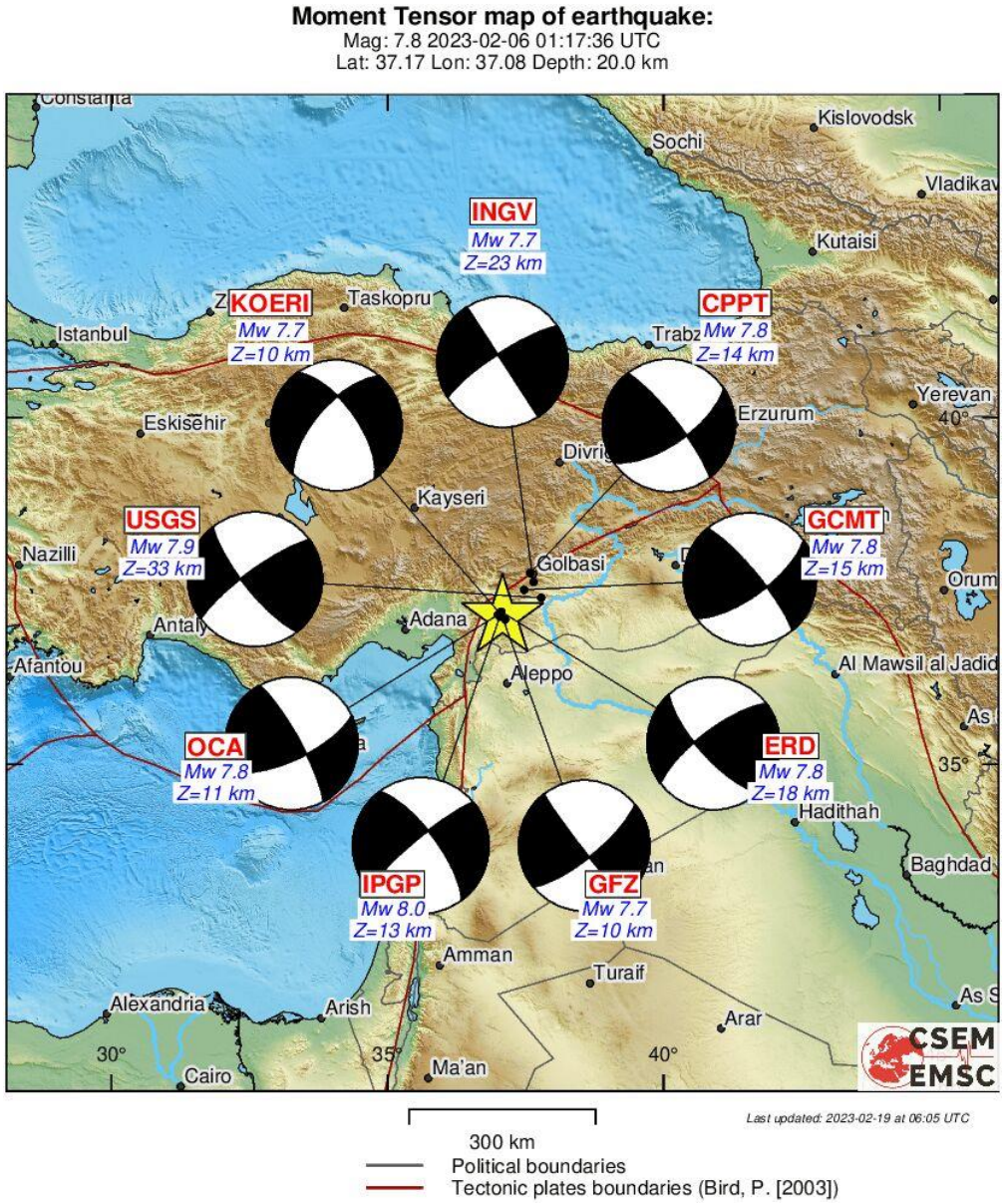



KARADENİZ
İstanbul
Marmara
1912
1953
1964
08.17.1999
11.12.1999
1967
1957
1944
1943
1942
1939
200 km


AÇIKLAMALAR
1. Karlıova-Bingöl segmenti
2. Palu-Hazar Gölü segmenti
3. Hazar Gölü-Sincik segmenti
4. Çelikhan-Erkenek segmenti
5. Gölbaşı-Türkoğlu segmenti
6. Türkoğlu-Antakya segmenti
SİMGELER
Doğrultu atımlı fay
Bindirme
Normal fay
Gerilme çatlağı
Son ikiyüz yılda yıkıcı depremlerde gelişmiş yüzey faylanması
Son ikiyüzelli yılda yüzey faylanması gelişmemiş aktif fay
Son beşyüz yılda yüzey faylanması gelişmemiş aktif fay
KUZEY ANADOLU FAYI
DOĞU ANADOLU FAY SİSTEMİ
GÜNEYDOĞU ANADOLU BİNDİRMESİ
SURİYE
AKDENİZ
Ovacık Fayı
Ovacık
TUNCELİ
Keban Baraj Gölü
Karlıova
Solhan
Muş Bindirmesi
BİNGÖL
Genç
Palu
Muş
Kavakbaşı Fayı
Lice
Sivrice
Hazar Gölü
MALATYA
Malatya Fayı
Elbistan
Elbistan Fayı
Çelikhan
Sürgü Fayı
Erkenek
Sincik
Pötürge
Çüngüş
DİYARBAKIR
Karacadağ Fayı
ADIYAMAN
Tut Fayı
Gölbaşı
Haydarlı
K.MARAŞ
Türkoğlu
Narlı
Bozova Fayı
Bozova
URFA
Akçakale Fayı
GAZİANTEP
Hassa
İslahiye
Karataş-Osmaniye Fayı
Yumurtalık
Kırıkhan
Reyhanlı
ANTAKYA
ÖLÜDENİZ FAYI
Reyhanlı Fayı
1784
1966
1866
1971
1874
1875
1905
1893
1513
1114
1822
1872
+236 yıl
+154 yıl
+ 146 yıl
2020
90 km
+115 yıl
+127 yıl
+198 yıl
+148 yıl
K
0
50 km
Maden Tetkik ve Arama Genel Müdürlüğü
Jeoloji Etütleri Dairesi
Yer Dinamikleri Araştırma ve Değerlendirme Koordinatörlüğü

February Earthquakes

On February 6, 2023, at 04:17 (01:17 GMT), a moment magnitude (Mw) 7.7 (Kandilli Observatory, Earthquake Research Institute http://www.koeri.boun.edu.tr, earthquake occurred on the East Anatolian Fault.
The epicenter is located at Sofalaca-Şehitkamil-Gaziantep (37.1123 N 37.1195 E).



On February 6, 2023, following the first event, approximately 9 hours later at 13:24 local time, severe earthquake with the epicenter centered in Ekinözü-Kahramanmaraş instrumental magnitude Mw=7.6 took place.

The focal depth of the earthquake is about 5 km and it is a shallow earthquake,
located on the 85 km long Çardak Fault, which has an E-W trending strike located apart from the branches of the East Anatolian Fault.

The mechanism solution shows strike-slip faulting with a normal faulting component.

ABOUT TÜRKİYE EARTHQUAKES

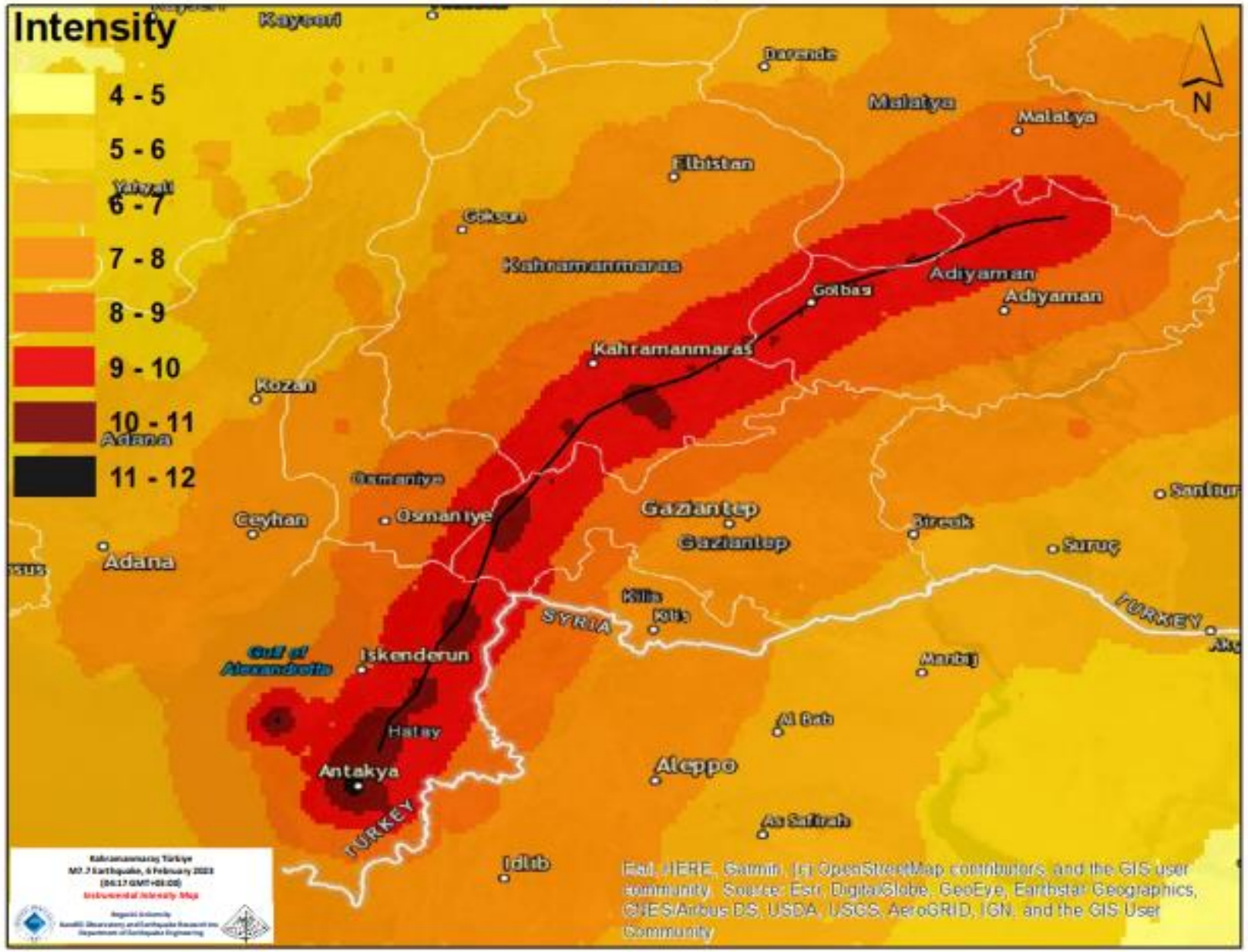
- One of the greatest natural disasters in world history,
- **”Disaster of the century"**
- Larger than many countries.
- 3X Switzerland,
- 3X The Netherlands,
- 3X Denmark,
- Almost 3X Dominican Republic
- The population directly affected is about twice the size of New York City.

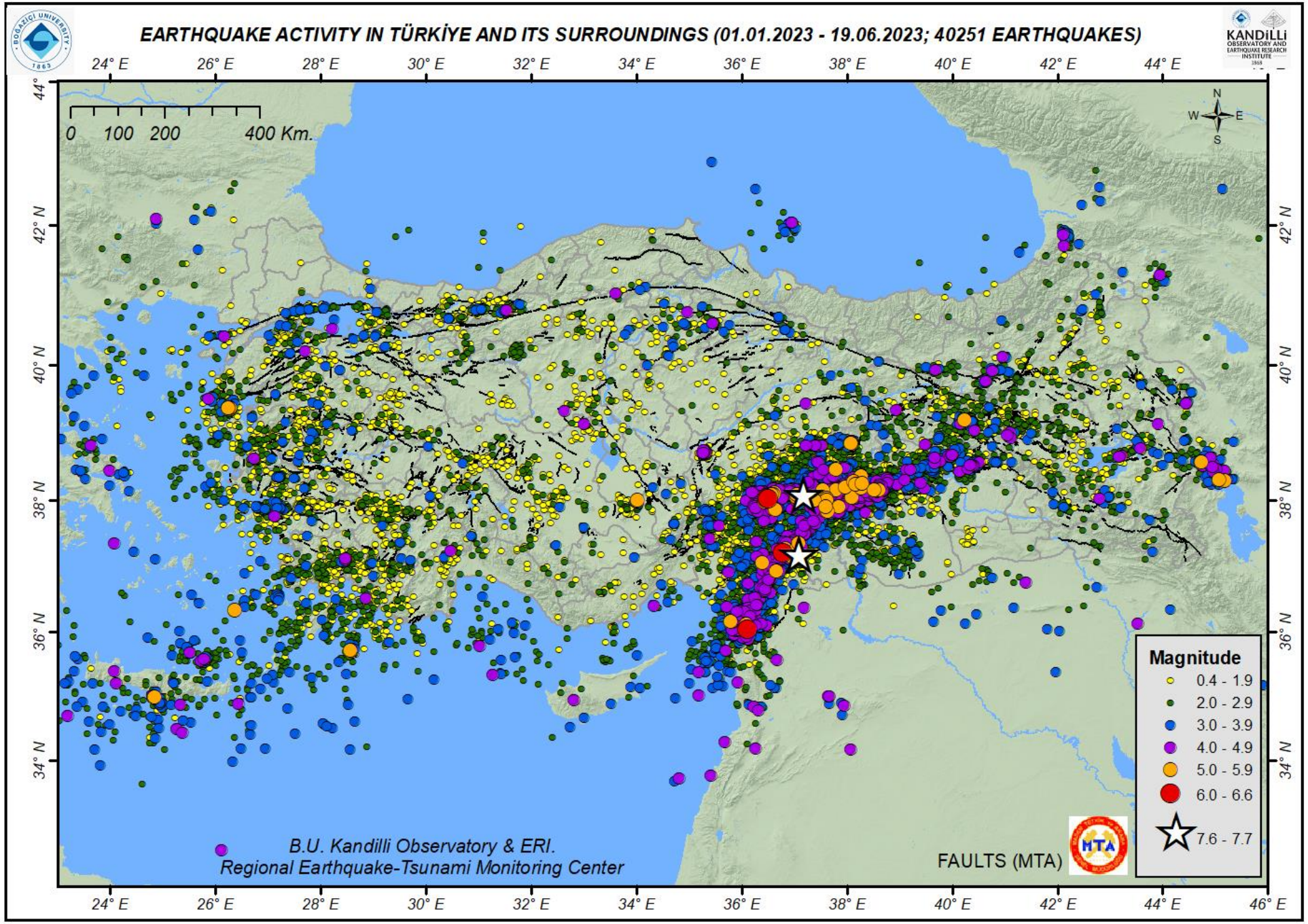
ABOUT TÜRKİYE EARTHQUAKES

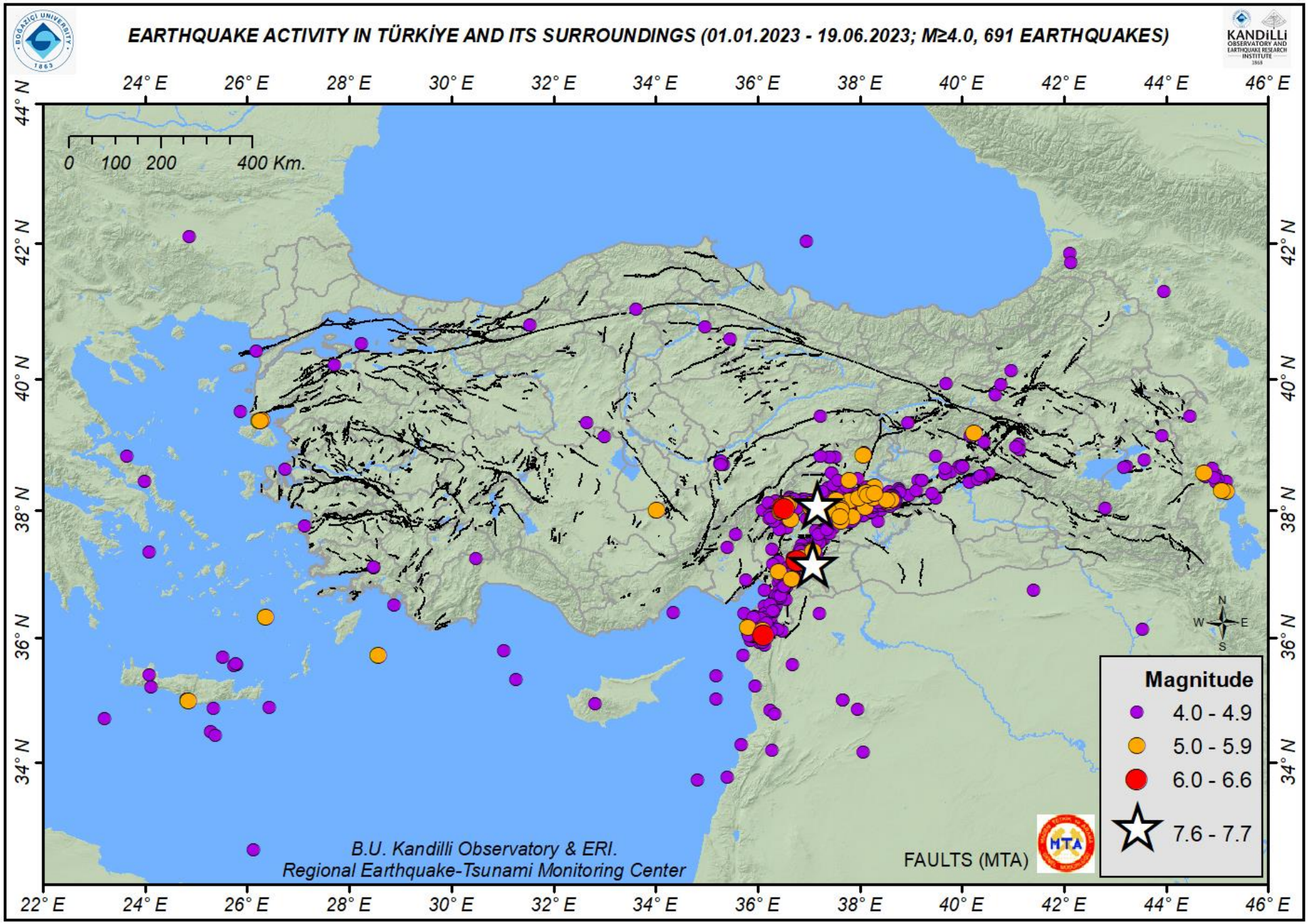
- extensive damage in a total of 11 provinces
- They were unprecedented in terms of their intensity and coverage.
- The earthquakes resulted in over 50,000 fatalities,
- damage to over half a million buildings,
- harm to communication and energy infrastructure,
- resulting in significant financial losses.
- The total population of the 11 provinces affected by the earthquake was recorded as almost as 15 million.
- This population corresponds to 17% of the country's demographic makeup

- The total material and financial cost of the earthquake,
- "103.6 billion dollars"
- This figure corresponds to approximately 9 percent of our national income expectation for 2023.

Intensity Map



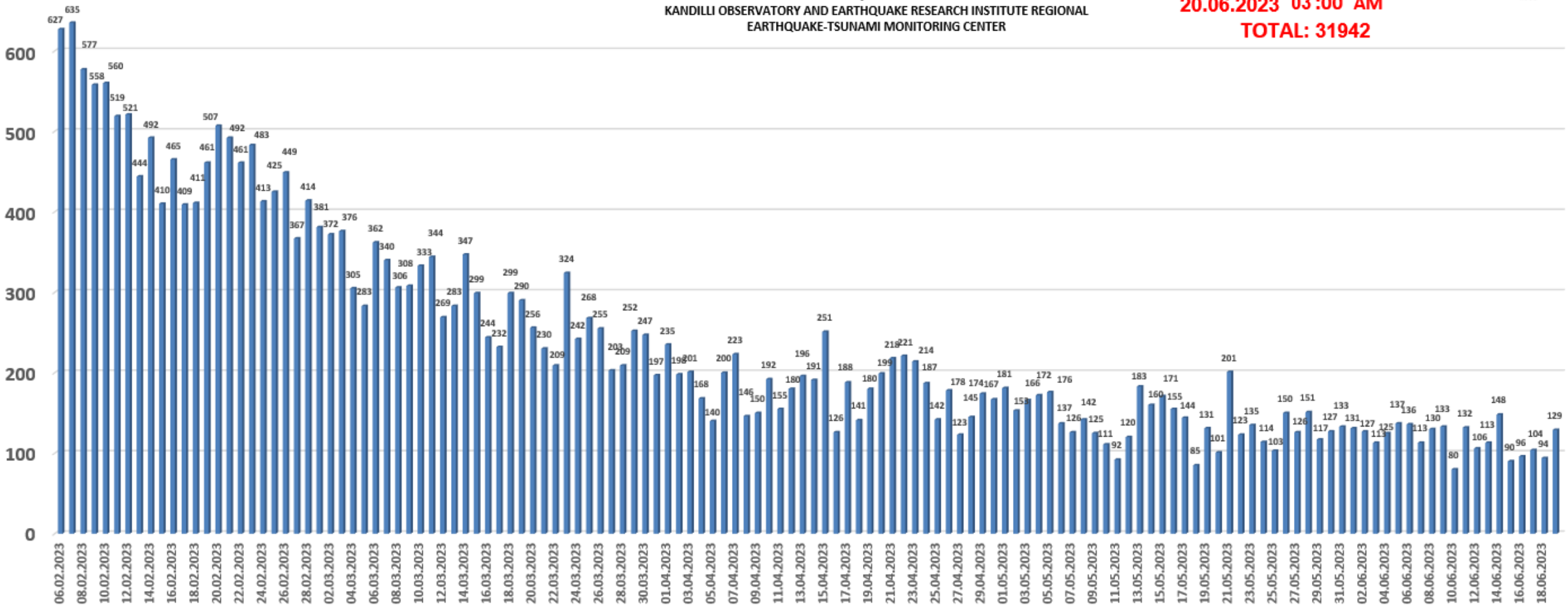

EARTHQUAKE ACTIVITY IN TÜRKİYE AND ITS SURROUNDINGS (01.01.2023 - 19.06.2023; 40251 EARTHQUAKES)
KANDILLI OBSERVATORY AND EARTHQUAKE RESEARCH INSTITUTE
0 100 200 400 Km.
N
W
E
S
Magnitude
0.4 - 1.9
2.0 - 2.9
3.0 - 3.9
4.0 - 4.9
5.0 - 5.9
6.0 - 6.6
7.6 - 7.7
FAULTS (MTA)
B.U. Kandilli Observatory & ERI.
Regional Earthquake-Tsunami Monitoring Center
24° E
26° E
28° E
30° E
32° E
34° E
36° E
38° E
40° E
42° E
44° E
46° E
44°
42° N
40° N
38° N
36° N
34° N

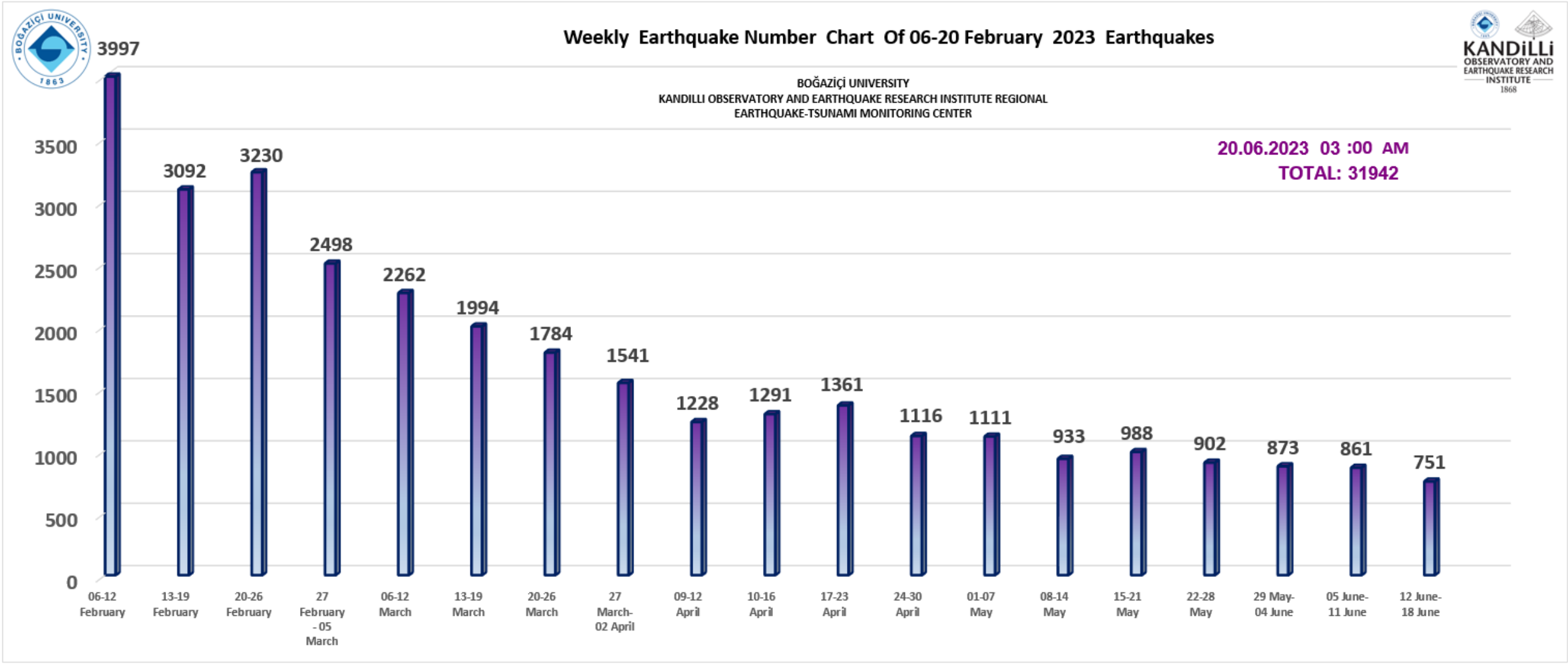

EARTHQUAKE ACTIVITY IN TÜRKİYE AND ITS SURROUNDINGS (01.01.2023 - 19.06.2023; M≥4.0, 691 EARTHQUAKES)
KANDILLI OBSERVATORY AND EARTHQUAKE RESEARCH INSTITUTE
0 100 200 400 Km.
Magnitude
4.0 - 4.9
5.0 - 5.9
6.0 - 6.6
7.6 - 7.7
FAULTS (MTA)
B.U. Kandilli Observatory & ERI.
Regional Earthquake-Tsunami Monitoring Center
22° E
24° E
26° E
28° E
30° E
32° E
34° E
36° E
38° E
40° E
42° E
44° E
46° E
34° N
36° N
38° N
40° N
42° N
44° N

Daily Earthquake Number Chart Of 06-20 February 2023 Earthquakes

BOĞAZİÇİ UNIVERSITY
KANDILLI OBSERVATORY AND EARTHQUAKE RESEARCH INSTITUTE REGIONAL
EARTHQUAKE-TSUNAMI MONITORING CENTER

20.06.2023 03 :00 AM
TOTAL: 31942

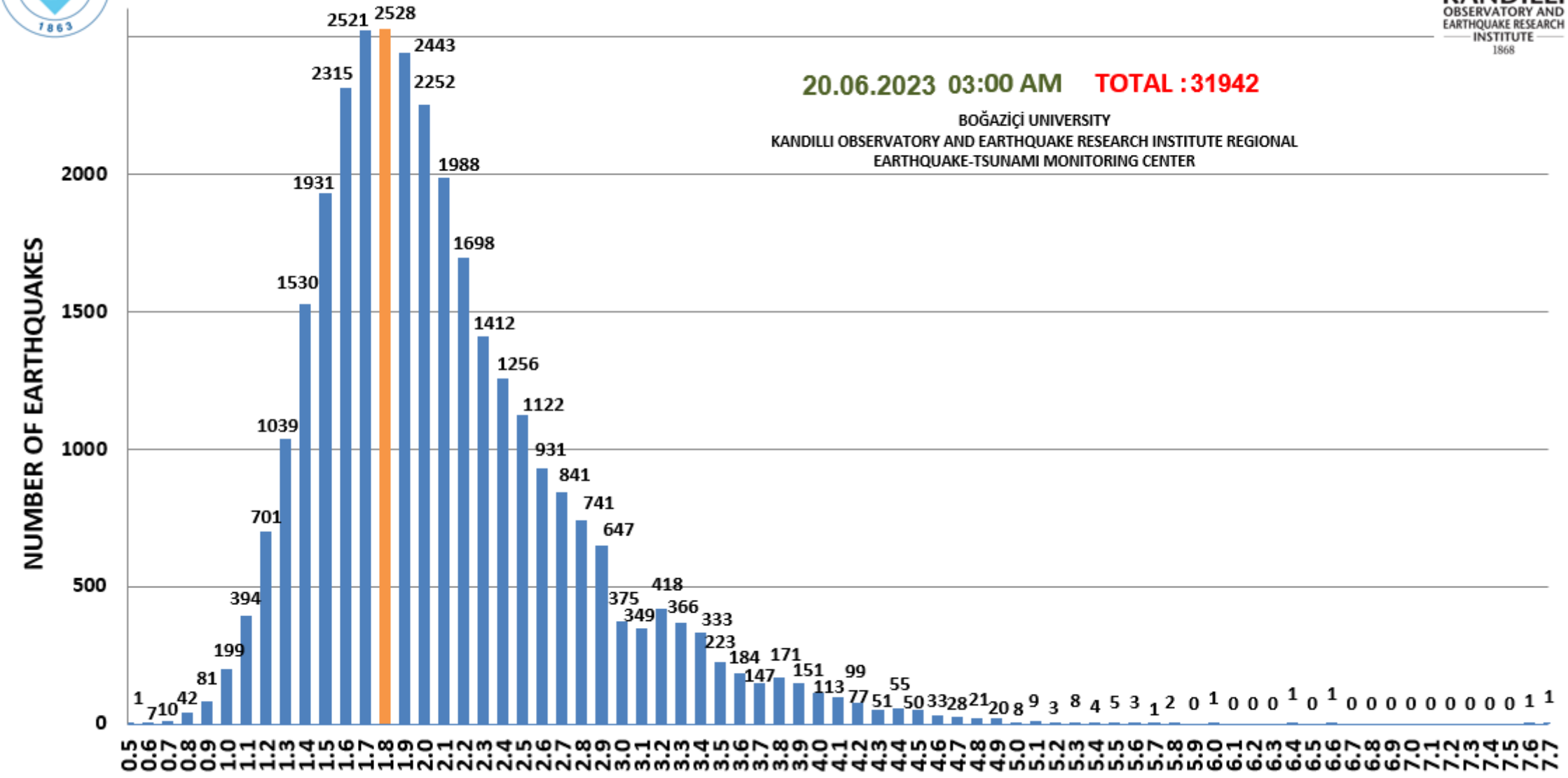



Weekly Earthquake Number Chart Of 06-20 February 2023 Earthquakes
BOĞAZİÇİ UNIVERSITY
KANDILLI OBSERVATORY AND EARTHQUAKE RESEARCH INSTITUTE REGIONAL
EARTHQUAKE-TSUNAMI MONITORING CENTER
20.06.2023 03 :00 AM
TOTAL: 31942
KANDiLLi
OBSERVATORY AND
EARTHQUAKE RESEARCH
INSTITUTE
1868
0
500
1000
1500
2000
2500
3000
3500
3997
3092
3230
2498
2262
1994
1784
1541
1228
1291
1361
1116
1111
933
988
902
873
861
751
06-12 February
13-19 February
20-26 February
27 February - 05 March
06-12 March
13-19 March
20-26 March
27 March- 02 April
09-12 April
10-16 April
17-23 April
24-30 April
01-07 May
08-14 May
15-21 May
22-28 May
29 May- 04 June
05 June- 11 June
12 June- 18 June

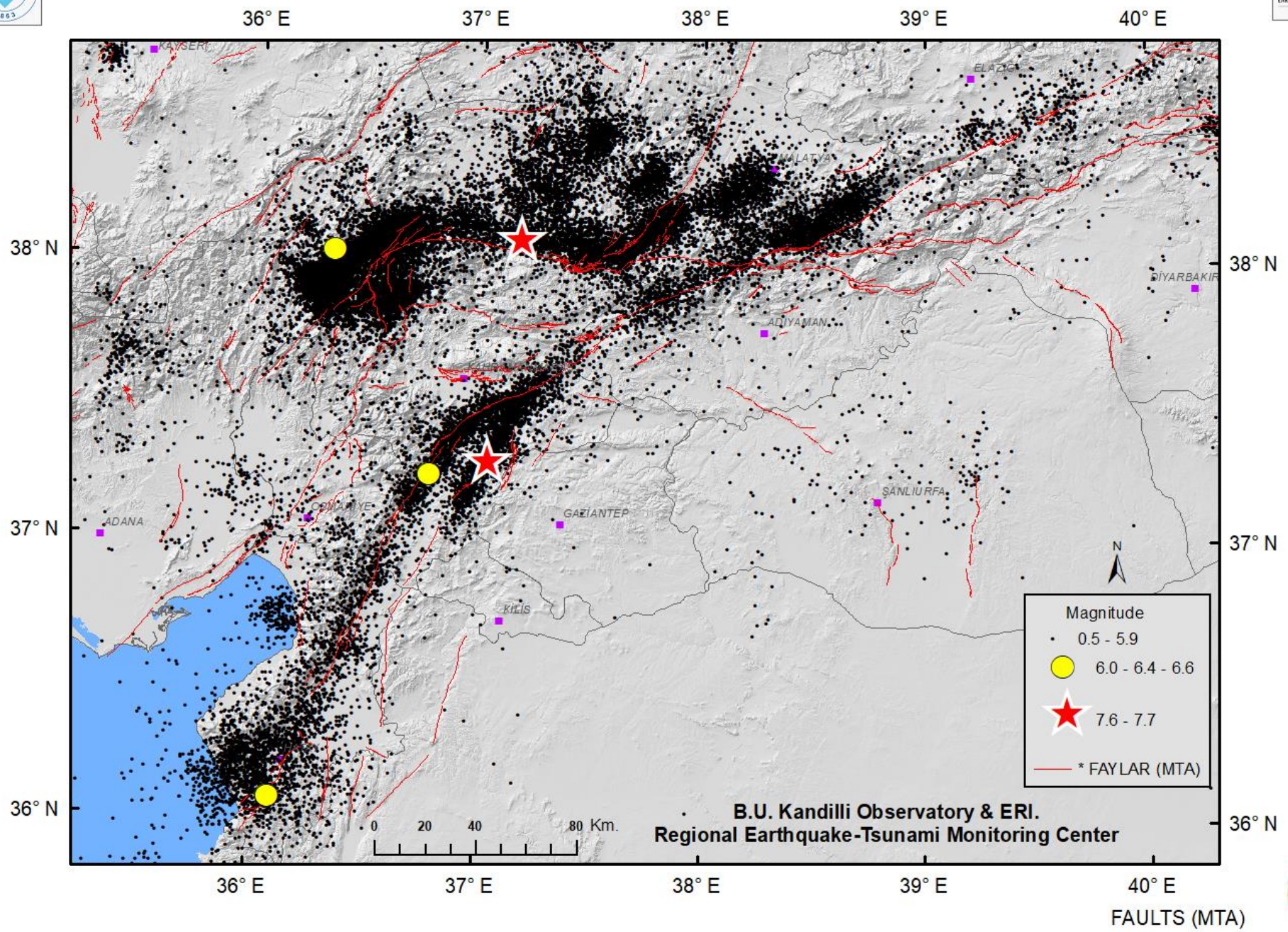
Magnitude Distribution Of Earthquakes (Number Of Earthquakes, Magnitude)

20.06.2023 03:00 AM **TOTAL : 31942**

BOĞAZİÇİ UNIVERSITY
KANDILLI OBSERVATORY AND EARTHQUAKE RESEARCH INSTITUTE REGIONAL
EARTHQUAKE-TSUNAMI MONITORING CENTER

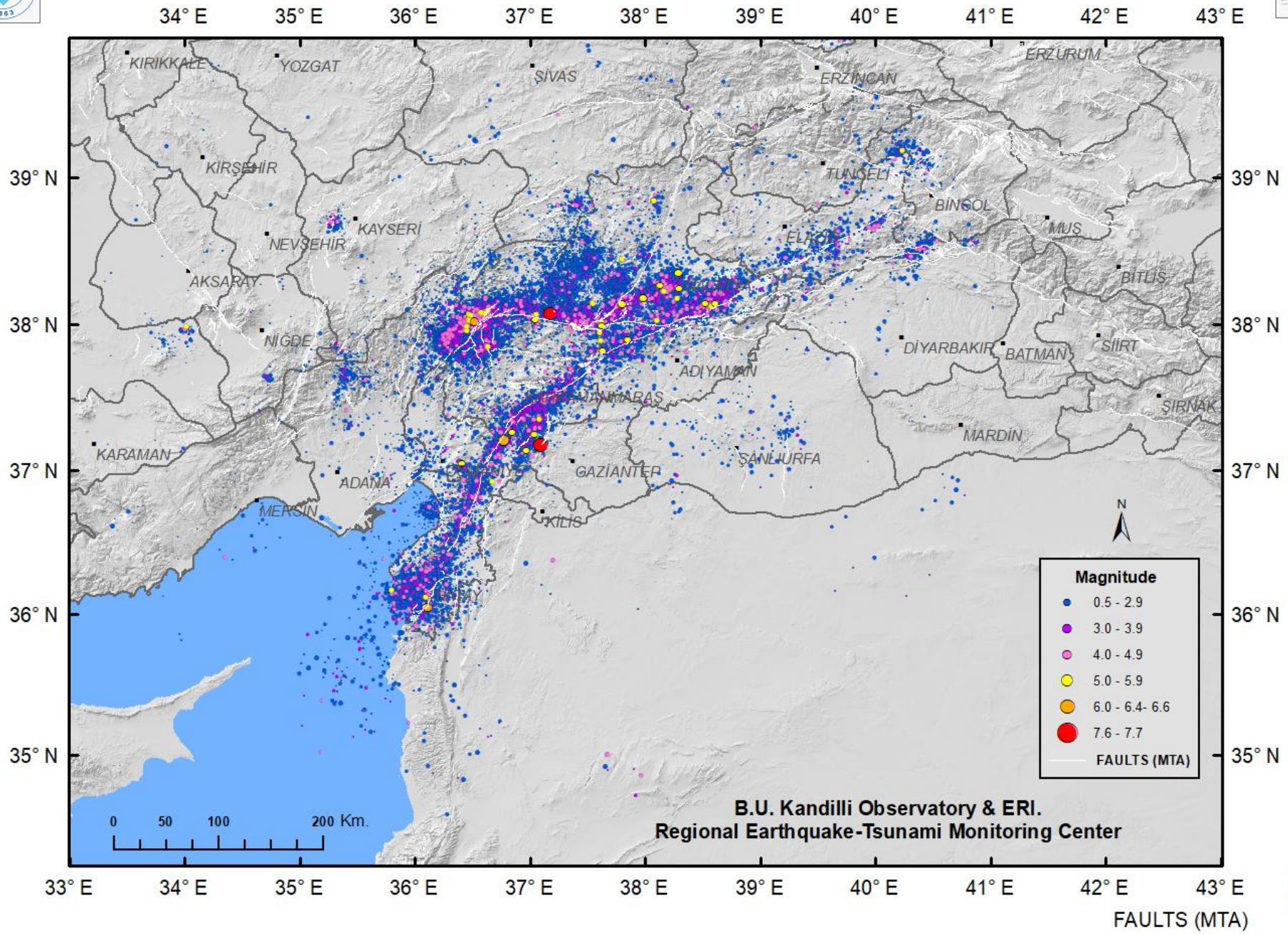


Earthquake Activity Map (06 February-19 June 2023; 31942 Earthquakes)

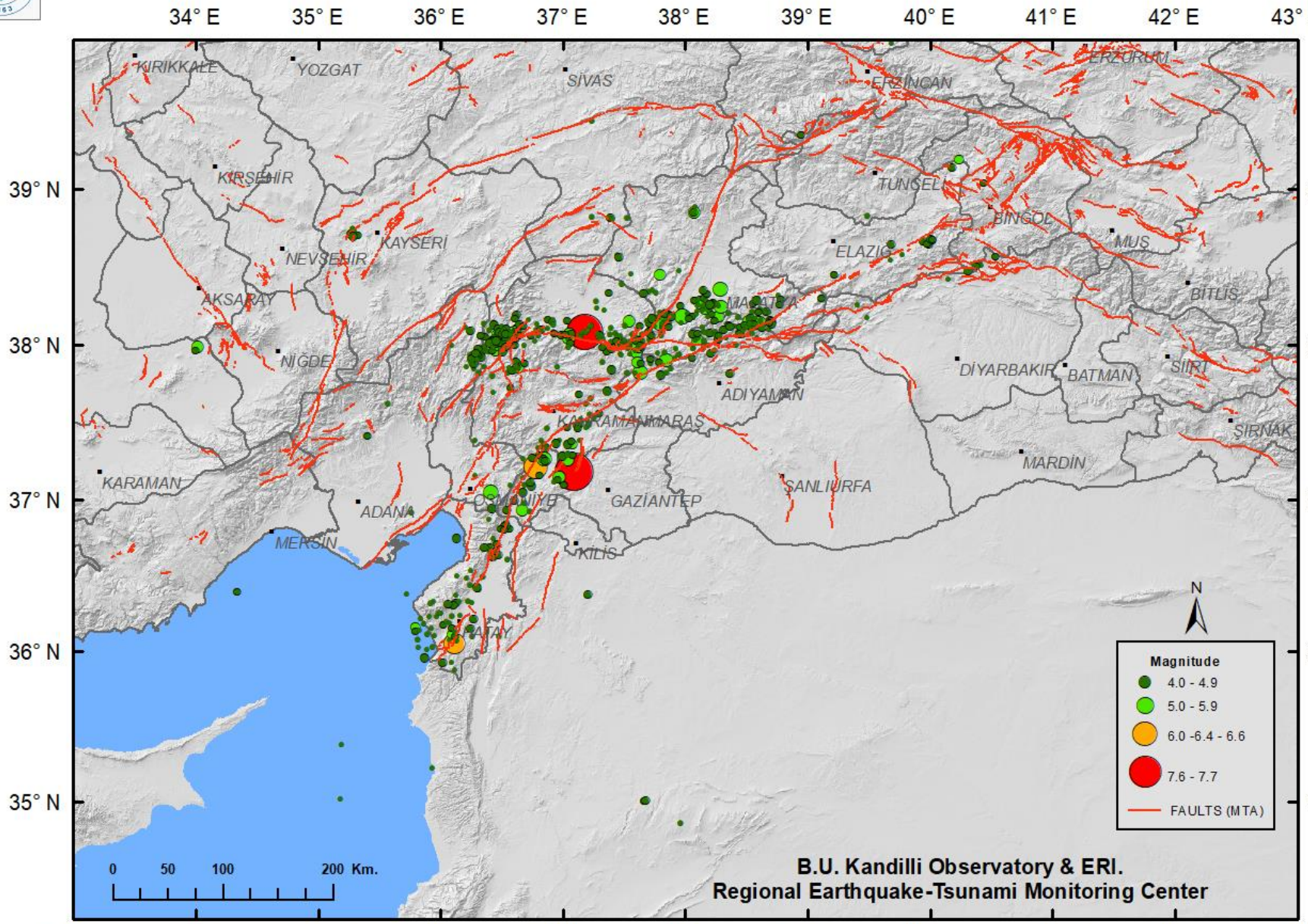


FAULTS (MTA)

06-20 February 2023 Earthquakes Within A Radius Of 350 Km (31942 Earthquakes; 19.06.2023)

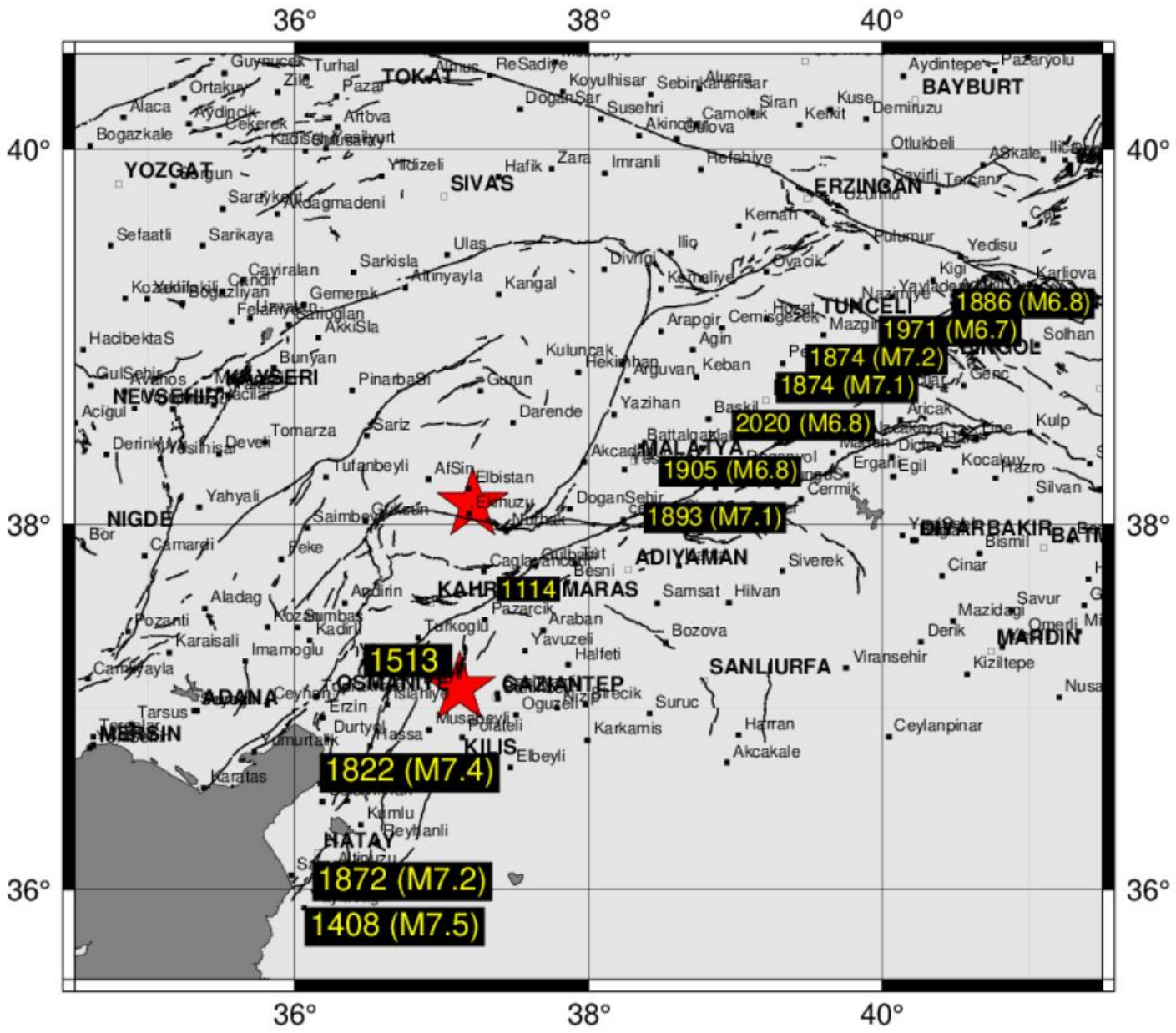


06-20 February 2023 Earthquakes Within A Radius Of 350 Km (M≥4.0, 595 Earthquakes; 19.06.2023)



FAULTS (MTA)

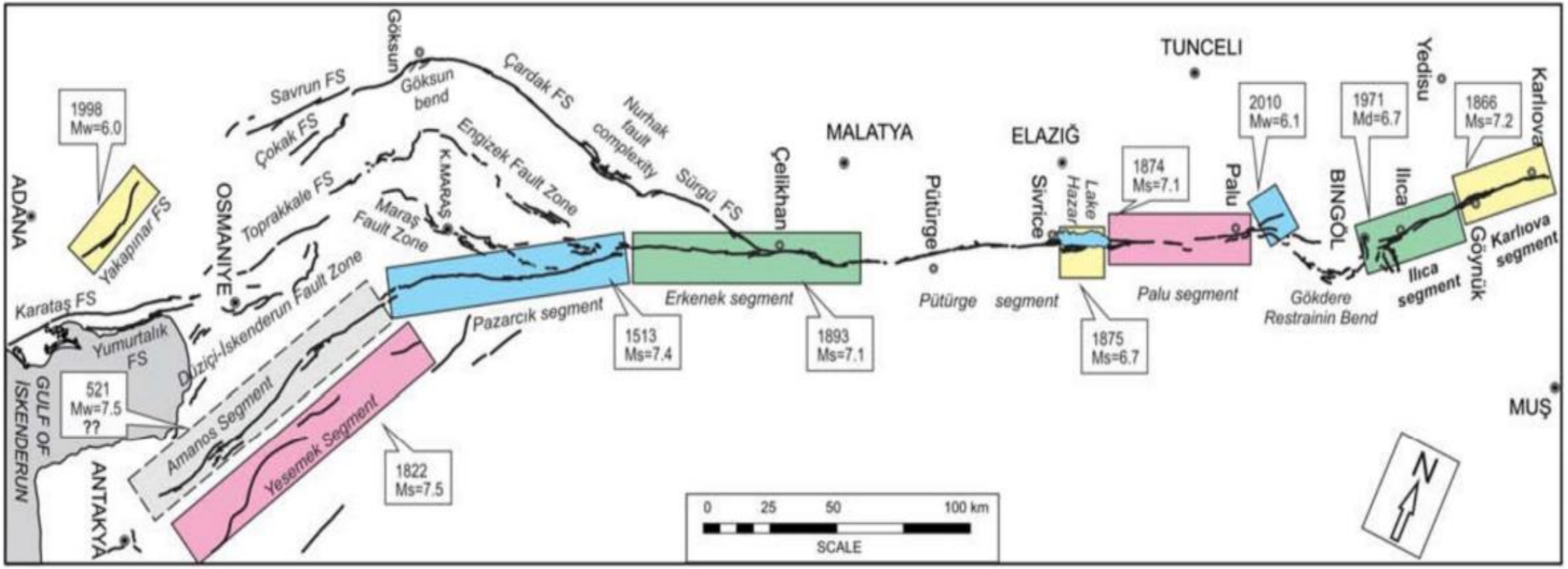
Historical and Instrumental Period Major Earthquakes on East Anatolian Fault Zone



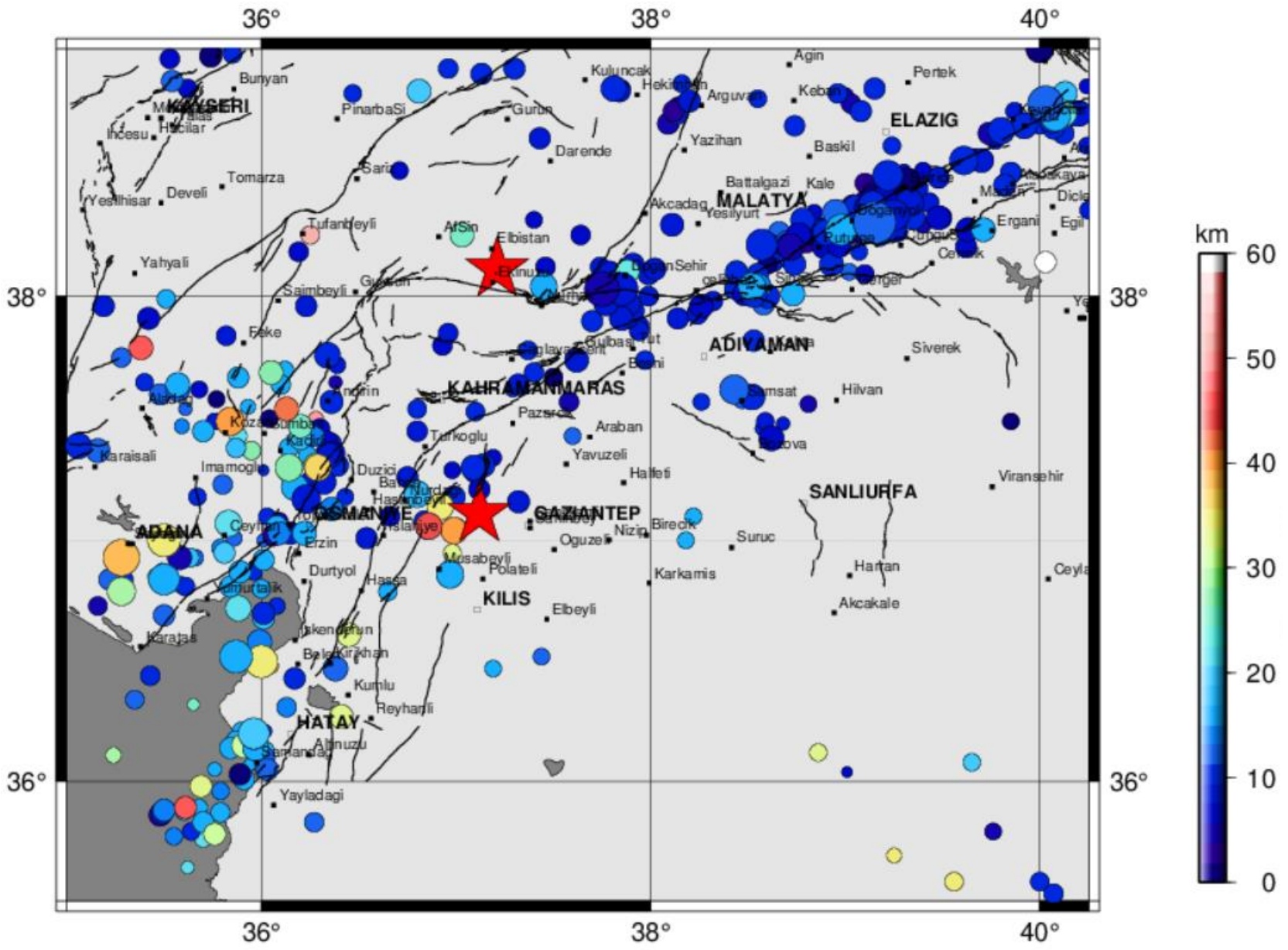
The previous major ruptures on the faults segments were in 1114, 1513 and 1822

The ruptured fault segment in southern part of the East Anatolian Fault Zone

(Lekkas et al., 2023 -ISSN 2653-9454)



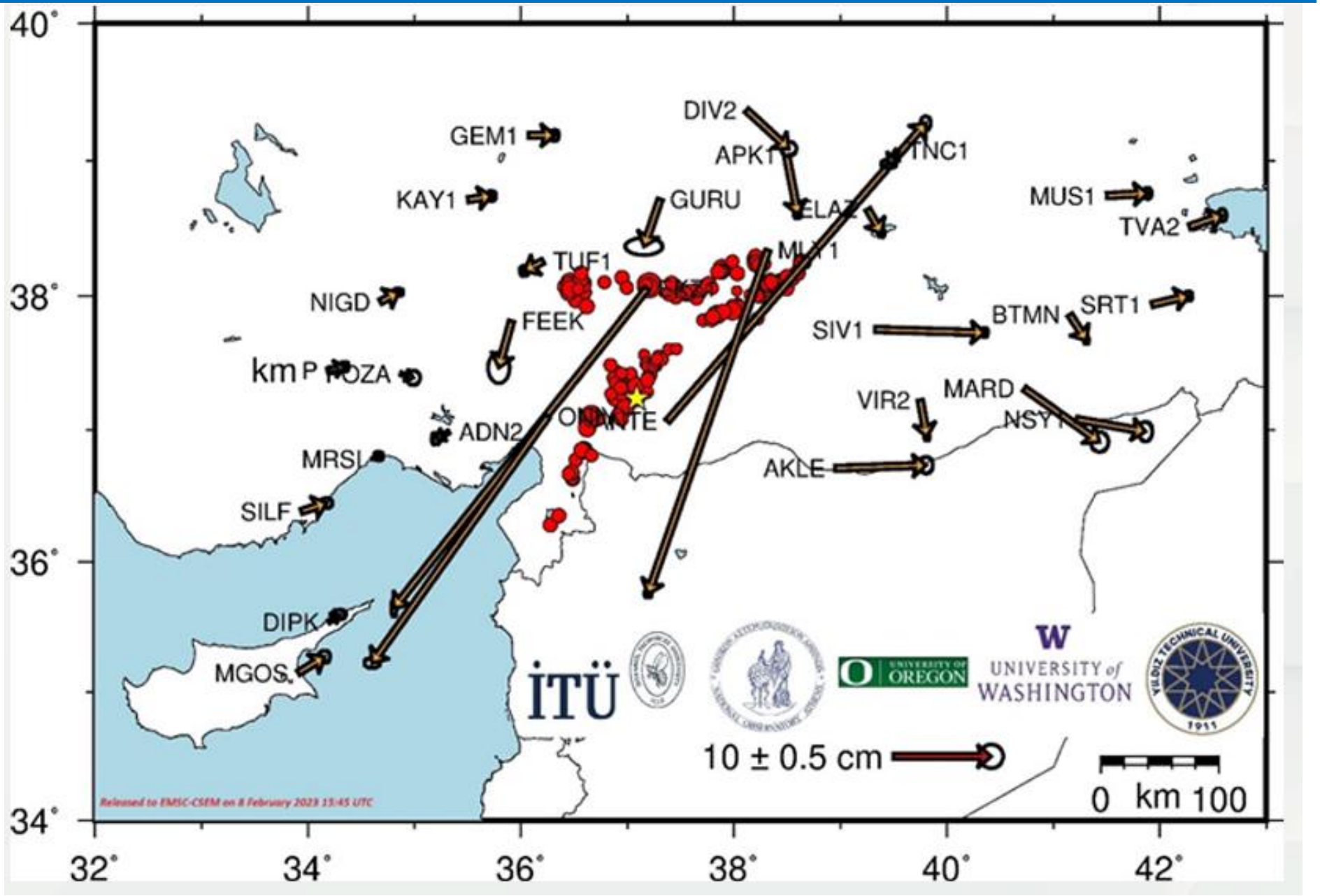
Seismicity Between 1900 -2021 Time Period (M > 4.0)

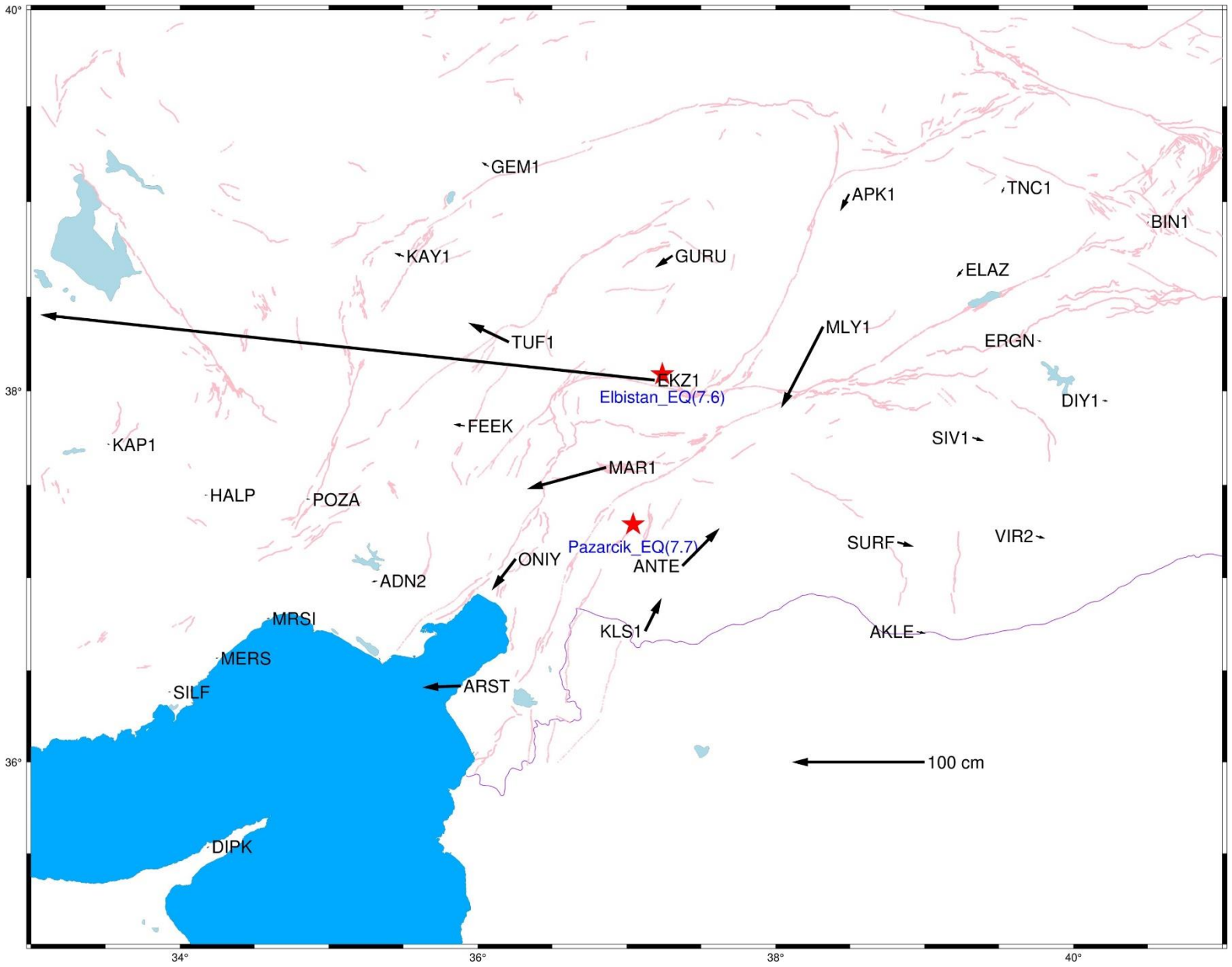


Red stars show the locations of the two mainshocks (Mw7.7 and Mw7.6)

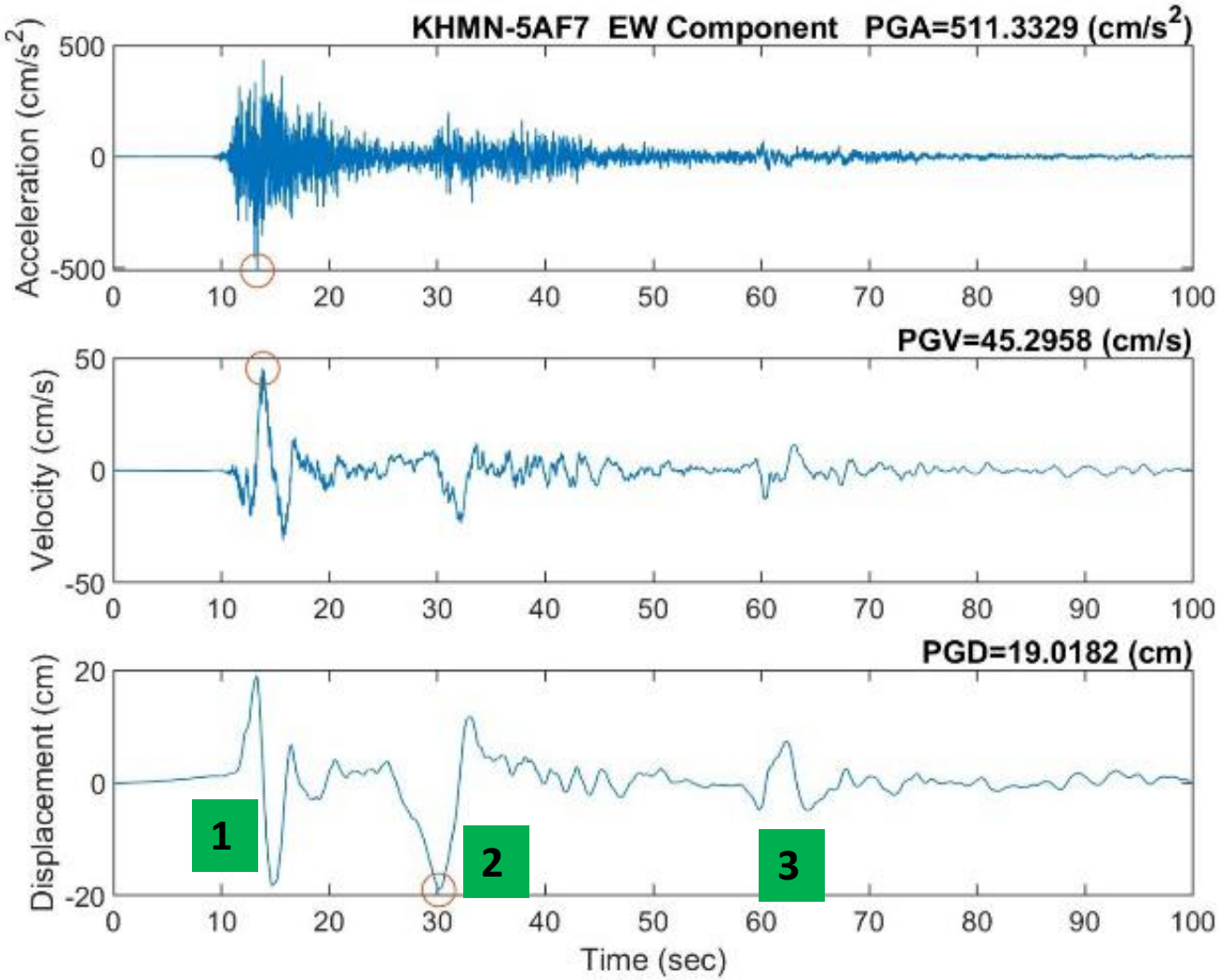
Note the accelerated seismicity around the epicenter of the first mainshock and the lack of seismicity around the epicenter of the second mainshock

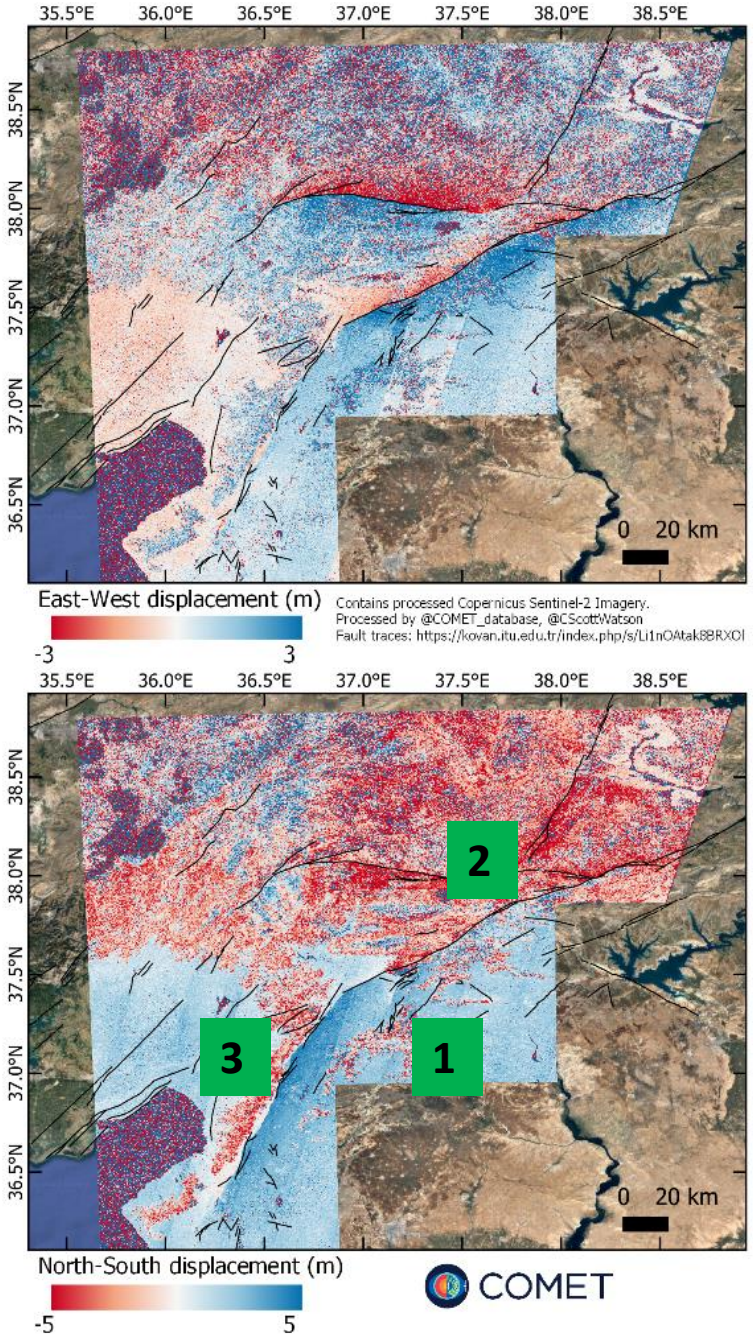
GPS Coseismic Slip Vectors



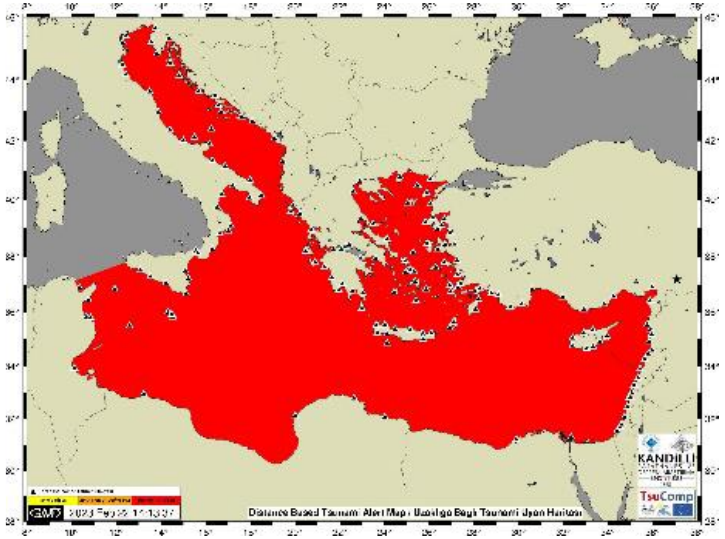

40°
38°
36°
34°
36°
38°
40°
GEM1
APK1
TNC1
BIN1
KAY1
GURU
ELAZ
TUF1
MLY1
ERGN
EKZ1
Elbistan_EQ(7.6)
DIY1
FEEK
SIV1
KAP1
MAR1
HALP
POZA
Pazarcik_EQ(7.7)
SURF
VIR2
ONIY
ANTE
ADN2
MRSI
KLS1
AKLE
MERS
SILF
ARST
100 cm
DIPK

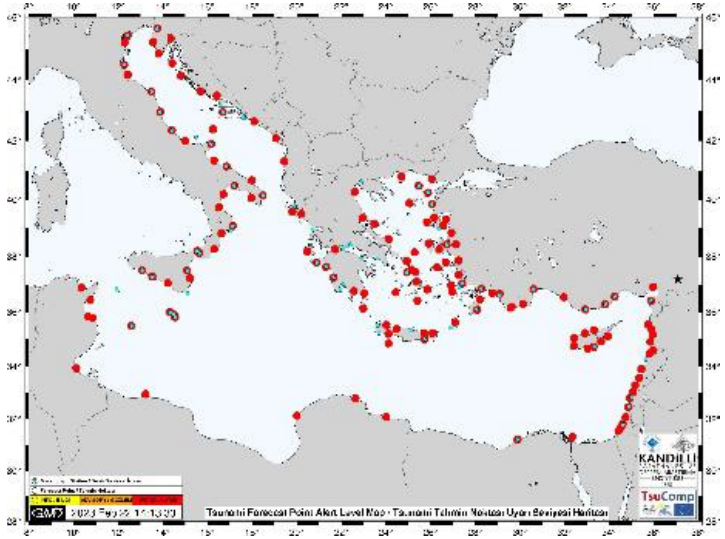
KOERI Stong Motion Station (KHMN)

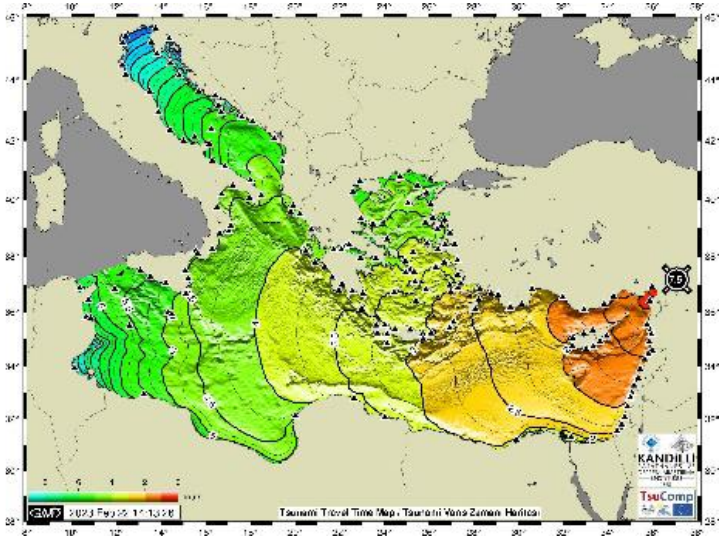




Tsunami Triggered by the Mainshock





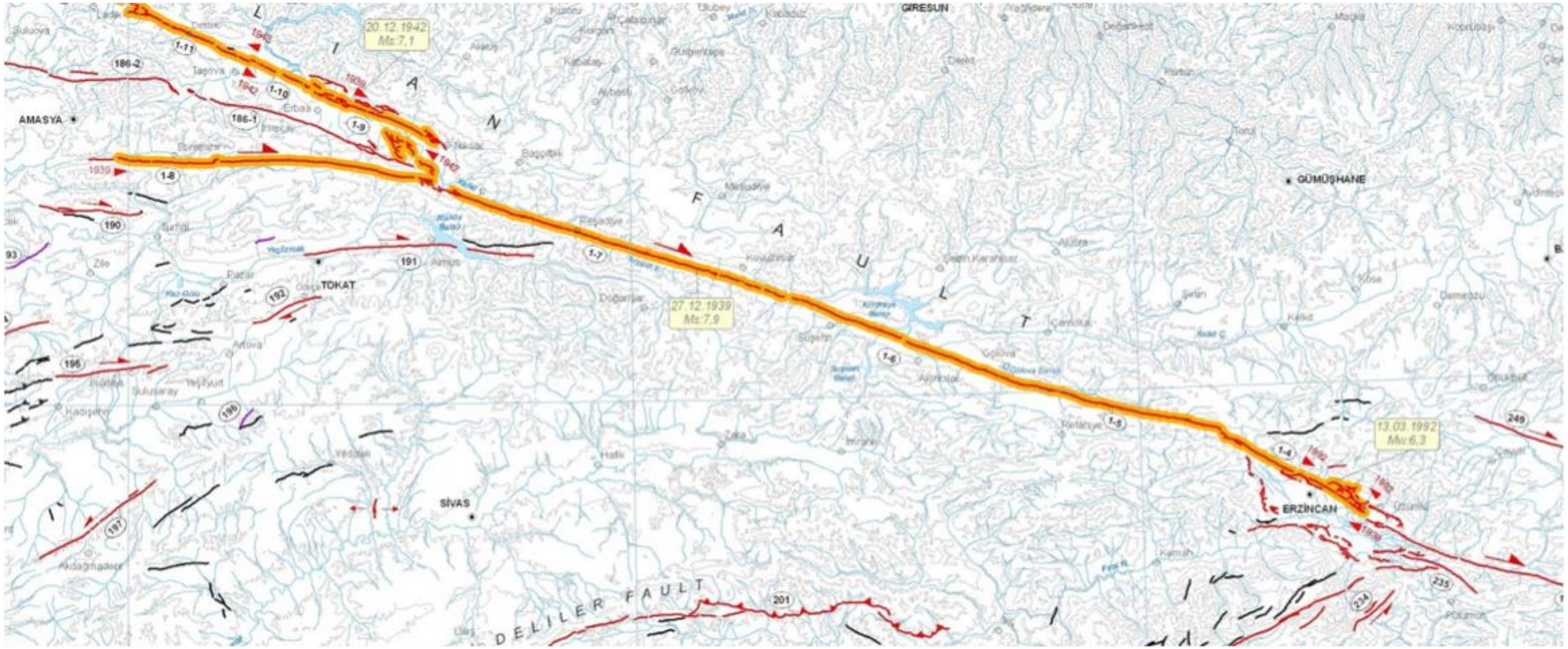


BAŞLIK	İÇERİK	ZAMAN
TSUNAMI MESAJI NO 001	1. Deprem Parametreleri (M7.5) 2. Tsunami Tahmin Noktalarına Dalga Varış Zamanları 3. Tsunami Tahmin Noktalarındaki Uyarı Seviyeleri	T0 + 15’

TSUNAMI MESAJI NO 002	1. Deprem Parametreleri 2. İlk Doğrulanmış Dalga Varışı Deniz Seviyesi okuması, t32(ISKENDERUN, 0.12m), t53(ERDEMLI, 0.13m)	T0 + 94’

TSUNAMI MESAJI NO 003	1. Deprem Parametreleri 2. İkinci Doğrulanmış Dalga Varışı Deniz Seviyesi okuması, t65 (GAZIMAGUSA, 0.17m)	T0 + 179’

TSUNAMI MESAJI NO 004	1. Tsunami Uyarısının Sonu	T0 + 552’



1939 Erzincan (Ms 7,9):

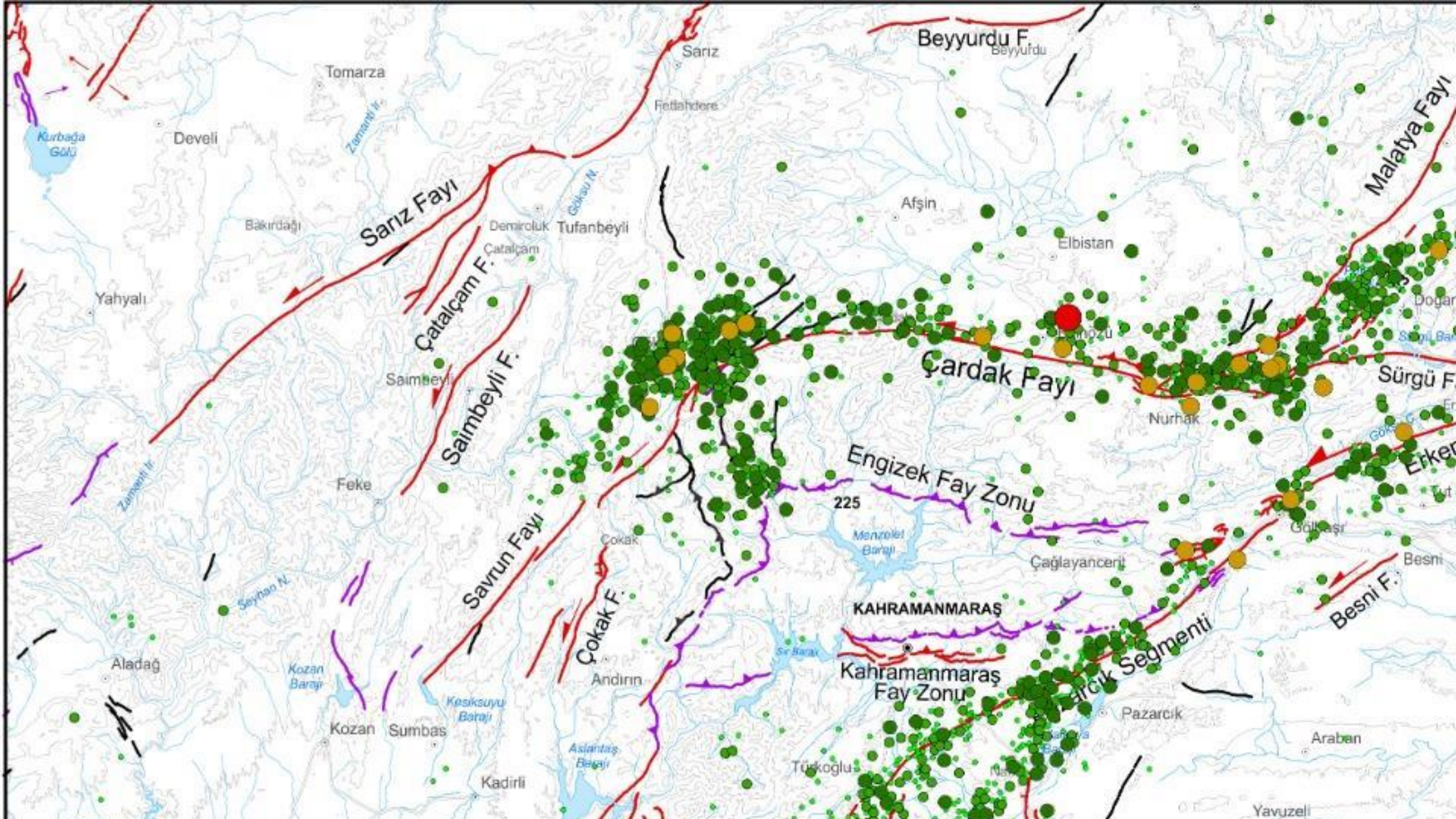
- Erzincan Segmenti: 42 km
- Refahiye Segmenti: 49 km
- Suşehri Segmenti: 65 km
- Reşadiye Segmenti: 90 km
- Ezinepazar Segmenti: 76 km (63 km kırıldı)
- Niksar Segmenti: 21 km

- TOTAL: 330 km

06 Şubat 2023 Pazarcık (Kahramanmaraş) (Mw 7,7):

- Pütürge Segmentinin Arıkonak bölümü: 20 km
- Yarpuzlu sıkışmalı çift büklümü: 15 km
- Erkenek Segmenti: 62 km
- Pazarcık Segmenti: 82 km
- Amanos Segmenti: 112 km
- Narlı Segmenti: 24 km

- TOTAL: 315 km

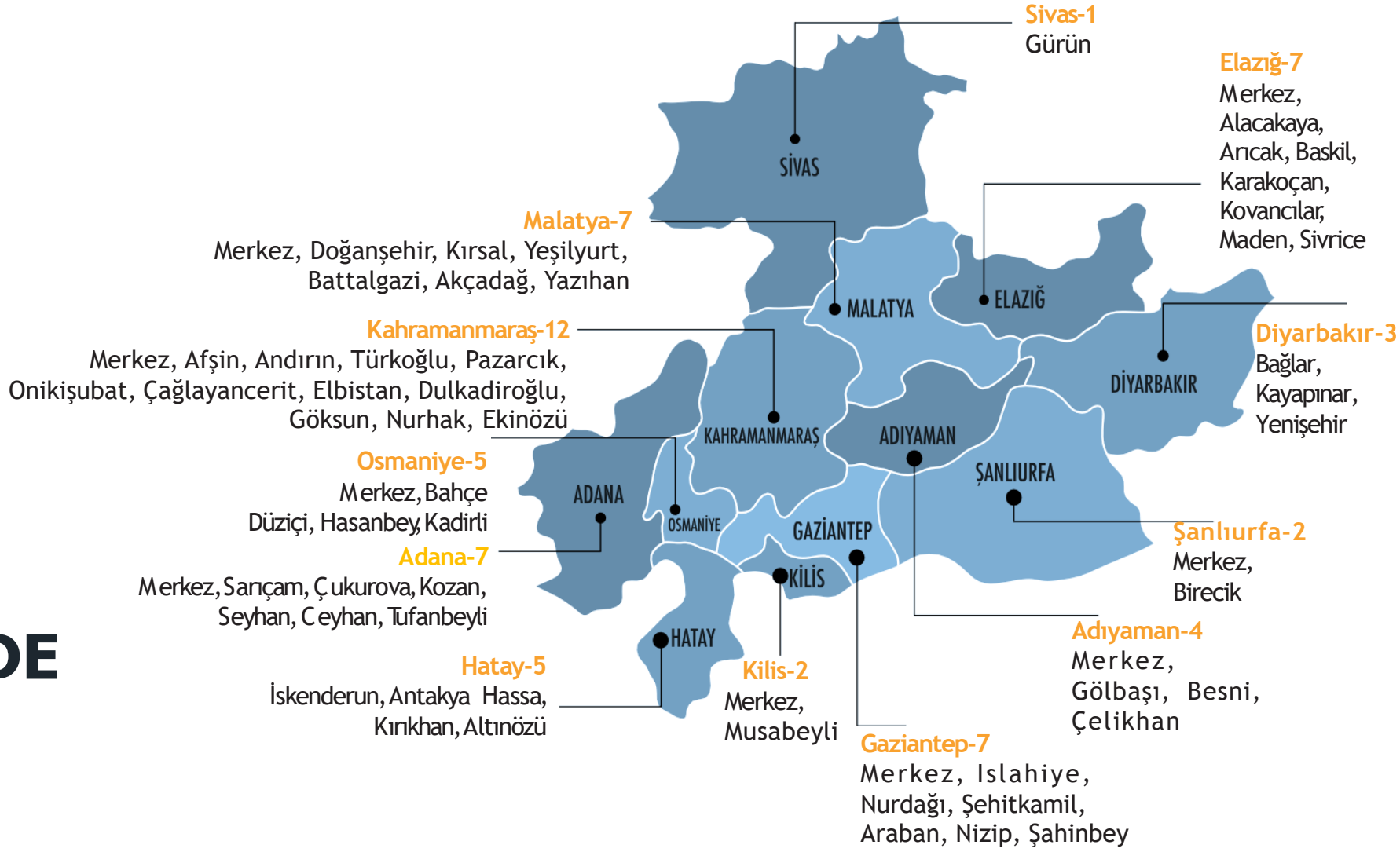

Beyyurdu F.
Beyyurdu
Sarız
Tomarza
Fettahdere
Develi
Kurbağa Gölü
Zamanti Ir.
Sarız Fayı
Göksu N.
Demirloluk
Tufanbeyli
Çatalçam
Çatalçam F.
Bakırdağı
Afşin
Elbistan
Malatya Fayı
Yahyalı
Saimbeyli
Saimbeyli F.
Çardak Fayı
Nurhak
Sürgü F.
Engizek Fay Zonu
225
Feke
Savrun Fayı
Çokak
Çokak F.
Menzelet Barajı
Çağlayancerit
Besni
Besni F.
KAHRAMANMARAŞ
Kahramanmaraş Fay Zonu
Pazarcık Segmenti
Aladağ
Kozan Barajı
Kesiksuyu Barajı
Andırın
Kozan
Sumbas
Kadirli
Asiantaş Barajı
Türkoğlu
Pazarcık
Araban
Yavuzeli

AFAD

Disaster and Emergency Management Presidency

21 İL

175 İLÇE



18 İL 62 İLÇEDE

Genel Hayata Etkili Afet Bölgesi ilan edilmiştir.

Aynı gün

7,7 - 7,6 ve 6,5

büyüklüklerinde

3 Büyük Deprem

meydana geldi.

06.02.2023 -03.03.2023

tarihleri arasında

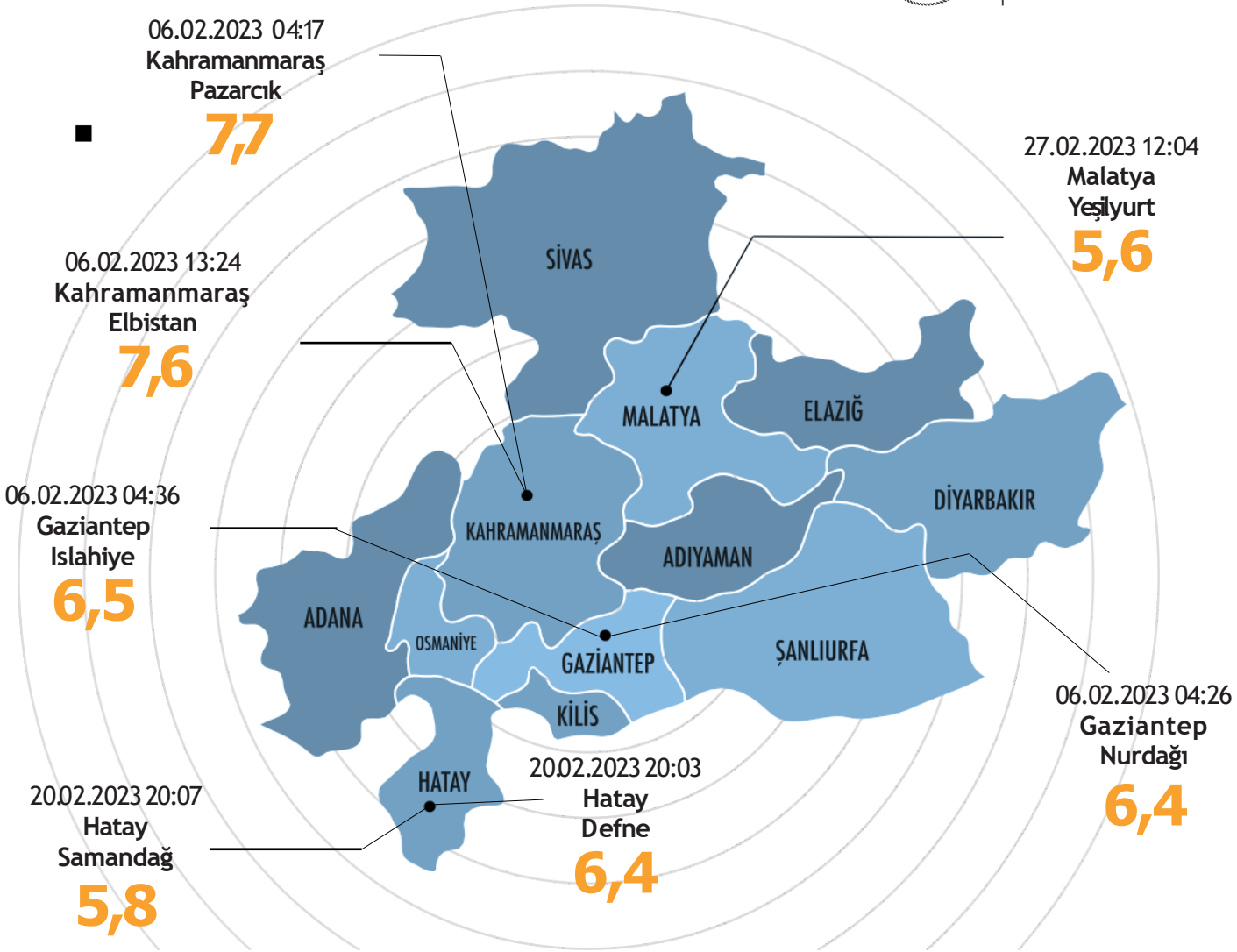
7 Büyük Deprem

35.560 Artçı Deprem

meydana geldi.

3-4 arası	4-5 arası	5-6 arası
2.885	557	48

artçı deprem meydana gelmiştir.



Görevlendirilen
Ambulans / UMKE
Personel ve Araç Bilgileri

UMKE
389
74 (Aktif)

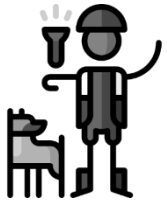
Ambulans
1.426
886 (Aktif)

UMKE
5.180
1.187 (Aktif)

Ambulans Personel
10.703
6.038 (Aktif)

Acil Müdahale Ünitesi
126
Ağır İklim
10

116



- **Toplamda Görev Yapan Arama Kurtarma Personeli:**
  35.250

- **Görevi Devam Eden Arama Kurtarma Personeli:**
  4.443

90

- **Toplamda Görev Yapan Uluslararası Arama Kurtarma Personeli:**
  11.488

- **Aktif Görev Yapan Uluslararası Arama Kurtarma Personeli:**
  -

- **Bölgedeki Ulusal K9**
  -

- **Bölgedeki Uluslararası K9**
  -

ARAMA KURTARMA FAALİYETLERİ

PERSONEL BİLGİSİ

Sahada, AFAD, Tahlisiye, PAK, JAK, JÖAK, DİSAK, Sahil Güvenlik, MSB-DAK, Güven Timleri, İtfaiye ve STK'lardan oluşan **35.250** Arama Kurtarma Personeli olmak üzere toplam **274.645** personel görev yapmıştır.
169.854 Personelin Görevi devam etmektedir.

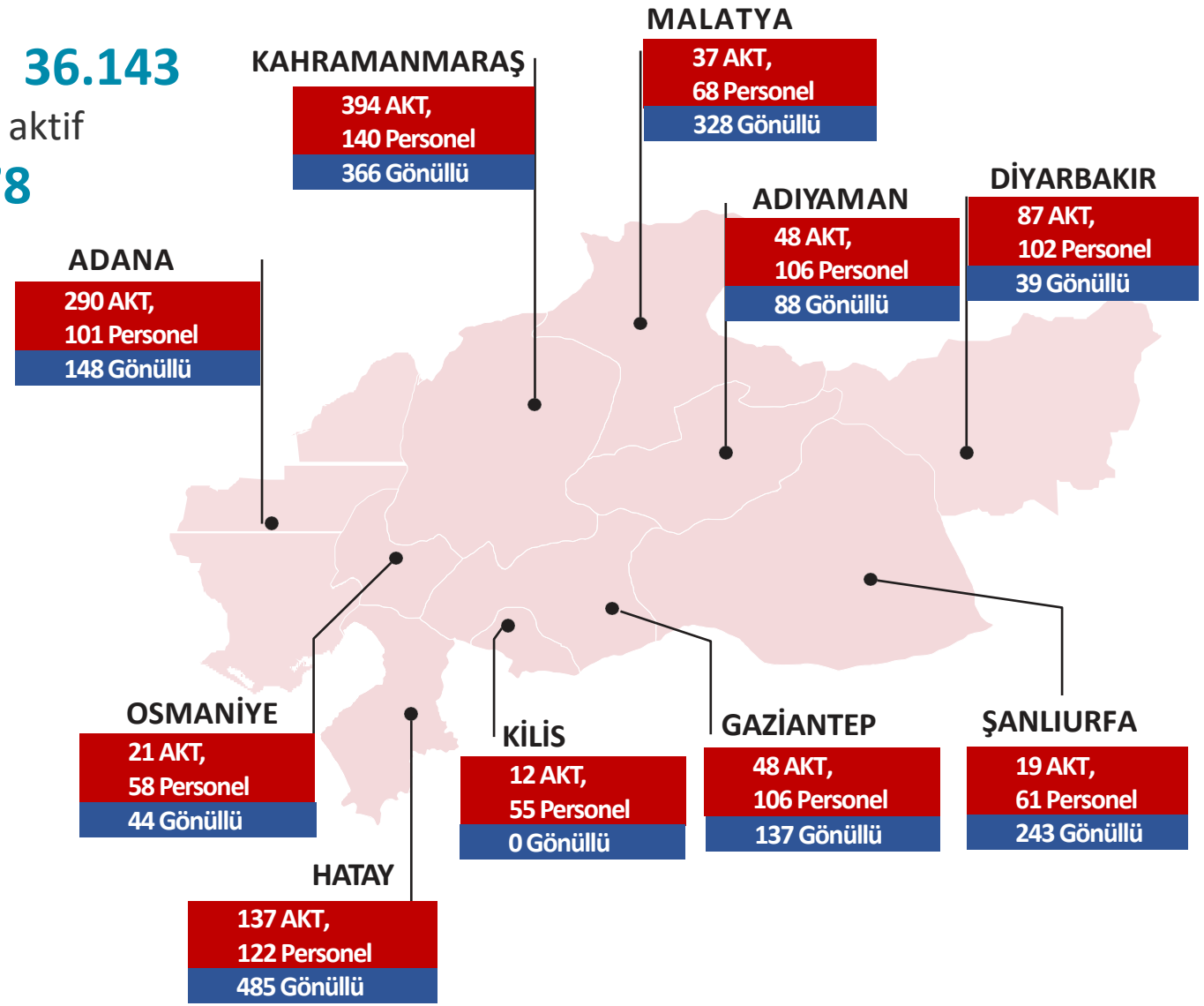
ETKİLENEN İLLER	TOPLAM	GÖREVİ DEVAM EDEN PERSONEL	AFAD	AİLE VE SOSYAL HİZMETLER	EMNİYET	JANDARMA	MSB	KIZILAY	GÖNÜLLÜ	UMKE	AMBULANS	DSİ + OGM	YEREL DESTEK	GÜVENLİK K. YEREL DESTEK
ADANA	17266	17037	101	497	8.887	2.145	2.598	66	148	234	1.124	1.176	61	
ADIYAMAN	22961	11867	106	949	4.202	3.015	1.744	155	88	24	126	283	152	1.023
DİYARBAKIR	27615	26771	102	588	9.371	11.449	1.920	84	39	98	844	1.160		1.116
GAZİANTEP	22324	16654	106	647	8.087	3.231	1.945	164	137	249	876	290	220	702
HATAY	61401	32750	122	1828	13.290	4.862	7.972	494	485	125	891	928	965	788
KAHRAMANMARAŞ	33112	18511	140	1348	7.627	4.109	1.719	340	366	13	213	1.211	438	987
KİLİS	4916	3928	55	189	1.846	988	170	0	0	136	178	213		153
MALATYA	22105	14842	68	1166	6.513	2.691	2.611	208	328	4	111	337	206	599
OSMANİYE	10643	7206	58	532	3.290	1.619	301	80	44	103	496	327	16	340
ŞANLIURFA	17052	15845	61	383	6.445	4.236	1.965	30	243	142	837	1.033		470
TOPLAM	**239.395**	**165.411**	**919**	**8.127**	**69.558**	**38.345**	**22.945**	**1.621**	**1.878**	**1.128**	**5.696**	**6.958**	**2.058**	**6.178**
													GÖREVİ DEVAM EDEN	**169.854**
													GENEL TOPLAM	**274.645**

AFAD PERSONEL BİLGİLERİ

1.093 Arama Kurtarma Personeli ve **919** Personel olmak üzere; Sahada Görev Yapan **Toplam AFAD Personeli Sayısı 2.012**

36.143

Görevi devam eden aktif gönüllü sayısı **1.878**

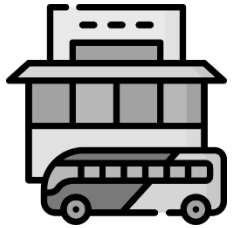


GÜVENLİK VE TRAFİK GRUBU ÇALIŞMALARI

- **69.558 Emniyet,**
- **38.345 Jandarma,**
- **3.295 Çarşı** ve **Mahalle Bekçisi** olmak üzere deprem bölgesinde
- **TOPLAM 111.198 Personel** görev yapmaktadır.

AFET TAHLİYE - DÖNÜŞ İŞLEMLERİ

Dünyanın en büyük tahliye işlemlerinden biri gerçekleştirilmiş olup bu kapsamda **Havayolu**, **Demiryolu**, **Denizyolu**, **Karayolu** ile **3 Milyonun** üzerinde tahliye gerçekleştirilmiştir.



Eşzamanlı olarak **280 binin** üzerinde **personel** nakli de bölgeye gerçekleştirilmiştir.

Afet bölgesine dönüş ve oy verme işlemleri kapsamında **225.094** afetzede afet bölgesine götürülmüş, **54.571** afetzede bölgeden tekrar ayrılmıştır. (**Son 10 gün** içerisinde **184.665** afetzedeye afet bölgesine ulaşım hizmeti verilmiştir.)

BARINMA ÇALIŞMA GRUBU

TOPLAM BARINDIRILAN AFETZEDE

3.044.620

Bugün 905.320

Dün 902.520

Bugün 112.183

Dün 109.932

Bugün 18.917

Bugün 2.604.760

Dün 2.604.760

Bugün 260.495

Dün 249.546

Afet Bölgesindeki

MEB Tesisleri
Bugün 37.160
Dün 37.160

GSB Tesisleri
Bugün 41.730
Dün 41.730

Afet bölgesinde toplam;
Bugün 2.933.196
Dün 2.933.797 afetzede barındırılmaktadır.

Afet Bölgesi Dışındaki

Otel
Barındırılan 4.637 - Kapasite 116.404
MEB Tesisleri
Barındırılan 5.398 - Kapasite 57.744
GSB Tesisleri
Barındırılan 71.171 - Kapasite 795.322

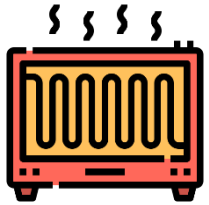
Afet Bölgesi Dışında Barındırılan
110.382

Kendi İmkanlarıyla Konaklaması Tespit Edilenler
1.263.270

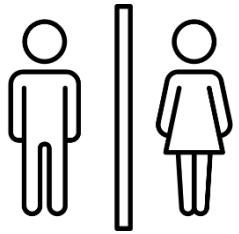
BARINMA ÇALIŞMA GRUBU

Toplam Dağıtılan Battaniye
4.540.075

Toplam Dağıtılan Yatak
488.115



Toplam Dağıtılan Isıtıcı
709.760



Afet Bölgesindeki Toplam WC
18.991

Afet Bölgesindeki Toplam Duş
9.267

Afet Bölgesindeki Toplam Çamaşır Makinası
5.447

Afet Bölgesindeki Toplam Kurutma Makinası
3.261

BARINMA ÇALIŞMA GRUBU

222 ÇADIR KENT

99

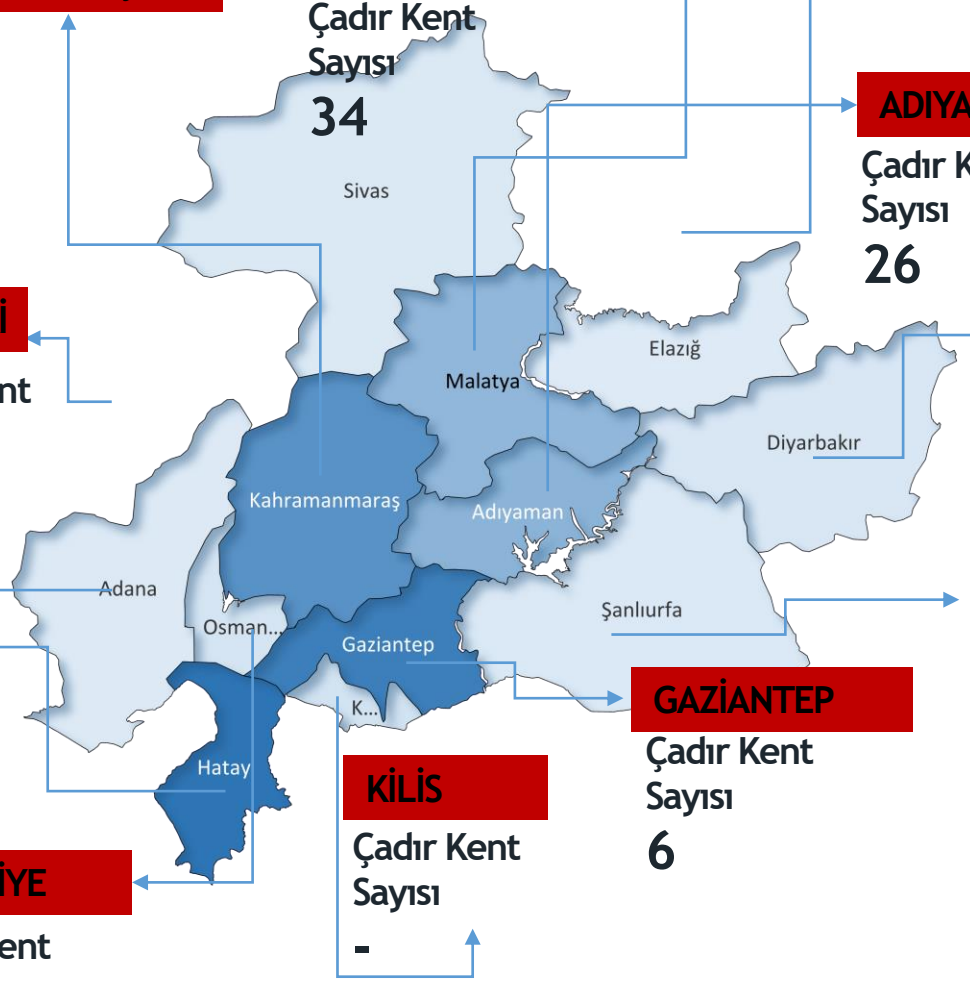
KÜÇÜK PARÇALI ÇADIR KENT ALANLARI

13.568

SÖKÜLEN ÇADIR SAYISI

221.147

STOKTAKİ ÇADIR SAYISI



KAHRAMANMARAŞ
Çadır Kent Sayısı
66

MALATYA
Çadır Kent Sayısı
34

BİNGÖL
Çadır Kent Sayısı -

ADIYAMAN
Çadır Kent Sayısı
26

DİYARBAKIR
Çadır Kent Sayısı
1

ADANA
Çadır Kent Sayısı
-

KAYSERİ
Çadır Kent Sayısı
-

ŞANLIURFA
Çadır Kent Sayısı
1

GAZİANTEP
Çadır Kent Sayısı
6

HATAY
Çadır Kent Sayısı
74

KİLİS
Çadır Kent Sayısı
-

OSMANİYE
Çadır Kent Sayısı
14

BARINMA ÇALIŞMA GRUBU

348

PLANLANAN KONTEYNER KENT SAYISI

169.760

PLANLANAN KONTEYNER SAYISI

109

Kurulum Çalışması Devam Eden Konteyner Kent Sayısı

43

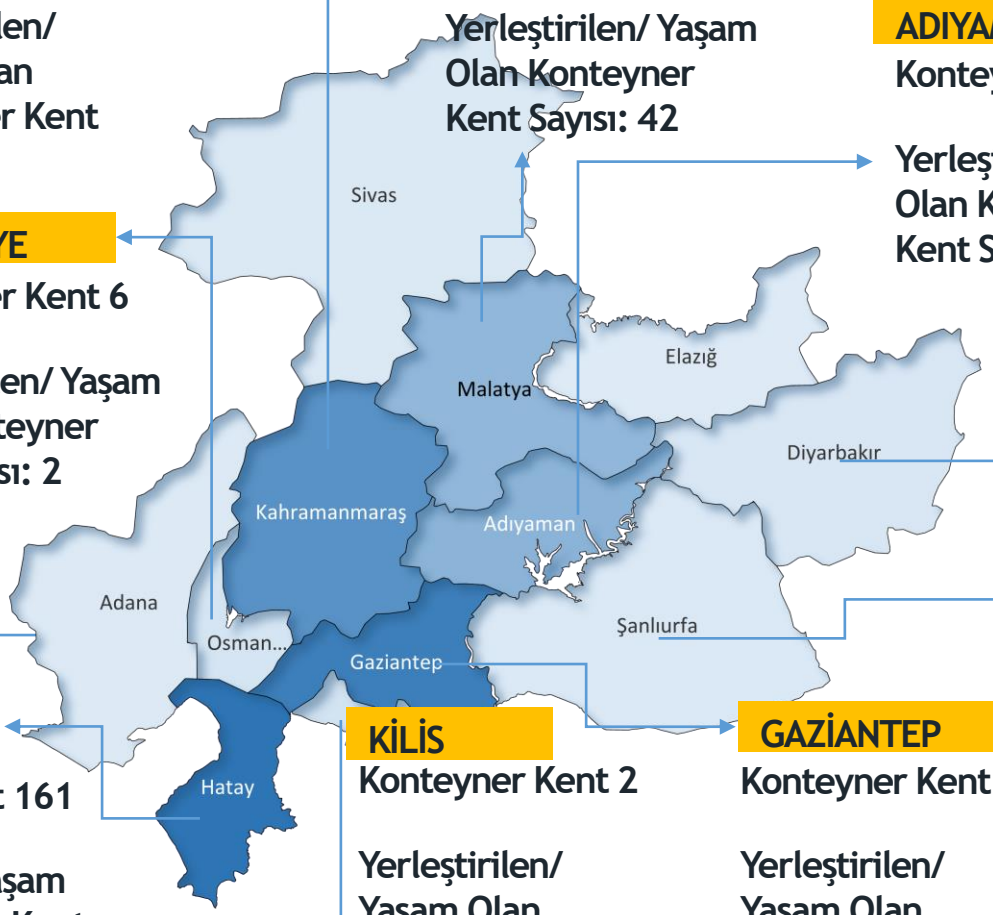
Altyapısı Tamamlanan Konteyner Kent Sayısı

164

Yapımı Tamamen Biten Konteyner Kent Sayısı

197

Yaşam Olan Konteyner Kent Sayısı



KAHRAMANMARAŞ

Konteyner Kent 44

Yerleştirilen/ Yaşam Olan Konteyner Kent Sayısı: 34

MALATYA

Konteyner Kent 61

Yerleştirilen/ Yaşam Olan Konteyner Kent Sayısı: 42

ADIYAMAN

Konteyner Kent 43

Yerleştirilen/ Yaşam Olan Konteyner Kent Sayısı: 27

OSMANİYE

Konteyner Kent 6

Yerleştirilen/ Yaşam Olan Konteyner Kent Sayısı: 2

ADANA

Konteyner Kent 2

Yerleştirilen/ Yaşam Olan Konteyner Kent Sayısı: 1

DİYARBAKIR

Konteyner Kent 1

Yerleştirilen/ Yaşam Olan Konteyner Kent Sayısı: 1

ŞANLIURFA

Konteyner Kent 2

Yerleştirilen/ Yaşam Olan Konteyner Kent Sayısı: -

HATAY

Konteyner Kent 161

Yerleştirilen/ Yaşam Olan Konteyner Kent Sayısı: 67

KİLİS

Konteyner Kent 2

Yerleştirilen/ Yaşam Olan Konteyner Kent Sayısı:2

GAZİANTEP

Konteyner Kent 26

Yerleştirilen/ Yaşam Olan Konteyner Kent Sayısı: 21

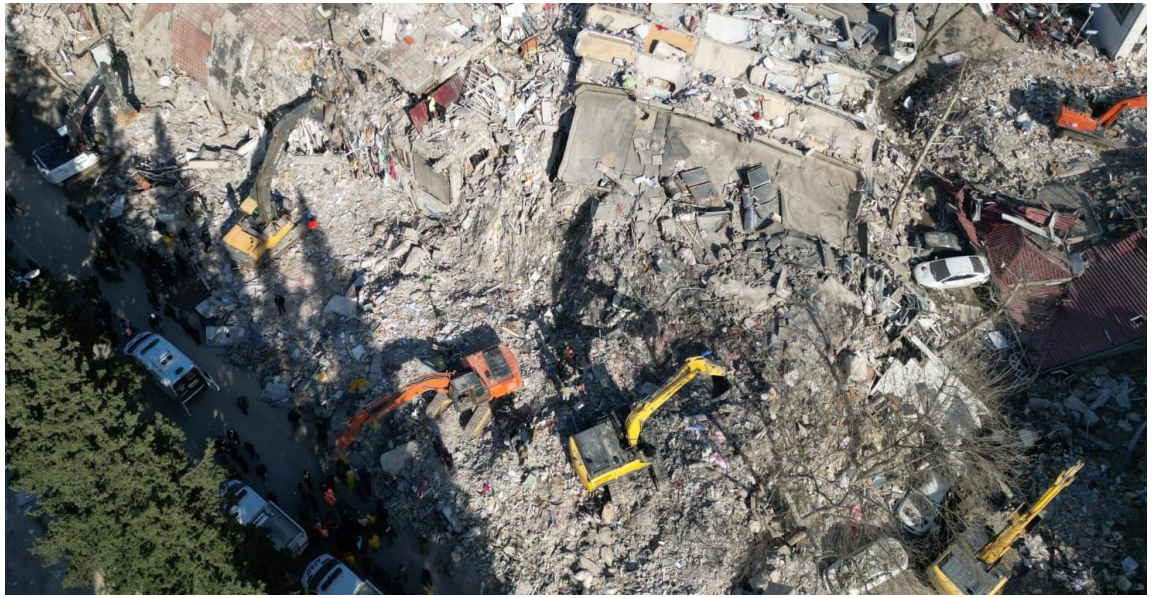
DAMAGE ASSESMENT WORKS

- Deprem bölgesinde **toplam 2.260.683 bina** tespiti yapılmıştır.

- **312.398** bina, **890.861** bağımsız bölüm **acil yıkılacak, ağır hasarlı, orta hasarlı ve yıkık** olarak tespit edilmiştir.

HASAR TESPİT ÇALIŞMALARI

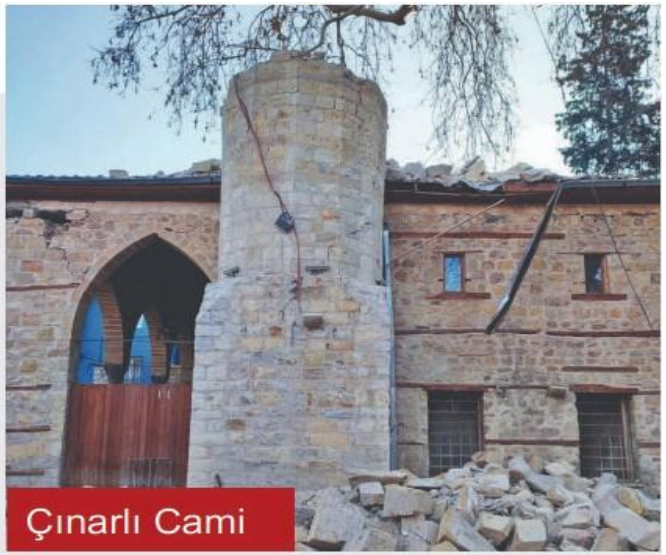
İL	YIKIK		ACİL YIKILACAK		AĞIR		ORTA		AZ HASARLI		HASARSIZ		TOPLAM TESPİT SAYISI		MAKS VERİLERİNE GÖRE İKAMETLER	TOPLAM ACİL+AĞIR+ YIKIK+ORTA	
	BİNA	BAĞIMSIZ BÖLÜM	BİNA	BAĞIMSIZ BÖLÜM	BİNA	BAĞIMSIZ BÖLÜM	BİNA	BAĞIMSIZ BÖLÜM	BİNA	BAĞIMSIZ BÖLÜM	BİNA	BAĞIMSIZ BÖLÜM	BİNA	BAĞIMSIZ BÖLÜM	KİŞİ SAYISI	BİNA	BAĞIMSIZ BÖLÜM
ADANA	35	365	37	309	2923	6551	5118	16539	39541	143634	276691	758289	**360.510**	**986.383**		**8.113**	**23.764**
ADIYAMAN	5838	13858	2306	6236	21348	48736	6507	22486	34558	93560	38618	70233	**114.376**	**263.865**		**35.999**	**91.316**
DİYARBAKIR	20	497	59	390	4708	11596	3355	14080	45602	160234	129986	412919	**195.273**	**620.007**		**8.142**	**26.563**
ELAZIĞ	53	75	48	178	7441	16345	506	2067	7945	42293	11767	90707	**28.874**	**154.453**		**8.048**	**18.665**
GAZİANTEP	3992	8249	1946	6621	14009	30491	6860	24526	63173	306733	177596	561612	**286.545**	**972.750**		**26.807**	**69.887**
KAHRAMAN MARAŞ	7233	19947	4390	13627	36193	87645	6050	25273	69271	205859	95433	172567	**236.541**	**554.299**		**53.866**	**146.492**
MALATYA	5050	12500	1810	8917	36046	89717	2783	19881	48690	157559	60825	109979	**168.916**	**415.635**		**45.689**	**131.015**
HATAY	13450	40558	8038	33883	64283	212852	12874	43375	103549	270144	140337	267032	**349.418**	**885.626**		**98.645**	**330.668**
KİLİS	463	629	151	189	1867	2658	486	1022	11191	36847	20188	47141	**36.047**	**91.354**		**2.967**	**4.498**
OSMANİYE	678	1515	530	2299	9010	17035	1094	4462	35006	98524	87674	154464	**135.473**	**282.434**		**11.312**	**25.311**
ŞANLIURFA	1172	1411	740	1187	7706	11474	3192	8610	112690	323554	195565	380794	**348.710**	**769.365**		**12.810**	**22.682**
TOPLAM	**37.984**	**99.604**	**20.055**	**73.836**	**205.534**	**535.100**	**48.825**	**182.321**	**571.216**	**1.838.941**	**1.234.680**	**3.025.737**	**2.260.683**	**5.996.171**	**2.145.078**	**312.398**	**890.861**

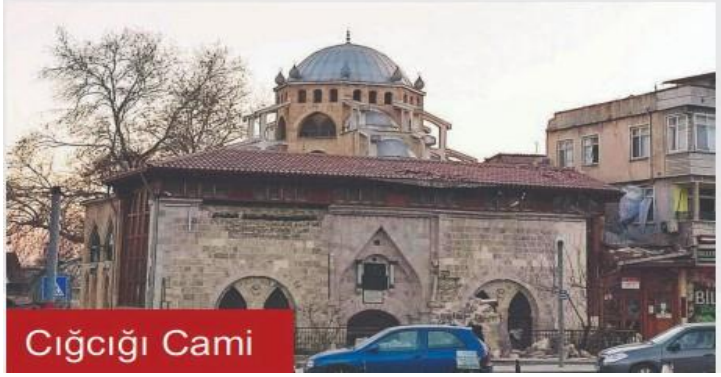


ALL debris of DESTROYED and IMMEDIATE DESTROYED buildings has been removed

Tender has been made for the demolition and debris removal of HEAVY DAMAGED buildings.

DESTROYED HISTORICAL AND CULTURAL BUILDINGS





Toplam Yıkılan İbadethane ve Tarihi Eser Sayısı

11 şehrimizde;

Toplam 3.905 kültür varlığımız incelenmiştir.

Yıkılan	218
Ağır hasarlı	635
Orta hasarlı	418
Az hasarlı	208
Hasarsız	1.829
Tespiti yapılamayan	3

ZARAR TESPİT ÇALIŞMALARI

	KONUT (Eşya)		İŞYERİ (Eşya)		TAŞIT		BİNA ZARAR		TOPLAM	
İLLER	TESPİT SAYISI	TESPİT EDİLEN TUTAR(TL)	TESPİT SAYISI	TESPİT EDİLEN TUTAR(TL)	TESPİT SAYISI	TESPİT EDİLEN TUTAR(TL)	TESPİT SAYISI	TESPİT EDİLEN TUTAR(TL)	TESPİT SAYISI	TESPİT EDİLEN TUTAR(TL)
ADANA	3.426	283.816.405,00	34	1.954.412,00	37	6.682.347,58	3.384	2.838.022.533	6.881	3.130.475.698
ADIYAMAN	58.962	8.079.956.500,00	3.163	833.719.846,00	3.194	417.004.321,80	0	-	65.319,00	9.330.680.667,80
DİYARBAKIR	467	38.543.014,00					467	385.430.138,00	467	423.973.152,00
ELAZIĞ	59	2.355.648,75	108	4.646.362,50	3	42.544,00			170	7.044.555,25
GAZİANTEP	31.115	4.948.183.993,00	2.755	1.636.621.342,50	2.103	412.032.297,00			35.973,00	6.996.837.632,50
HATAY	273.925	16.311.960.649,64	55.199	64.981.417.155,27	18.177	2.242.208.250,68		-	347.301,00	83.535.586.055,59
K.MARAŞ	84.122	5.799.512.369,50			5915	489.557.860,00			90.037,00	6.289.070.229,50
KİLİS	906	19.586.986,00	17	276.799,35	47	1.741.440,00			993	21.774.825,35
MALATYA	51.968	8.671.700.432,00	8.069	3.986.805.469,00	1.089	169.480.868,00	92.156	46.420.721.888,00	153.282,00	59.248.708.657,00
OSMANİYE	10.499	109.244.115,00	332	15.325.672,43	510	24.517.970,00			11.341,00	149.087.757,43
ŞANLIURFA	525	15.454.593,50	46	1.385.949,69	53	5.347.213,00			624	22.187.756,19
TOPLAM	**515.974**	**44.280.314.706**	**69.723**	**71.462.153.009**	**31.128**	**3.768.615.112**	**96.007**	**49.644.174.559**	**712.388,00**	**169.155.426.986,19**

ENERJİ GRUBU ÇALIŞMALARI

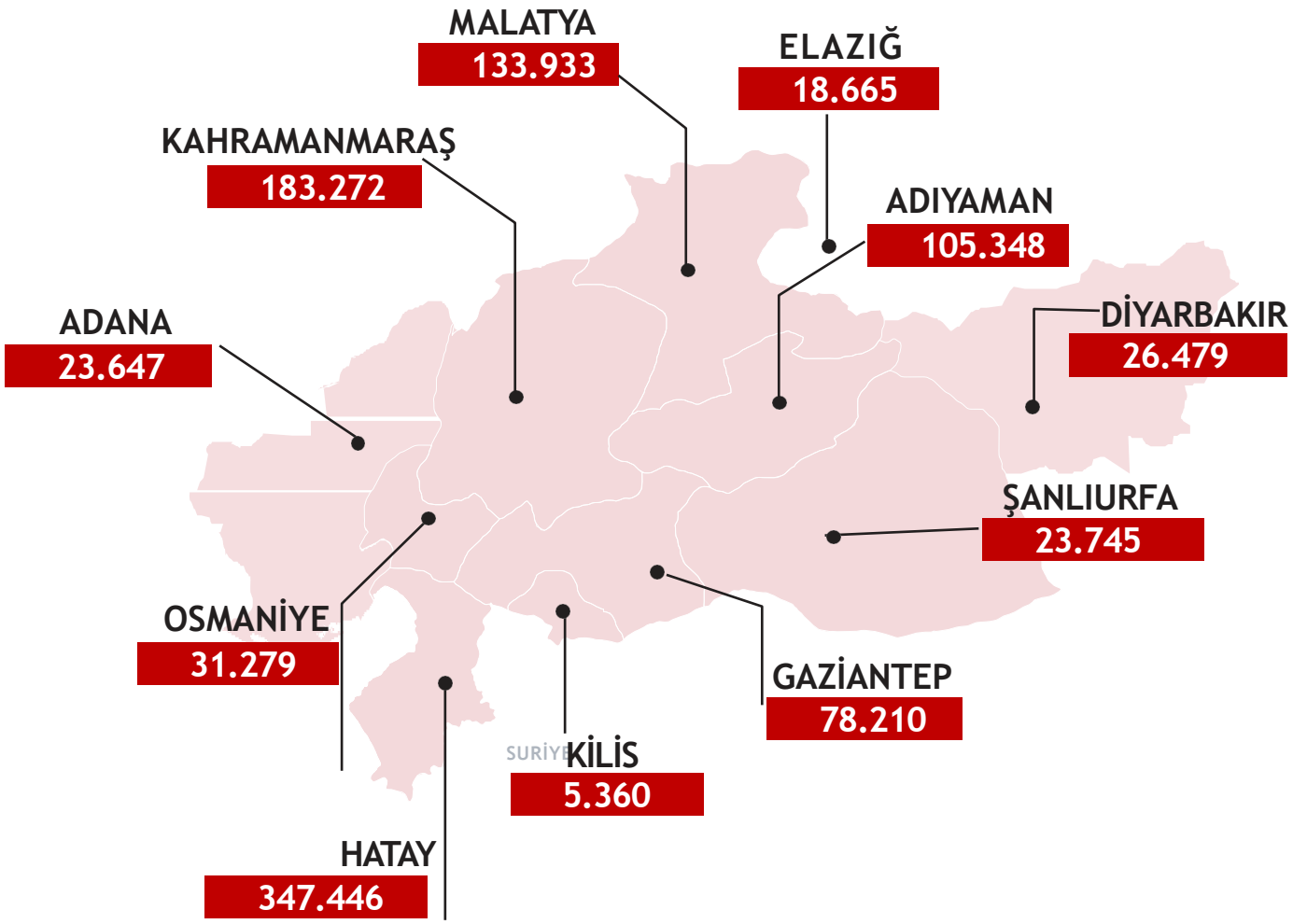
Depremden bölgesinde **5** ilde **25** ana trafo merkezi servis dışı kalmıştır.

- İlk gün **19** adet,
- İkinci gün **2** adet,
- Üçüncü gün **4** adet trafo merkezlerinin hasarları giderilerek devreye alınmıştır.

Deprem bölgesinde **11** ilde toplam **0** ilçede **0** köyde **977.384** aboneye elektrik verilmek üzere çalışmalar devam etmektedir.

Elektrik verilemeyen abone **%0,0**'dır.
(Yıkık/Ağır-Orta Hasarlı Konutlar hariç)

- Doğalgaz verilemeyen konut sayısı **16.585'**dir.
- Gaz verilemeyen konut yüzdesi **%0.99'** dur.



COMMUNICATION WORKS

- **Çadır kent ve Konteyner kentlerde**

  93 Noktada Fiber + Wi-Fİ

  163 noktada VSAT + Wi-Fi aktif olarak kullanılmaktadır.

Sevk Edilen Mobil Baz İstasyonu

344

Operatör: **378**

Evrensel: **36**

Jeneratör

Kurulan:

Aktif Çalışan: **466**

Jeneratörden Elektriğe Dönen:

1.925

Personel sevk edilmiştir.

4

Acil İletişim Aracı

KARAYOLU

- **Adıyaman** illerindeki Devlet ve İl yolları ulaşıma açıktır.
  Gaziantep, Hatay, Kahramanmaraş, Mersin, Adana, Osmaniye illerindeki Devlet ve İl yolları ile otoyollar ulaşıma açıktır.
  Şanlıurfa-Gaziantep Otoyolu ve Devlet yolu ulaşıma açıktır.

HAVAYOLU

- **Malatya**, **Adıyaman**, **Kahramanmaraş**, **Gaziantep, Hatay** insani yardım amaçlı uçuşlar öncelikli olmak üzere tüm uçuşlara açıktır.
  Diyarbakır, Şanlıurfa ve **Adana** için herhangi bir kısıtlama yoktur.

BESLENME (İAŞE) ÇALIŞMALARI

15.05.2023 tarihinde **Toplam 1.546.869** kişi/öğün yemek dağıtılmıştır.

Günlük 12 Milyon ekmek Üretimi Yapılmaktadır. Yaklaşık **4 Milyonu** Afetzedelere dağıtılmaktadır.

854' Gönüllü olmak üzere **Toplam 1.507** Personel

Sıcak yemek
339.218.908

İçecek
19.867.024

Çorba
20.186.794

Su
79.194.880 L

Ekmek
327.065.771

Kumanya ve Paketli Gıda **31.463.269**

İkram Aracı
37

Mobil Fırın
55

Mobil Mutfak
313

Yardım Tırı
730

Hizmet Aracı
457

PSYCHOSOCIAL SUPPORT STUDIES

4 Mobil Sosyal Hizmet merkezi,

Personel
10.021

Araç
1.874

1.930.227

716.469

1.156

12.022

2.659.874 Kişiye sosyal destek verildi

Özel Eğitim
59 Destek Çadırı
322 Öğrenci
95 Öğretmen

Rehber Öğretmen ve Psikolojik Danışman
3.824

Öğrenci ve Veli
Deprem Bölgesinde
914.380
Deprem Bölgesi Dışında
867.199

Ana Sınıfı 396
İlkokul 127
Ortaokul 168
Lise 277
YKS - LGS Kurs 717

Temel Eğitim Psiko-sosyal Destek
381 Çadır Alanı

TRT EBA'dan derslerin takip edilebilmesi için
Kurulan Televizyon
13.060

Ders Kitabı ve Yardımcı Kaynak
26.000.000

Kırtasiye Seti
200.000

AYNİ BAĞIŞ VE DEPO YÖNETİMİ ÇALIŞMALARI

4.307.954 L

16 Uluslararası Ayni Bağış Deposu

71 Ayni Bağış Deposu

18 ilde toplam **87** Ayni Bağış Deposu bulunmaktadır.

Deprem Bölgesinde; Toplam **203** Sosyal Market

Deprem Bölgesi Dışında; Toplam **94** Sosyal Market

3.341.169 adet battaniye

574 araç

20.609 yardım tırı

467.503 adet çadır

3.319 personel

582.066 adet ısıtıcı

2.515.396 çuval yakacak ürünler afetzedelere ulaştırılmıştır.

TARIM VE ORMAN BAKANLIĞI ÇALIŞMALARI

Hayvan Çadırı:
16.559 adet

Hayvan Yemi:
15.998 ton

Hayvan Maması:
47,15 ton

Personel Sayısı
7.797

Yardım Tırı
732

Odun Dağıtımı
82.284 ton

Baklagil/Yağ/Un/
Muhtelif Gıda/Et
32.811,33 ton

Afet bölgesine **243** adet **yatakhane konteyner**, **46** adet **WC/Banyolu Konteyner**, **1.204** adet **Barınma Çadırı**, **208** adet **Seyyar Tuvalet** gönderilmiştir.

TARIM VE ORMAN BAKANLIĞI ÇALIŞMALARI

Yıkılan Ağır Hasarlı Ağıl-Ahır	Büyükbaş (Ölen)	Küçükbaş (Ölen)	Toplanan Süt Miktarı (Ton)	Gönderilen Yem Miktarı (Ton)	Gönderilen Hayvan Çadırı	Korumaya Alınan Büyükbaş	Korumaya Alınan Küçükbaş
17.069	8.091	70.021	148.930	15.998	16.559	1.521	3.979

ÇALIŞMALARDAN GÖRÜNTÜLER

MARINE AND AIRCRAFT ACTIVITIES

Construction Machinery
18.053

Helicopter
141
78 (Aktif)

Plane
72

Boat
23 (Aktif)

Got out
17.358

- **32 KKK, 6 ÖZKUV, 7 HV.K.K., 1 DZ.K.K. olmak üzere TSK'ya ait 46+0 KATAR + 4 ABD helikopteri ile;**
  - **718** Sıhhi Tahliye,
  - **4.429** personel nakli,
  - **1.625.545 kg** malzeme nakli,
  - **35** yangın söndürme
  - **4.468 Sorti** ile gerçekleştirilmiştir.

- **MSB, SSB, Sağlık Bakanlığı, O.G.M. Vasıtası ile**
  - **10 Gemi**
  - **67 Uçak**
  - **61 Helikopter**
  - **22 İHA,**
  - **6.807 Sorti** gerçekleştirilmiştir.

- **Jandarma, Emniyet ve Sahil Güvenlik Vasıtası ile**
  - **13 Gemi**
  - **5 Uçak**
  - **17 Helikopter**
  - **9 İHA**
  - **6.083 Sorti** gerçekleştirilmiştir.

Chamber of
Surveying and Cadastre Engineers

- In these devastating earthquakes, 10 of our colleagues lost their lives.
- Homes and offices of approximately our 100 members were destroyed.
- Provincial branch offices of our chamber in three cities were destroyed completely.

OUR HUMANITARIAN AIDS

We have collected donations and materials such as blanket, food, water, clothes from our members. Also materials purchased by the chamber.

Disaster Coordination Centers established by Union of Chambers of Turkish Engineers and Architects.

OUR HUMANITARIAN AIDS

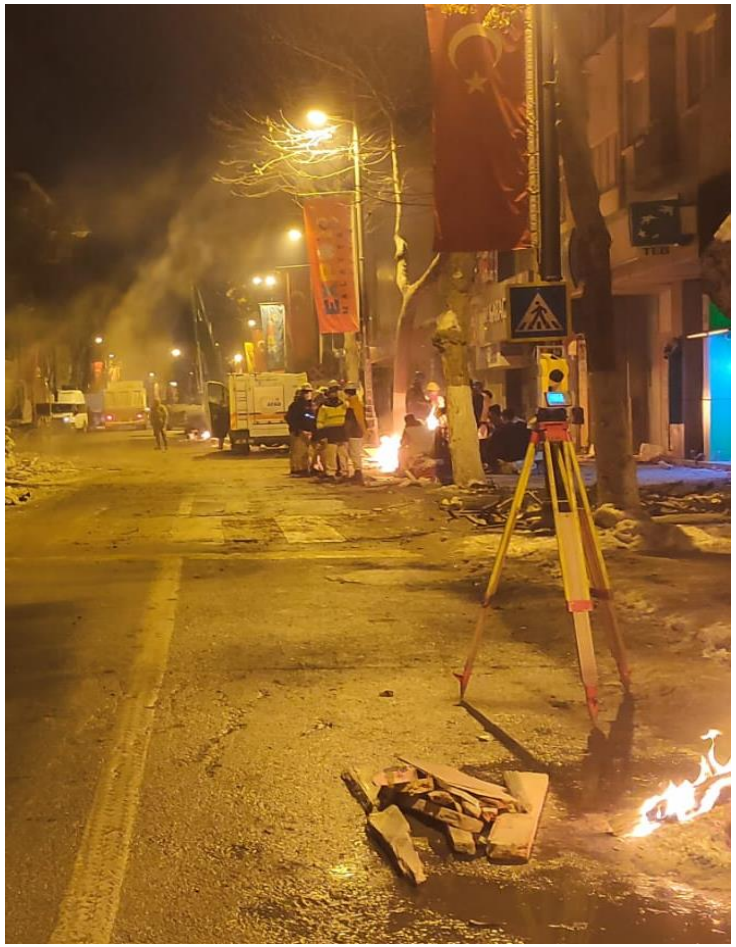
Since the first days of the earthquake, our Board of Directors has participated to the humanitarian and technical works in the earthquake area. Contact with all members and support the works on the delivery and coordination

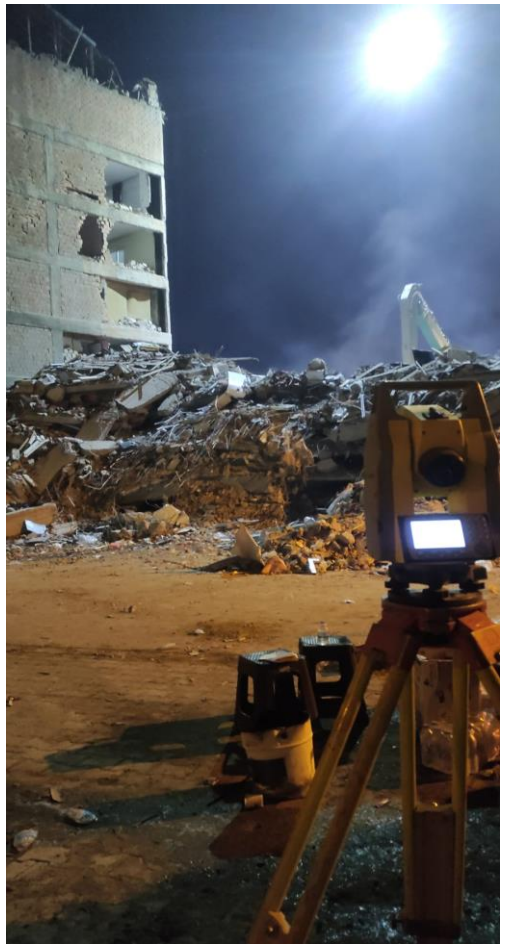
On February 7, 20 volunteers were identified as the Chamber for the rapid mapping of the disaster area with unmanned aerial vehicles and damage assessment. The data obtained has been shared at cloud of General Directorate of GIS in a way that everyone can use.

UAV image from Hatay/Antakya

Volunteer surveying teams were established

- to monitor the movements of heavy damaged buildings in order to ensure the life safety of the teams in search and rescue activities.



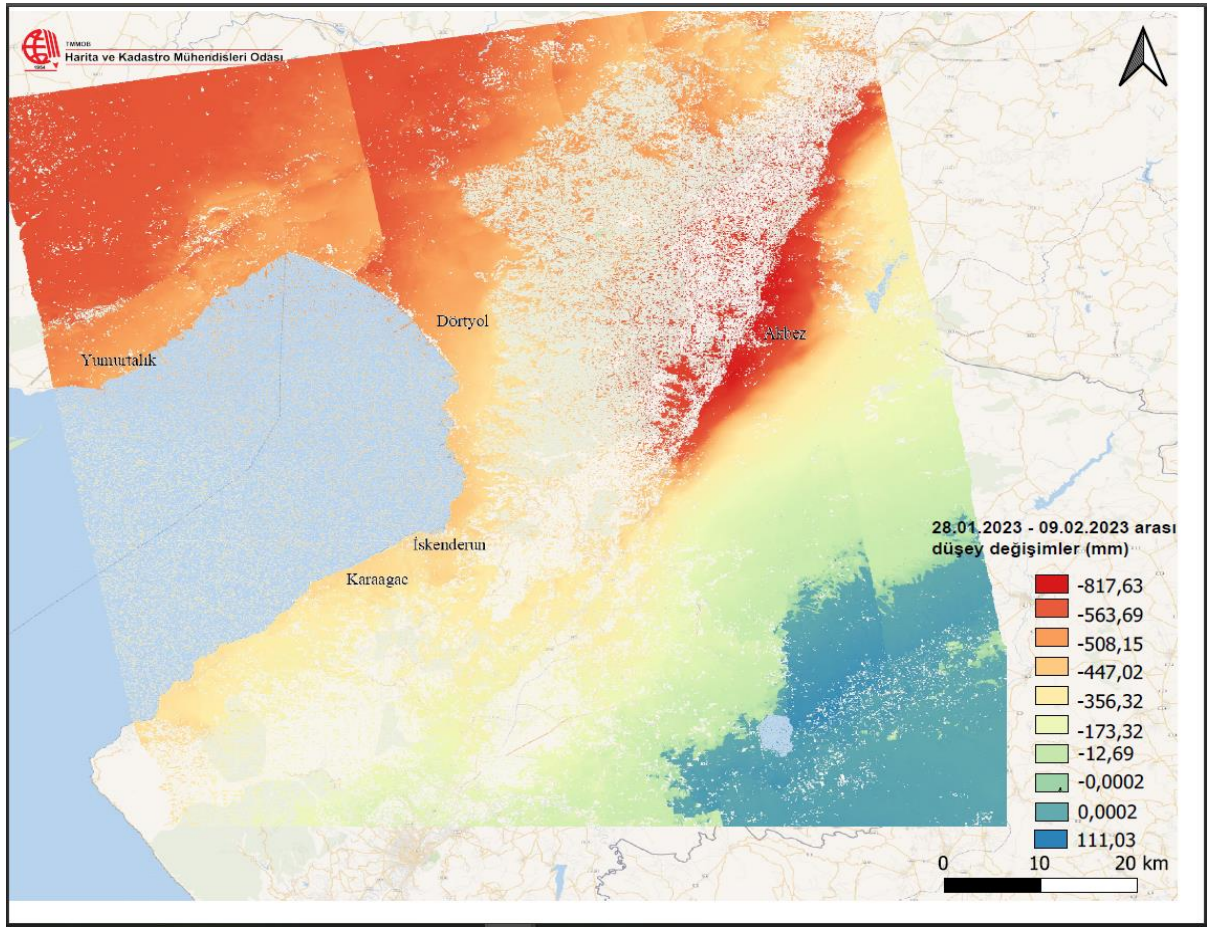


A meeting was held with the Ministry of Justice and it was ensured that survey engineers take part in the evidence collection teams.

Survey Engineers took place during the evidence collection from damaged and collapsed buildings.

- **InSAR Analysis of Disaster Area and Informing the Public.**

Photogrammetry and Remote Sensing Commission prepared a report regarding surface deformations, horizontal and vertical displacement and the floods as a secondary disaster using satellite radar data.



- **Geodetic Evaluation of the Earthquake**

A report prepared by our Geodesy and Navigation Commission on the Geodetic Evaluation of the Earthquake and its effects and the urgent work to be done.

Rapor

2023 Şubat

Kahramanmaraş Depremleri

HKMO Afet Çalışmaları Ön Raporu

14.02.2023

TMMOB
Harita ve Kadastro Mühendisleri Odası

A mobile application and desktop interface was developed by our Chamber in order to coordinate the aids provided by the Engineers' Chambers to prevent duplication, and collect and monitor the needs properly. Necessary licenses for the software infrastructure were obtained from ESRI free of charge and made available for usage of all members .

- All of our members in the 4 provinces (Adıyaman, Hatay, Kahramanmaraş and Malatya) affected severely,
- Our members who left the earthquake area transportation and accommodation provided
- Chamber waived all service charges (registration, documents, etc.) to support their activities.
- Registration renewal of self-employed members for 2023 refunded.
- A collaborative network was established for all needs of our members in the earthquake zone with our members.

- 10 container offices
- Malatya, Adıyaman, Hatay-Center, Hatay Kırıkhan, Kahramanmaraş-Center, Kahramanmaraş-Elbistan

- 6 Total Stations,
- 14 GNSS Receivers,
- 8 Workstation computers,
- CAD software licenses,
- Levelling equipments,
- Cors accounts,
- Mobile data lines,
- Printers,
- Furniture and work

Pictures

Highway and Railway Deformations

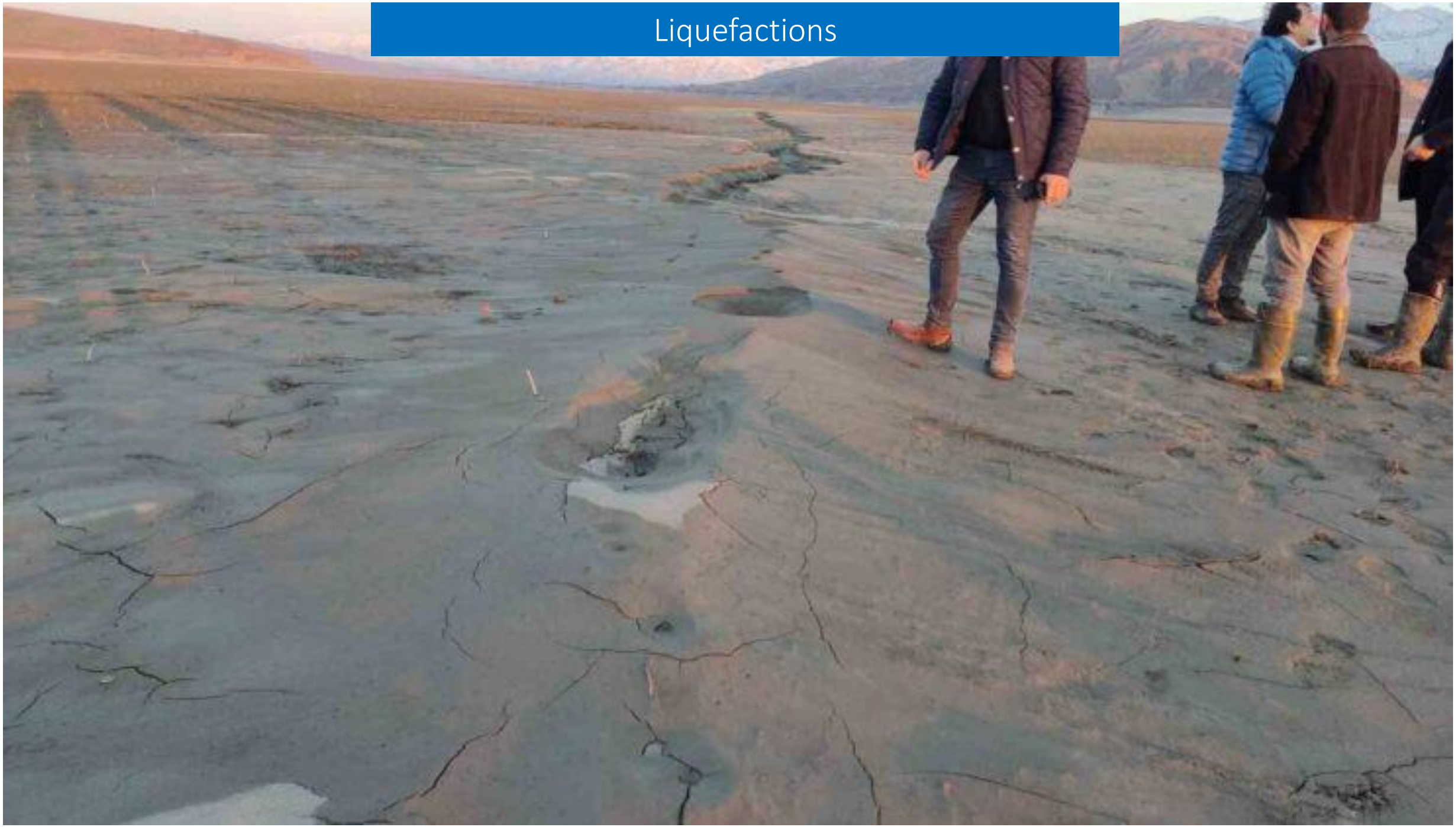
Structural Damages and Collapsed Buldings

Structural Damages and Collapsed Buldings

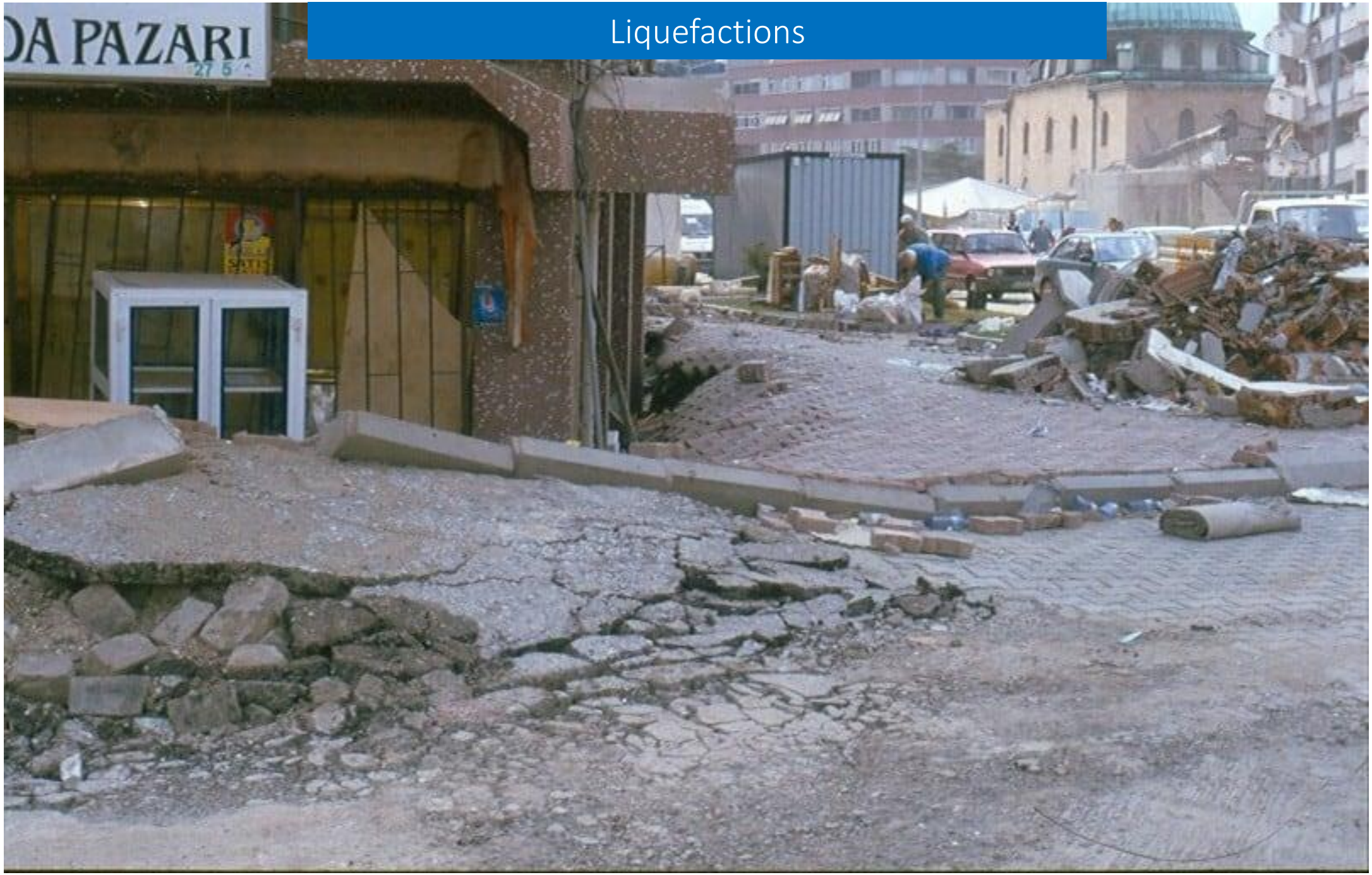
Structural Damages and Collapsed Buldings

Structural Damages and Collapsed Buldings

Liquefactions



Liquefactions

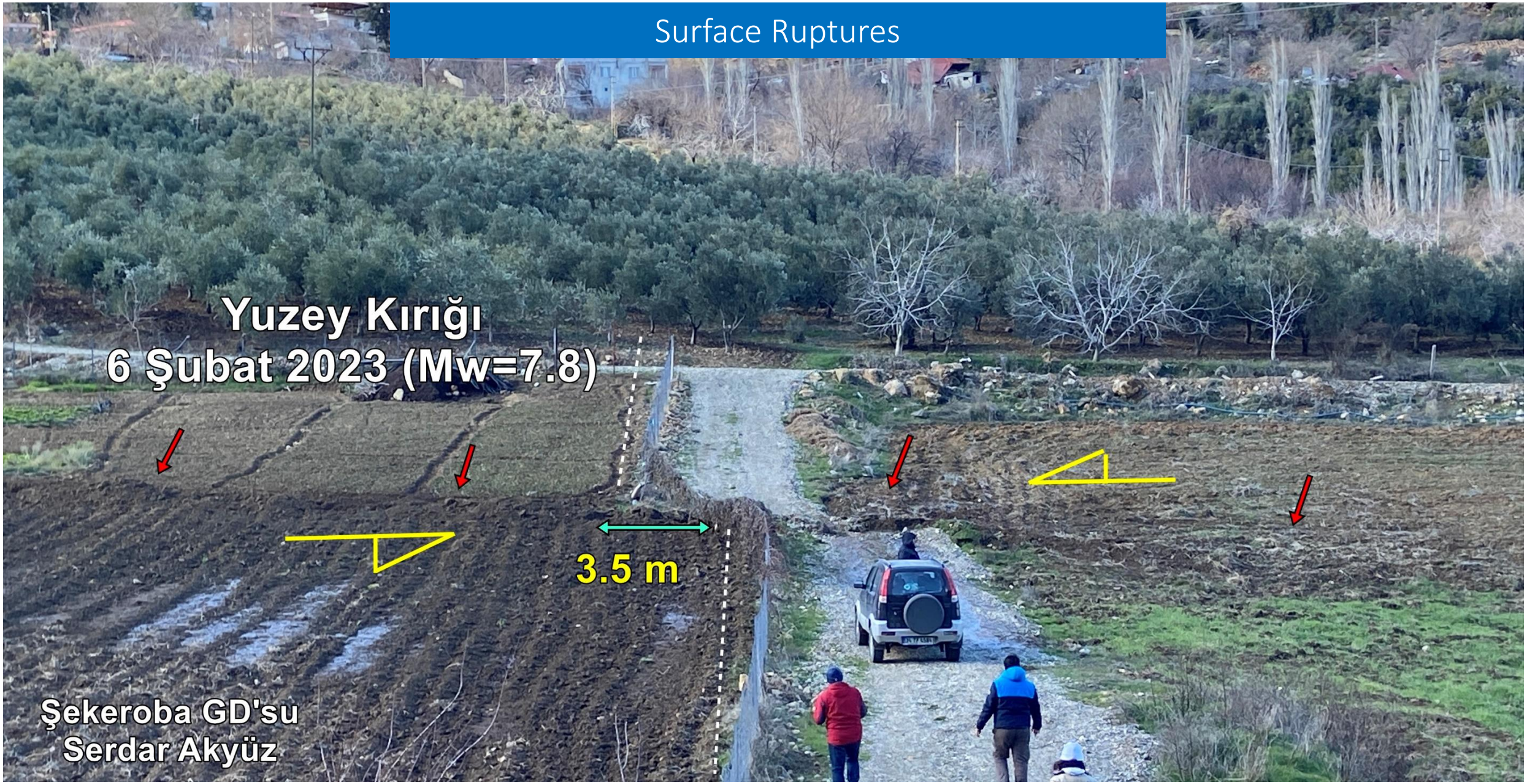


Liquefactions

Surface Deformations

Surface Ruptures

Surface Ruptures



south-west of Türkoğlu 337 cm left lateral displacement

Concluding Remarks

- The magnitudes (Mw7.7 and Mw7.6) of the February 6, 2023 major earthquakes exceeded the Mmax values expected for the source region of these earthquakes.

- Similarly, the intensity of the ground shaking defined as the peak ground acceleration (PGA) exceeded the values defined in the building construction codes.

- The fault ruptures associated with both the major events were very complex. Several fault segments failed as domino effect of triggering ruptures on the nearby faults.

- The rupture sequence of the Mw7.7 earthquake initiated on an off-fault called Narlı fault that was ruptured by a Mw6.8 earthquake.

- The rupture on the Narlı fault propagated toward the East Anatolian Fault and triggered the major earthquake resulting in magnitude Mw7.7.

- The February 6 major earthquakes portrayed that multiple fault rupture pattern is a characteristic feature of large earthquakes and should be taken into account in the building construction codes.

- The subsidiary off-faults located nearby the main faults such as East Anatolian Fault have the potential to trigger ruptures on the main faults.

- The return period of the major earthquakes is quite large. The previous event on the faults ruptured by the Mw7.7 earthquake is reported to be about 500 years ago.

- The geologist claim that the previous rupture on the fault that generated the Ekinözü Mw7.6 earthquake was about 2,000 to 3,000 years ago.

- Thus, special attention should be paid for such faults located in Central Anatolia that may have similar rupture return periods.

- Collaborative efforts among the earthquake prone countries are necessary to increase their resilience against natural disasters.

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Thank you for your Attention

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