Long-term seismicity of Istanbul and of the Marmara Sea region

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ABSTRACT
We examine the long-term seismicity of the Marmara Sea region in Turkey over a period of twenty centuries to attempt to answer two questions: (1) how well recorded in history is the earthquake activity of this region? and (2) does seismicity over this long period of time differ from that over the present century? We study this densely-populated and fast-developing region because it is one of the most tectonically active regions on the continents that appears today to be relatively quiescent.

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INTRODUCTION

The Marmara Sea region is roughly bounded by 39°N to 42°N and 26°E to 31°E (Fig. 1). For more than twenty centuries it has been the cross-roads between West and East, a region of great importance, with Constantinople (Istanbul) at its centre, the thriving, populous capital of an Empire with a sustained tradition of historiography; the historical record of this region over the past twenty centuries, as provided by literary sources, is remarkably full and relatively continuous. The Byzantine tradition necessarily waned with the Ottoman conquest but was superceded by the fairly rich Ottoman historiography; both are supplemented by occidental sources. The historical record of the Marmara Sea region is rivalled only by that of a few, better-documented districts of China.

Figure 2 shows in greater detail the distribution of the well-documented damaging earthquakes in the region during this century, and Table 1 lists their main characteristics. This figure shows that during the 20th century no truly large shocks have occurred near Istanbul. However, the potential seismic risk to the region, particularly to the larger urban centres such as Istanbul, Nicea (Iznik), Nicomedia (Izmit), Prusa (Bursa) and Adrianople (Edirne) is reflected in their very rapid growth combined with the apparent seismic hazard of the region. Considering that in 1480 the population of Istanbul was just over 100,000 and today has exceeded 7,000,000, it is obvious that the repetition of a large historical earthquake now would cause proportionally much greater losses.

DATA

Of the many earthquake catalogues available for the Eastern Mediterranean region, there are few exclusively devoted to the area of Istanbul. These are Georgiadis (1904), Dück (1904), Antoniadis (1907), Downey (1955), Grumel (1958), Cezar (1963) and Wirth (1966). Georgiadis' work covers the period up to 1821 and is based almost exclusively on Greek sources. That of Dück deals with the period 387–1901 and draws from a variety of mainly secondary sources. The catalogue of Antoniadis extends to 1453, and like Georgiadis', is based chiefly on well-known, classical Greek and Byzantine sources. All these three catalogues contain many errors. Downey's annotated list includes events for the period 342–1454, draw from Greek and Latin chroniclers. Although this list and those of Grumel (1958), Wirth (1966) and Ducellier (1980) are very incomplete, they are reliable sources of primary information. Finally, Cezar's short catalogue, which covers the period 1489–1894, draws exclusively from Ottoman sources, mostly chronicles, and is similarly useful.

At the outset of our study we began with these catalogues, which were purged of errors and spurious events. Into this improved data set we incorporated a much larger body of information from a wide variety of primary sources, both published and unpublished. For the earliest period we have recovered information from Greek and Roman sources; for the medieval period we have carried out an exhaustive retrieval of data from Byzantine and occidental chronicles, while for the Ottoman period, we have

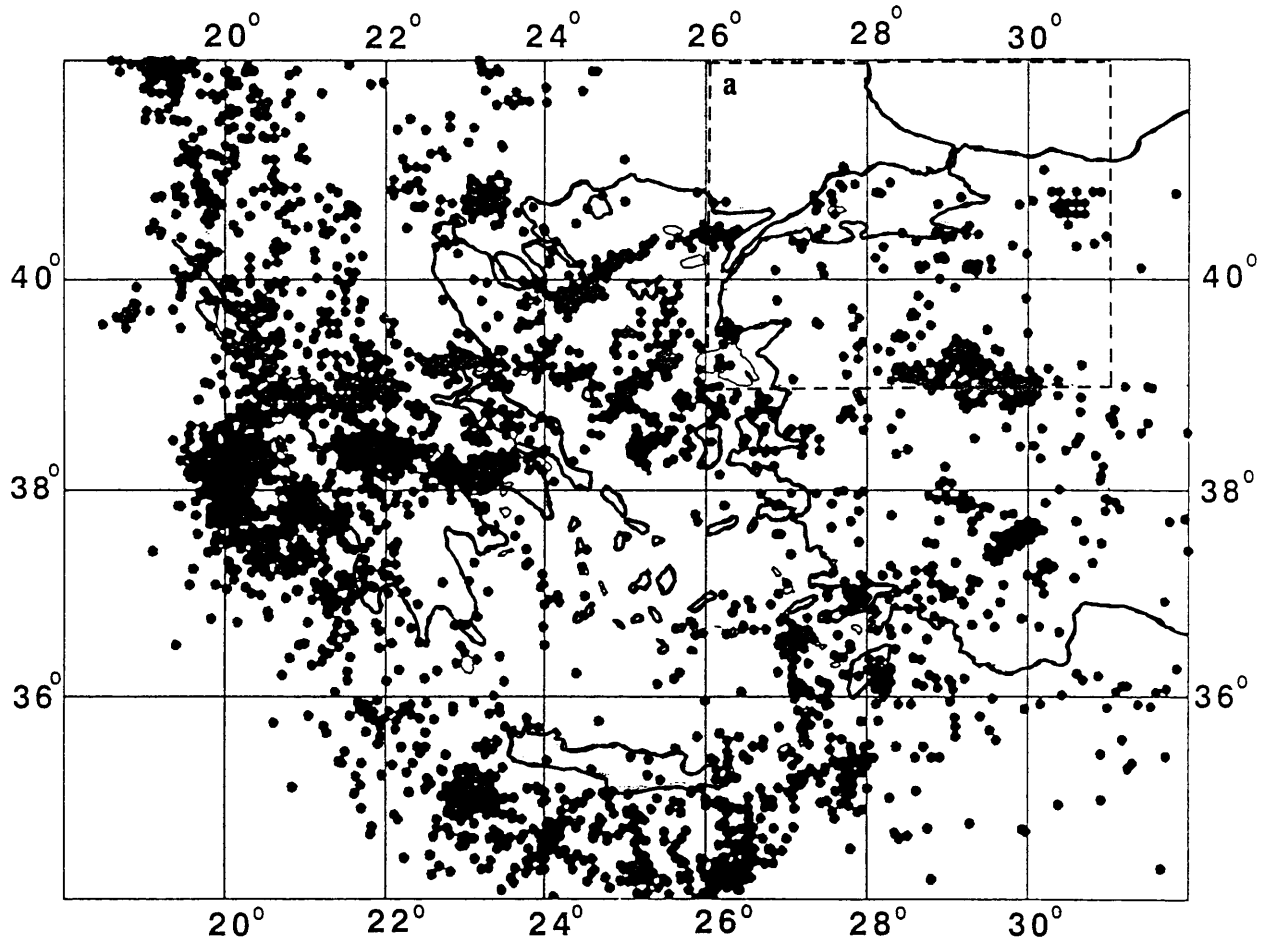

Fig. 1. *Seismic activity in the Aegean and neighbouring regions reported by the USGS in the period 1963 to 1987, probably complete down to magnitudes 4.5. Inset (a) shows the seismic activity in the Marmara Sea region.*

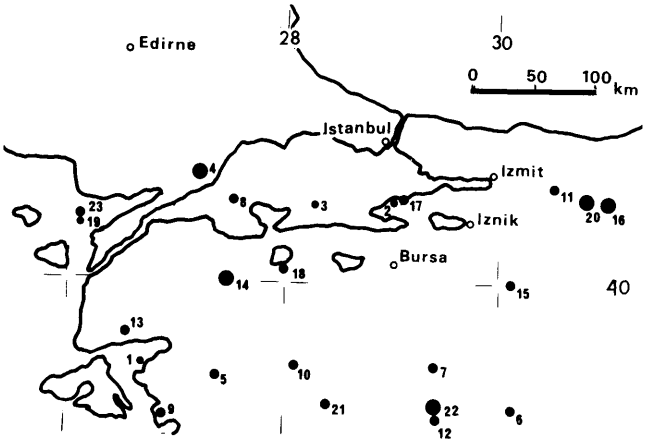

Fig. 2. *Distribution of damaging earthquakes in the Marmara Sea region during the 20th century. Numbers refer to entries in Table 1.*

relied on mainly unpublished Ottoman chronicles and archival material, on the accounts of western travellers, on consular reports and the Press. For the Ottoman period we have, to a lesser extent, also utilized Arabic, Greek, Armenian and Slavonic sources. In many cases we were fortunate in finding a contemporary or near-contemporary account of an earthquake from a local source. The source material used in this paper is, however, too extensive to quote in detail; the list of references given for each event is therefore kept to a minimum, priority being given to those considered most important. Further, secondary sources of information have only been used where they were judged to be reliable.

Ottoman archival materials on the effects of earthquakes have not hitherto been utilized so fully as in this paper. Since such documents were often drawn up in order to ascertain the cost of repairs, minute details of the level of damage caused by an earthquake to a structure are often available; this is even more the case for earthquake damage in the further provinces than in the Marmara Sea region. A source which has not, however, been consulted on this oc-

Table 1. Earthquakes with $M_s \geq 5.9$ in Marmara Sea area after 1899.

	Date	Origin time GMT	Epicentre N E	M_s	I_o (MSK)	r3 (km)	Location
1	1901 Dec 18	0341	39.4–26.7	5.9	VIII	220	Ayvalik
2	1903 May 26	0609	40.6–29.0	5.9	VI+	170	Marmara
3	1905 Oct 22	0335	40.6–28.3	5.9	V+	200	Marmara
4	1912 Aug 9	0129	40.8–27.2	7.4	X	500	Saros
5	1919 Nov 18	2144	39.3–27.4	6.9	IX	—	Soma
6	1924 Nov 20	2028	39.1–30.1	6.0	VII+	200	Altintaş
7	1928 May 2	2155	39.4–29.4	6.2	VIII	280	Emet
8	1935 Jan 4	1441	40.6–27.5	6.4	IX	290	Marmara
9	1939 Sep 22	0037	39.0–26.9	6.5	VIII	310	Dikili
10	1942 Nov 15	1701	39.4–28.1	6.2	VIII	230	Bigadiç
11	1943 Jun 20	1533	40.7–30.5	6.4	VIII	280	Hendek
12	1944 Jun 25	0416	39.0–29.4	6.0	VIII	225	Şaphane
13	1944 Oct 6	0235	39.6–26.5	6.8	VIII	270+	Ayvacik
14	1953 Mar 18	1906	40.0–27.5	7.2	IX	500	Yenice
15	1956 Feb 20	2032	40.0–30.1	6.1	VIII	260	Söğüt
16	1957 May 26	0633	40.6–31.0	7.0	X	460	Abant
17	1963 Sep 18	1658	40.6–29.1	6.4	VIII	320	Yalova
18	1964 Oct 6	1431	40.1–28.0	6.9	IX	400	Manyas
19	1965 Aug 23	1409	40.4–26.1	5.9	VI+	270	Saros
20	1967 Jul 22	1657	40.6–30.8	7.1	X	485	Mudurnu
21	1969 Mar 25	1322	39.1–28.4	6.1	VIII	260	Demirci
22	1970 Mar 28	2102	39.1–29.4	7.1	IX	550	Gediz
23	1975 Mar 27	0515	40.4–26.1	6.6	VII+	350	Saros

Note: M_s: surface wave magnitude; I_o+: signifies maximum observed intensity, not necessarily epicentral; r3: radius of perceptibility corresponding to I = III(MSK).
(Data from Ambraseys, 1988.)

casion, but which Ayverdi's volumes (Ayverdi, 1966, 1972, 1973) suggest may be fruitful for further research are the records of the cadi's courts of the area, for cadis were frequently called upon to control expenditure on repairs on behalf of the central government.

The methodology used to determine epicentral areas and estimate the size of events is that developed for the study of the seismicity of the Middle East (Ambraseys and Melville, 1982; Ambraseys and Finkel, 1987). All events identified in the Marmara Sea region for the whole period, including the twentieth century, are studied in the present paper on the basis of their macroseismic effects, using the same criteria. Data provided by historical sources for earthquakes on land are generally adequate to permit relatively good location of the epicentral area, particularly for the larger events. Early earthquakes are less well located and it is often difficult to ascertain their true epicentral area, although for the larger of them there is rarely ambiguity about their general location within the Marmara Sea region. For the early period, allowing for exaggerations, the notice of any seismic effects in the region must reflect their gravity and significance. For that period, while it is certain that many small-magnitude shocks must be missing from the record, we can reasonably assume that those of which damage details survive were important events.

At this stage our studies are not advanced enough to allow us to turn this information into numbers, that is to assign macroseismic epicentres and magnitudes to individual events. However, the material retrieved so far allows us to identify the most important events, which is likely to be of value to the earth scientist, and to assess the damage inflicted on historical monuments and sites, which will be useful for the engineer and historian: such damage is indicated in abbreviated form in the Appendix.

DISCUSSION

The total number of earthquakes identified for the period AD 1 to 1899 amounts to just under 600. Thirty-eight of the events described above are estimated to be relatively large shocks of magnitude $M_s \geq 7.0$. These events, that are important for the assessment of seismicity and tectonics of the region, have been singled out because of the large area over which they caused damage or were felt.

We may ask now how complete our information is. At this stage of our research, it is indeed unlikely that all moderate and large magnitude shocks in the interior before the

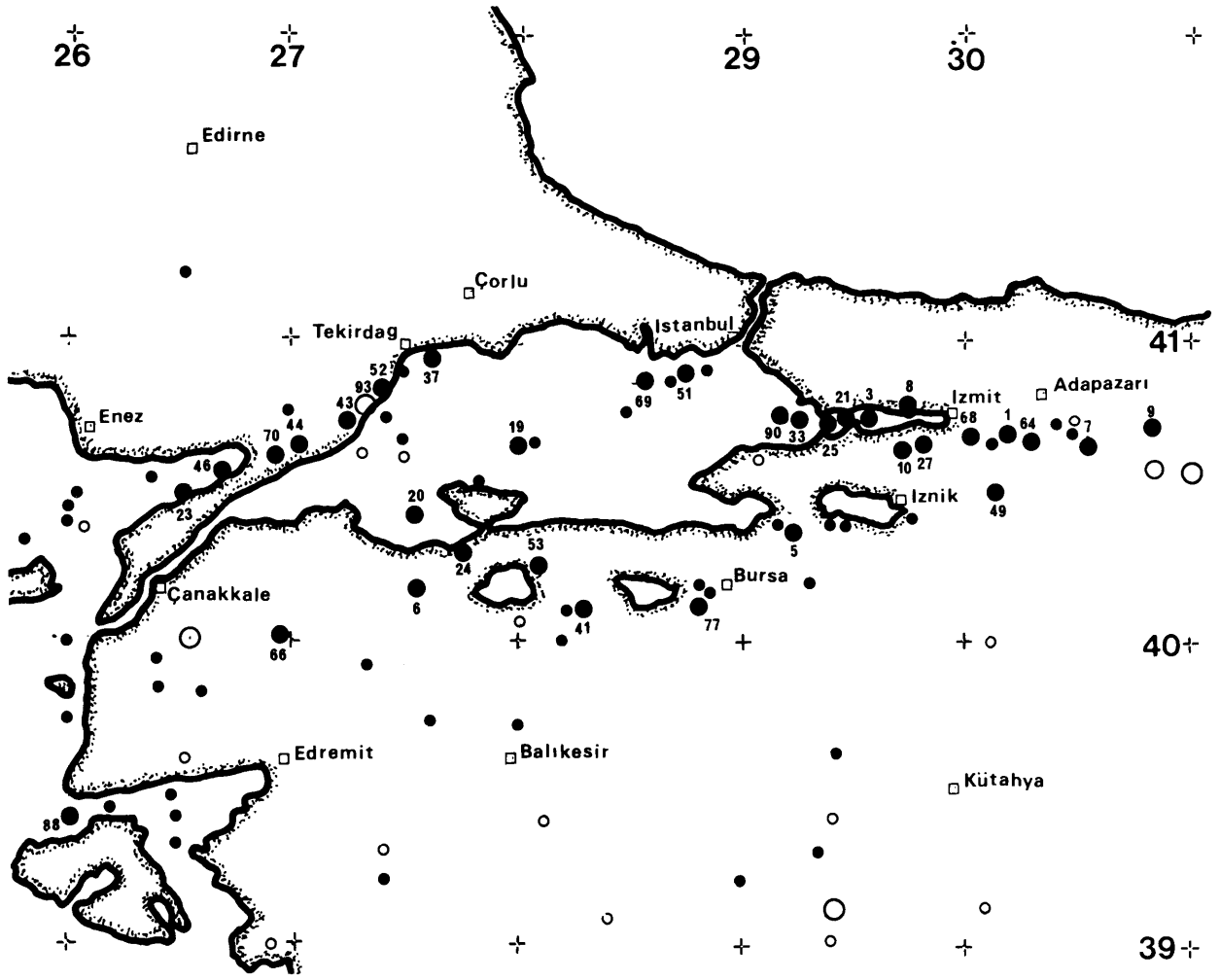

Fig. 3. *Long-term seismic activity of the Marmara Sea region. Distribution of earthquakes during the last 20 centuries. Large solid circles indicate the estimated epicentral location of events with $M_s \geq 7.0$, and numbers refer to the serial number of the event in the text. Smaller solid circles show the assessed location of events with $6.0 \leq M_s < 7.0$, probably incomplete. Open circles are events of this century, listed in Table 1.*

middle of the 18th century would have been recorded. It is very probable, however, that any large or major earthquake has been noted, although not necessarily fully identified. After the middle of the 18th century documentary information improves rapidly, further supplemented by occidental sources (consular correspondence, travellers and the Press), so that data about moderate and large magnitude events in the region after about 1770 should be complete. It is reasonable to suppose, therefore, that the available data for the whole region is complete only for major magnitude earthquakes.

Figure 3 shows the spatial distribution of the main events identified. Their estimated epicentres are at this stage approximate. From this figure we notice that the bulk of the activity follows the extension of the North Anatolian Fault Zone into the Aegean Sea. In the eastern part of the Marmara Sea region the westward motion of Turkey relative to Europe occurs mostly along the North Anatolian Fault Zone. In the western part of the region this motion is taken up by an extension of the crust in and around the Aegean Sea. East of about longitude 31°E the North Anatolian Fault system, which accommodates most of the westward motion of Turkey, has a narrow and localized character, clearly defined by the predominantly strike-slip surface along its entire 1000-km length, associated with a series of large magnitude earthquakes during the last four centuries. In contrast, west of 31°E the North Anatolian Fault system appears to branch into a series of sub-parallel strands that cross the Marmara Sea region into the Aegean extensional province (Taymaz *et al.*, 1991).

Figure 3 shows this diffusion of activity within a 100-km wide zone that contains the Marmara Sea region.

Figure 4 shows the cumulative time distribution of the number of earthquakes identified for the period before 1770, and also the time distribution of the largest earthquakes ($M_s \geq 7.0$) as well as the larger seismic sea-waves.

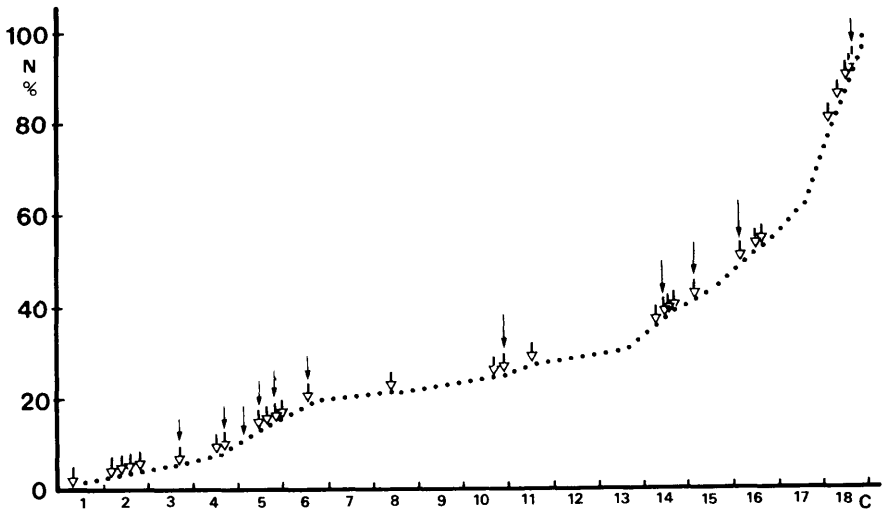

Fig. 4. *Cumulative distribution with time of significant events identified in the Marmara Sea region before 1770, expressed as a percentage* N *of their total number (110). Open arrows show the location in time of large earthquakes ($M_s \geq 7.0$). Solid arrows indicate shocks associated with seismic sea-waves.*

From this figure we notice that in terms of number of earthquakes, the rate of seismicity over the early period between the 3rd and 6th centuries does not differ much from that over the later period between the 14th and 17th centuries. However, over the intervening period, between the 7th and 13th centuries, the rate of activity in Fig. 3 is very low, a feature noticed already for Istanbul (Ambraseys, 1971). For this intermediate period of observations there is no lack of source material, information coming from both Byzantine and occidental writers, and it is rather unlikely that so many of the earthquakes that would be needed to fill in this gap of low activity over this relatively well-documented period have been missed out. This period of low activity, at least in terms of large earthquakes, should therefore be genuine.

There is little doubt, therefore, that the seismic activity in the Marmara Sea region during the 20th century is rather atypical of the long-term seismicity of the region. Many of the larger historical earthquakes identified have occurred much nearer to Istanbul and to other cities than any event we know during this century, causing great damage and affecting areas which today are considered to be almost totally quiescent. Figure 4 suggests clustering of the seismic activity which must be borne in mind in making statistical assessments of hazard evaluation.

That a few early monuments are still to be found in a state of tolerable preservation in the region should not be interpreted as an indication that these sites have been free from destructive earthquakes. Our evidence shows that monuments still extant have in fact, during their lifetime, been subjected to a number of destructive earthquakes and they have partly or wholly survived through a process of natural selection. They represent today a small sample of the best final design and construction, achieved through the ages by trial-and-error techniques or by chance.

In conclusion, we have compiled a catalogue for the last twenty centuries which includes more than ten times as many events as listed by any other catalogue for the region. However, what is more important, is that through the uniform processing of the data retrieved from historical sources, we have been able to confirm that earthquake activity in the region is well recorded and that large earthquakes can occur in parts of the region which today are virtually quiescent.

ACKNOWLEDGEMENTS

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The following abbreviations have been used:

PG: Patrologiae Graeca, Paris, 1857–1906.
PL: Patrologiae Latina, Paris, 1844–1952.
CSHB: Corpus Scriptorum Historiae Byzantini, Bonn, 1828–1897.
JHS: Journal of Hellenic Studies, London.
BCH: Bulletin de Correspondance Hellénique, Athènes.

AA Archives des Affaires Etrangères, Paris.
AE Archives Nationales, Paris.
AG Archivo General de Simancas, Valladolid.

Fig. 5. *Illustration (imaginary) in a contemporary flysheet depicting the damage caused in Constantinople (Istanbul) by the earthquake of 10 May 1556.*

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BBA Başbakanlik Arşivi (Prime Ministers' Archives), Istanbul.
BC Biblioteca del Museo Civico Correr, Venice.
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APPENDIX

In what follows we give a summary of the effects of the most important earthquakes in the region, deduced from a preliminary examination of the available data. In the text, (?) implies information in need of authentication, while in the lists of damage, (?) indicates that damage or repairs to important structures may be due to other causes, or not necessarily associated with the event under which it is listed. The type of structure destroyed or damaged by a particular earthquake and by its fore- or aftershocks is designated thus: * for mosques or their appertaining structures; + for churches; " for statues or free-standing monumental columns; = for city walls; ↑ for gates. Monuments and sites located outside Constantinople (Istanbul), are preceded by the name of their location.

The damage sustained by a named structure as a result of a particular earthquake is indicated by Ds, if the available evidence suggests that the structure was destroyed or damaged to the verge of collapse, by Dp, if the indication is that only part of the structure was destroyed or damaged beyond repair, and by dm, if the structure was damaged or affected to the extent that it required repairs or strengthening. With different sources often giving differing degrees of damage, this broad classification can only be preliminary and of an indicative nature. Earthquakes of an estimated surface wave magnitude equal to or greater than 7.0 are marked with an asterisk. Where they could be determined, modern names of localities mentioned in the case histories are shown in parentheses.

(1) 32 AD*
The province of Bithynia was shaken by an earthquake; most houses in Nicaea(Iznik) were destroyed. The shock seems to have been experienced in Athens(?) as well.
[Phlegon:607; Dionysius:epist.7]
(2) 69
Nicomedia (Izmit), the capital of Bithynia, was 'destroyed' by an earthquake which must have been large, since the city was rebuilt with funds provided by the imperial treasury in Rome; money was also given to those who survived.
[Malalas:259]
(3) 121*
A major earthquake in Bithynia 'destroyed completely' Nicomedia (Izmit) and the greater part of Nicaea(Iznik). Both cities were rebuilt with public funds.
[Eusebius:614; Robert 1978:397]
(4) 123 Nov 10
Cyzicus (n.Erdek), the capital of the province of Hellespont was 'destroyed' by a large earthquake. Imperial funds were used for its reconstruction.
[Malalas:279; Hasluck 1910:77,187]
(5) 128*
A major earthquake in Bithynia destroyed the greater part of Aoria and Nicomedia(Izmit) together with their respective districts.
[Chr.Paschale:476]
(6) 155*
A major earthquake in the provinces of Hellespont and Bithynia. Cyzicus (n.Erdek) was 'totally destroyed' together with other towns, and Mytilini was damaged. In the interior of the Hellespont the ground deformed extensively. The shock was felt throughout Bithynia and caused great panic in Symrna(Izmir) and Ephesus. Cyzius was restored with the financial assistance of Rome.
[Dio Cassius:69,70; Hasluck 1906:3]
(7) 181 May 3*
Nicomedia (Izmit) as well as the region up to Mudupolis(Mudurnu?) and the river Sangarios(Sakaria) were 'destroyed' by a major earthquake. The government in Rome provided funds for the reconstruction of the city.
[Malalas:380]
(8) 269*
The province of Bithynia, its capital Nicomedia(Izmit), and the region up to Daciviza (Gebze) and the river Sangarios(Sakaria)(?) were 'ruined' by a major earthquake. In places the ground opened up and the sea flooded the coast. Nicomedia was restored with state funds.
[Malalas:299]
(9) 358 Aug 24*
A catastrophic earthquake in Bithynia 'totally destroyed' Nicomedia(Izmit) and its district killing, among others, the vice-governor and two bishops who happened to be in the city. Nicaea(Iznik), Constantinople, and Perinthus (n.Marmaraereğlisi), as well as many other towns, were damaged. Landslides, ground deformations and a seismic sea-wave(?) in Nicomedia, followed by a conflagration, completed the destruction. The shock was strongly felt in Macedonia and in Asia Minor as far as the district of Pontus.
[Ammianus:17.7; Sozomenes:4.16], [+Apostles dm?)
(10) 362 Dec 2*
Nicomedia (Izmit) was 'totally destroyed' as well as a good part of Nicaea(Iznik). Springs dried up. As a measure of relief the authorities lowered the price of essentials. The earthquake was felt in Constantinople and allegedly damaged the newly-built cathedral of Sta Sophia.
[Ammianus:122.13; Vita Const.:71], (+Sophia dm?)
(11) 368 Oct 11
An earthquake in Bithynia destroyed Nicaea(Iznik) and ruined other towns in that province. The shock does not seem to have affected any other large centre of population; possible location of the epicentral area would be Nicaea and further west in Bithynia.
[Idatius:31, Socrates:4.11; Malalas:342]
(12) 368 Nov
The greater part of Germa (n.M.Kemalpaşa) in the Hellespont was destroyed by an earthquake. This was most probably a large aftershock of the earthquake in October, confirming that the centre of activity in 368 was between Nicaea and Germa.
[Socrates:4.11]
(13) 394 Nov
An earthquake confined in the European provinces near Constantinople, whose epicentral area is impossible to identify.
[Marcellinus:920]
(14) 396
An earthquake in Constantinople and vicinity, followed by aftershocks that obliged the people to stay in the open. No evidence has been preserved about the degree of damage done in and outside the capital.
[Prosper:588; Downey 1961:437]
(15) 402 Jun
An earthquake felt in Constantinople which caused considerable concern.
[Marcellinus:924; Synesius:672]
(16) 403
A strong earthquake was felt at Constantinople. Aftershocks continued for four months. The shock possibly originated at some considerable distance from the capital.
[Theodoret:335]
(17) 407 Apr 1
An earthquake in the Sea of Marmara destroyed many houses at Hebdomon(Makriköy/ Bakirköy) and caused damage in Constantinople, particularly in the districts of Kaenupolis and Xerolophos. As a result of the associated sea-wave(?) many ships were disabled. The epicentral area involved cannot be identified, but may possibly be located offshore. The shock does not seem to have affected seriously any other centre of population.
[Chron.Pasch.:570; Glycas:478], (Forum dm; Capitolium dm)
(18) 412
An earthquake in Constantinople that caused damage to the walls of the city.
[Patria:150; Codinus:24], (=Land dm)
(19) 447 Nov 6*
Preceded by a damaging earthquake on 26 January, a catastrophic earthquake in the Sea of Marmara destroyed many towns in the provinces of Bithynia, Phrygia and Hellespont. In Constantinople, public buildings and houses damaged in January were ruined, and the greater part of the city wall and 57 of its 96 towers were overthrown. In other places, not named, but at some distance from the capital, the shock triggered landslides and elsewhere cracks opened in the ground. The shock was followed by a damaging sea-wave and by aftershocks that continued for months.
[Marcellinus:927; Evagrius:26; Janin 1950:281], (Forum dm; =57 Towers Dp; =Land Dp; ↑ Vlanga Dp)
(20) 460 Apr 7*
This earthquake caused extensive damage in the province of the Hellespont and in the greater part of Thrace. Cyzicus (n.Erdek) and villages in the interior were totally destroyed, with great loss of life. In places the ground opened up.
[Marcellinus:930; Priscus:110]
(21) 478 Sep 25*
A destructive earthquake in the eastern part of the Sea of Marmara in which Helenopolis (n.Karamürsel) and Nicomedia(Izmit) were totally destroyed with great loss of life; Constantinople was seriously damaged. The earthquake was followed by a damaging sea-wave and by aftershocks that continued for 40 days. The emperor fled the capital and took refuge in Chalcedon(Kadiköy). The shock caused damage in Thrace and in Bithynia and the towns destroyed received financial assistance from the imperial treasury for reconstruction.
[Theophanes Chron.:125; Megas Chr.:307; Stein 1950:787], (↑ Eugenios/ ↑ Yali Köşkü dm; Portico of Forum dm; =Inner Dp)
(22) 484*
A destructive shock in the western part of the Marmara Sea region caused damage in Thrace and serious loss of life. Sistos(Şehitlikler) and Callipolis(Gelibolu) were 'destroyed completely' and Tenedos(Bozcaada) sustained serious damage. Lampsacus(Lapseki) and Abydus(Çanakkale) were heavily damaged and the Long Walls of the Chersonesus at Hexamili (n.Ortaköy) were breached. Near Sistos tar oozed out of the ground. Minor damage extended to Constantinople.
[Megas Chr.:308], (Chersonesus: Long Walls Dp; 50 towers Long Walls Ds)
(23) 542 Aug 16
A severe earthquake in Constantinople caused considerable damage and the loss of many lives. Many houses and a number of churches collapsed and the walls near the Golden Gate were damaged. The shock overturned a number of statues and other free-standing monuments.
[Theophanes Chron.:345], "Constantine dm; "Arcadius dm; Forum dm; = ↑ Golden dm)
(24) 543 Sep 6
An earthquake that destroyed half of the city of Cyzicus (n.Erdek), was severe at Constantinople where it caused minor damage.
[Malalas:482; Cedrenus:i.656], ("Justinian dm)

(25) 554 Aug 16*
A destructive earthquake caused the collapse of the best part of Nicomedia(Izmit) and of many houses, public buildings and part of the walls of Constantinople. Many people were killed in other towns and the sea flooded the coast inland to a distance of two miles, sinking many ships. Damaging aftershocks continued for a long period of time.
[Malalas:489; Theophanes Chron.:354], (=Golden Tower dm; =Land dm)
(26) 557 Dec 14
This destructive shock affected the north coast of the Sea of Marmara. In Constantinople houses and public buildings were destroyed and many people were killed, including the consul. Damage was done to the city walls which were breached in many places. Destruction was more serious west of Regium(n.K.Çekmece) where not a single house was left standing and a monument sunk into the ground. The destruction extended over a large area, the limits of which are not known. Damaging aftershocks continued for ten days and obliged the people to live encamped in the country.
[Theophanes Chron.:357; Agathias:281], (Hippodrome dm; +Theotokos dm; +Petala Ds; +Sophia dm; +Samuel Ds; +Vincentius Ds; "Arcadius Ds; "Theodosius Ds; =Sea dm?; =Land from ↑ Golden to ↑ Rusiu/ ↑ Mevlevihane dm; Churches from ↑ Golden to ↑ Rusiu Ds. Regium: +Stratonikiu Ds, +Kalliniku Ds)
(27) 740 Oct 26*
This was a destructive earthquake causing enormous material and human loss. Churches, monasteries, public buildings and private houses were destroyed or ruined; the walls of many towns in Thrace and Bithynia, particularly Nicomedia(Izmit), Praenetos (n.Karamürsel) and Nicaea(Iznik) were so damaged as to require immediate restoration. The sea retired from the land permanently, in places not named changing the coastline. The earthquake destroyed a considerable part of the walls of Constantinople and caused damage to buildings, houses and in particular to free-standing structures. Aftershocks continued for almost a year. So extensive was the destruction, that to meet the extraordinary expenditure for reconstruction the emperor was obliged to impose additional taxation.
[Theophanes Chron.:412; Cedrenus.i.801], (+Irene dm; "Arcadius at Xerolophos Ds; =Land Dp. "Theodosius at ↑ Golden Ds; "Constantine at Atalus Ds; "Atalus Ds)
(28) 824 May 5
The earthquake destroyed the walls of Panion (n.Barbaros) and damaged Heraclea (n.Marmaraereğlisi). The shock was possibly felt in Constantinople.
[Genesius:1045]
(29) 861 Apr 10
A severe earthquake in Constantinople was preceded and followed by many shocks. The epicentre area of the earthquake seems to have been at some distance from the capital where the shock caused great damage and the drying-up of rivers and springs. In Constantinople a number of houses, public buildings and a small section of the city walls were damaged. Aftershocks continued for 40 days.
[Scylitzis:173; Theophanes cont.:34; Nicetas:525; Georgios:22], (+Apostles dm; "Victory Ds; "Sta Anne Dp; =Exokionion/Constantinian dm)
(30) 869 Jan 9
An earthquake caused considerable damage in Constantinople, killing a number of people. The shock damaged the cathedral of Sta Sophia, part of which collapsed. The church of the Apostles which was damaged by the earthquake of 861, collapsed, together with the church of the Virgin at Sigma which fell during mass killing all in it except four people. A long series of aftershocks, some of them strong enough to cause additional damage in the city, continued for 40 days.
[Cedrenus.ii.173; Nicetas:525; Janin 1936:51], (+Sophia dm; +Apostles dm; +Theotokos Sigma Ds; monastery of Manuel Dp; "Niki dm; "Constantine Ds; Deuteron district dm; +Anna dm; Hippodrome dm; =Exokionion/Constantinian Dp; Kentenarion Tower dm)
(31) 925 Aug
A major earthquake somewhere in Thrace produced an enormous cleft in the ground. Many villages and churches were totally destroyed. The shock apparently caused some damage to Athos as well.
[Symeon:801; Codex Pant.: 225]
(32) 967 Sep 2*
Many villages and towns in the provinces of Honorias and Paphlagonia were destroyed. Claudiopolis(Bolu) was totally ruined with great loss of life. The shock was strongly felt in Constantinople where it caused no damage.
[Leo Diac.:42; Cedrenus.:ii.372]
(33) 989 Oct 25*
A destructive earthquake in the eastern part of the Sea of Marmara caused extensive damage to villages and towns in the provinces of Thrace and Bithynia. In Constantinople many houses collapsed and public buildings and parts of the city walls were damaged or destroyed. Damage was equally heavy in Nicomedia(Izmit) and was in places aggravated by a seismic sea-wave(?). The shock was possibly felt as far as southern Greece.
[Leo Diac.:175; Yahia:428], (+Sophia Dp; =Land dm; Eutropius Tower Ds; Valens aqueduct dm; Kentenarion nr. Galata Ds)
(34) 1011 Mar 9
Preceded by a strong foreshock in January, a destructive earthquake in the provinces of Byzantium caused great loss of life. In Constantinople a few public buildings and houses were destroyed.
[Cedrenus.ii.456], (+Polyeuctos Dp?; +Tessaraconda Ds; +Apostles dm?; =Land dm)
(35) 1032 Aug 13
A destructive earthquake centering somewhere on the Asiatic side of the Marmara Sea region, caused the collapse of public buildings and of an aqueduct. In Constantinople the shock damaged the land walls.
[Cedrenus.ii.500; Zonaras:xvii.12], (=Land dm)
(36) 1037 Dec 18
An earthquake, probably a large aftershock of the major earthquake on the North Anatolian Fault Zone of May 1035 in Gerede, caused some damage in Constantinople.
[Cedrenus:ii.515], (=Land dm?)
(37) 1063 Sep 23*
This was a severe earthquake that spread desolation particularly along the north coast of the Sea of Maramara, and ruined many districts which lay between Constantinople and the Dardanelles. The walls of towns, aqueducts, churches and public buildings, were thrown down throughout all southern Thrace particularly at Myriophyto(Mürefte), Panion (n.Barbaros) and Redestos(Tekirdağ). Damage extended to Nicaea(Iznik) where the walls of the great church where the First Council of Churches had assembled were crumbled to their foundations. In Constantinople, houses were ruined and a few public buildings were damaged or destroyed. The earthquake caused the collapse of the remains of the temple of Hadrian at Cyzicus (n.Erdek). Aftershocks continued to be felt in Constantinople for two years. Most probably the shock originated from the Sea of Marmara offshore Cyzicus.
[Scylitzis:657; Attaliates:87; Glycas:605; Lampros 1910:131], (=Land dm?. Nicaea: +Cathedral Ds. Cyzicus: Hadrian Temple?)
(38) 1143 Nov 26
An earthquake caused considerable damage and loss of life in Prusa(Bursa). The river that flows through the city stopped for three days. The shock was possibly felt in Constantinople.
[Michel Syr.:259]
(39) 1296 Jun 1
An earthquake in Constantinople caused considerable damage, particularly to a number of old houses, public buildings and free-standing structures and to the city walls as well. The earthquake, which was followed by aftershocks for many days, affected even more the Asiatic provinces, but details are lacking. As a consequence of the earthquake, the emperor was obliged to return to Constantinople.
[Pachymeris.:ii.233; Gregoras:i.202; Lampros 1910:137], (+Apostles Dp; "Arch.Michael dm; =Land/Sea?)
(40) 1296 Jul 17
A destructive earthquake in the district of Neocastra (n.Akhisar), the effects of which extended from the region of Pergamum (n.Bergama) through Chliara (n.Kirkağaç) to the Anatolian highlands in the east. In many places the earth opened up and in some places water was ejected from the ground. The shock destroyed completely the fort at Chliara and caused the collapse of churches and houses in the region. The shock was strongly felt in Constantinople and further to the east.
[Pachymeris:ii.234, Rheidt 1986]
(41) 1323*
An earthquake in Constantinople caused severe damage to buildings, churches and monumental columns, which the sources do not name. There is good evidence that Militopolis (n.Karacabey), and perhaps Apollonia (Apolyontköy), were destroyed by this earthquake. This shock marks the beginning of a period of seismic activity in this part of the Marmara region, during which the earthquakes of 12 May 1327, which destroyed Lopadion(Ulubad), and of 17 January 1332, were widely felt.
[Phrantzes:662; Gregoras:i.460; Schreiner 1977:232; Hasluck 1910:77,188]
(42) 1332 Jan 17
This earthquake was felt very strongly in Constantinople and was followed by violent thunderstorms and heavy seas which caused serious damage to buildings and the sea walls. The shock itself caused no damage.
[Gregoras:i.460]
(43) 1343 Oct 18*
Followed by an almost equally destructive aftershock, an earthquake in the western part of the Marmara Sea caused extensive damage to Thrace and along the coast to Chersonesus(Gallipoli Peninsula). Among other towns, Myriophyto(Mürefte) and Hora(Hoşköy) were almost destroyed with great loss of life and Lysimachia(Bolayir) was ruined. In Constantinople the city walls were breached and some of the fortification towers were partly destroyed. Houses, public buildings and churches suffered different degrees of damage. The aftershock, that took place a few hours after the earthquake, was equally damaging throughout the region. It was followed by a seismic sea-wave that flooded the coast to a great distance and cast sailing ships on land, the sea advancing 12 stadia(2.2 km) inland on flat ground and causing extensive damage to settlements and towns along the coast of Thrace. Aftershocks continued to be felt for almost a year. The earthquake had serious social and financial repercussions.
[Gregoras:ii.694; Schreiner 1977:258; Cantacuzenus:ii.475; Athenagoras 1935:178], (+Sophia dm; =Land & Sea dm)
(44) 1344 Nov 6*
This was probably a large, belated aftershock of the earthquake of 1343 in Thrace. It destroyed completely the region of Ganohora(Gaziköy) on the west coast of the Sea of Marmara, including the castles of Ganos(Gaziköy), Hora(Höşköy), Marmara Island, and the Long Walls of the Chersonesus or Tihos at Hexamili (n.Ortaköy). The shock seems to have been experienced very strongly at Constantinople, where it caused some damage to the city walls. Aftershocks continued for a few weeks.
[Cantacuzenus:ii.476; Schriener 1977:260; Gregoras:ii.694,711; Lampros 1910:141], (=Sea dm. =Tihos Ds)
(45) 1346 May 19
During the autumn of 1345 and again in the spring of 1346 new shocks were felt in Constantinople. The earthquake of 19 May 1346 caused some damage to a number of free-standing structures and to the church of Sta Sophia, the eastern part of which collapsed. It is not possible to locate the epicentral area of this event.
[Cantacuzenus:iii.29; Gregoras:ii.694,749; Bees 1944:271], (+Sophia Dp)
(46) 1354 Mar 1*
This earthquake ruined the region along the coast of the Marmara Sea, from Redestos (Tekirdağ) to Madytos(Haciabad), including Callipolis(Gelibolu), and other places in Thrace where many lives were lost. The earthquake damaged houses and the walls of Constantinople as well as numerous settlements south of Madytos and in the districts of Thrace and Macedonia as well as in Tenedos(Bozcaada). The shock was felt over a large area, and its epicentre must be sought in the peninsula of Callipolis. Traditon has it that it was owing to the collapse of the city walls in this earthquake that the Ottoman army was able to enter and take Gelibolu.
[Cantacuzenus:iii.277; Schreiner 1977:283; Bees 1944:272; Gregoras:iii.220; Arnakis 1952:310–12], (=Land & Sea dm. =Callipolis Ds. Castle at Tzymbi (n.Gelibolu) Ds?)
(47) 1384 Aug 6
A destructive earthquake in the island of Lesvos and adjacent parts of Asia Minor. Almost all the houses in the island and the castle of Mytilini collapsed, killing a large number of people including the ruler of the island. Continuing aftershocks and a severe

thunderstorm completed the destruction, which was still visible many years after the event.
[Cydones:191; Clavijo:26–28; Schreiner 1977:327]
(48) 1400 Jan
An earthquake that must also have been destructive in Bursa, was strongly felt in Constantinople. The details are not satisfactorily recorded.
[Montfaucon 1739:549; Lampros 1910:149; Schreiner 1977:366]
(49) 1419 Mar 15*
This earthquake in the district of Rum is probably associated with the Northwest Anatolian Fault zone, and consequently outside the Marmara Sea region. However it destroyed the walls of Bursa together with most of its houses; not a single house was left undamaged; '. . . the shock triggered huge rockfalls from the mountain (?) and the earth opened up; rivers overflowed and new springs appeared in Wadi Azraq. . .'. Its effects extended to the borders of Constantinople, Kastamonu, Amasya and Tokat. The sea in the Gulf of Izmit(?) flooded the coast and elsewhere the shock caused loss of life. The shock was possibly felt in Thessaloniki as well. Aftershocks continued for almost a year. The survival of this notice in Arabic sources suggests that the earthquake was a large magnitude event. We have assumed that the epicentral area of this event was at some considerable distance to the east of Constantinople.
[al-Maqrizi:4.482; Turan 1954:20–21,56–57], (Bursa: *Ulu dm; =City dm)
(50) 1489 Jan 16
An earthquake in Istanbul, during a period of intermittent shocks, caused the collapse of a number of minarets. The earthquake probably had an epicentre some distance from Istanbul, but no information is available for the damage caused outside the city.
[Giese 1922:121; Elezovic 1940:494; Bonito 1691:643]
(51) 1509 Sep 10*
A destructive earthquake that caused considerable damage throughout the Marmara Sea area, from Gelibolu to Bolu and from Edirne and Demitoka to Bursa. Damage was particularly heavy in Istanbul where many mosques and other buildings, part of the city walls, and about 1000 houses were destroyed, and 5000 people were killed. Many houses and public buildings sustained various degrees of damage in Demitoka, Gelibolu, Iznik and Bolu. The shock was felt within a radius of 750 km and was followed by a seismic seawave in the eastern part of the Sea of Marmara. Aftershocks, some of them destructive, continued intermittently for almost two years.
[Ambraseys & Finkel 1990], (*Bayazit dm; *Fatih dm; *Aya Sofya dm; *Atik Ali Paşa dm; *Daud Paşa Dp; Kiz Kulesi dm; Topkapi Sarayi dm; "At Meydani Ds; Karaman Pazari Ds; Anadolu Hisari dm; Rumeli Hisari dm; ↑ Eğri Dp; ↑ Silivri dm; ↑ Edirne dm; ↑ Isa Dp; ↑ Narli Dp; ↑ Kayiklar Dp; ↑ Ishakpaşa Dp; Yedikule Dp; =Land & Sea Dp; Valens aqueduct Dp; Fener Dp; =Galata & Tower Dp; "Dikili Taş dm. Burgaz Is: +Saviour Dp. Heybeli Is: +Prodromos Dp. Çekmece: Bridges dm)
(52) 1542 Jun 12*
A destructive earthquake in Thrace caused extensive damage and great loss of life in the region between Gelibolu, Edirne and Istanbul. In Istanbul, 1700 houses are said to have been ruined and 4500 people killed. Contemporary European sources put the total losses for the whole area at many tens of thousands of lives, which in the absence of corroborating evidence from Ottomon sources may be considered grossly exaggerated. The epicentral area involved cannot be identified, but a possible location would be the central part of the north coast of the Sea of Marmara. The shock seems to have been experienced strongly near Thessaloniki(?) as well.
[Anon 1542; Blauer 1542:159], (Topkapi Sarayi dm; Old Palace dm)
(53) 1556 May 10*
A destructive shock in the east part of the Sea of Marmara ruined many places including Aydincik (n.Erdek), and killed a large number of people. Damage extended to Bursa and Istanbul where many houses, mosques and parts of the city walls were ruined. The walls of Aya Sofya were cracked and the Fatih Mosque had to be repaired, Figure 5. The details of this event suggest that its epicentre must be sought offshore in the Sea of Marmara.
[Tarih:105; Dreytweiss 1564:117; Ayverdi 1966:398; Busbecq 1694:144], (*Aya Sofya dm; *Fatih dm; =Land dm; ↑ Edirne dm. Bursa: Ertugrul minaret dm)
(54) 1567 Oct 1
This earthquake caused damage in the Sapanca area and to some unnamed villages in a district where a landslide was triggered by the shock. Damage extended to Izmit and to Istanbul, where a few houses collapsed. It is unlikely that the damaging effects of the earthquake extended beyond the limits of Sapanca.
[Anon 1567]
(55) 1577
A damaging earthquake in the Karesi district destroyed houses in Balikesir and ruined a number of buildings killing 40 people in the town and in neighbouring villages. The shock seems to have been experienced in ports on the Aegean Sea.
[BBA: MD 31/621; Bonito 1691:717], (Balikesir: *Yildirim Han & minaret dm; *Zağanos Paşa & minaret Dp)
(56) 1625 May 18
A widely-felt earthquake of long duration in Istanbul. It caused some minor damage in the city, possibly also in Manisa, and it was felt in Greece, in the Aegean Islands, at Athos and in Anatolia. The details of this event suggest that it was a relatively large-magnitude shock originating at some distance from Istanbul, Manisa and Athos, where its effects were mainly due to long-period ground movements, most likely from the Aegean Sea.
[Anon 1625.273; Stojanovic 1902:312; Gökçen 1946:i.36–37], (Manisa: *Ali Bey dm)
(57) 1648 Jun 28
This earthquake damaged multistorey houses, chimneys and the spires of minarets in Istanbul. There is no information that the shock was felt elsewhere. The details of the effects of the shock in Istanbul suggest that the city was some distance from the epicentral region of a relatively large-magnitude earthquake, possibly in Transylvania.
[Naima 1866:4.289; Bonito 1691:780]
(58) 1659 Feb 17
A large earthquake was felt throughout the western part of the Ottoman Empire. In Istanbul old buildings, houses and chimneys were ruined, as were churches and mosques in Tekirdağ. The shock, which seems to have caused some damage to the domes of a mosque in Manisa, was also felt in Skiathos and in Izmir, where it set up standing waves on the surface of a flooded marsh. The effects of this earthquake suggest that the shock was of large magnitude and originated some distance from the places mentioned above, possibly from the Aegean Sea.
[Naima 1866:6.395; Poullet 1668:33; Evangelidis 1913:23; Gökçen 1946:ii.147; Incicyan 1976:89; Nani 1680:493], (*Süleymaniye dm. Manisa: *Hafza Sultan dm)
(59) 1671 Nov 20
The facts about this earthquake are not clear. In the island of Tenedos(Bozcaada) almost all houses, and the Venetian fort and church, were destroyed. There was also damage in the northern part of the island of Lesvos where the mosque in the inner castle of Molivo collapsed. It is said that as a result of the earthquake the springs of water at Ligia (n.Truva) dried up and the shock seems to have been experienced in Izmir and the Aegean Islands as well. If these latter effects were the result of the same earthquake, it epicentral region must be sought on the coast of Biga province.
[BBA: MMD 9849.123; Beer 1709; Lechevalier 1791:7], (Molivo: *Fethiye Ds; Tenedos: Mocenigo's Fort?)
(60) 1688 Sep 10
This earthquake was felt rather strongly in Istanbul, Stalimine, Mytilini, Chios and Izmir as well as along the coast of Asia Minor. The absence of any other information, except that the shock caused heavy damage inland, suggests that the earthquake originated from somewhere in Karesi province.
[Berryat 1761:584]
(61) 1689 Apr 25
An earthquake was felt over a large area of northwestern Anatolia and Thrace, particularly along the west coast of the Black Sea. In Istanbul and Edirne several houses, mosques and towers were damaged by the shock and most probably by the high winds documented at about this time, which necessitated repairs to various buildings in Istanbul. The shock was possibly felt in Sofia. The epicentral area involved is impossible to identify, but a likely location would be the Maritsa Valley.
[Katip Celebi:142; Hoffner 1691; Rycaut 1700:336,609; BBA: MMD 4967]
(62) 1690 Jul 11
A damaging earthquake in Istanbul; a number of houses collapsed killing 20 people. At Büyük Çekmece a minaret collapsed. The absence of data from other towns suggests the possibility that this was a local shock with an epicentre offshore. Aftershocks continued to be felt for several days.
[Raşid:2.122; al-Umari:219v; Coronelli 1693:323; Erdoğan 1977:164], (*Fatih dm; ↑ Topkapi dm; Büyük Çekmece: minaret Ds)
(63) 1707 Jun 2
This earthquake caused non-structural parts of the castle of Sedd ül-bahr to collapse. The shock was felt strongly at Izmir and was perceptible in Istanbul. The data suggest an epicentral region south of the Dardanelles.
[BBA: MMD 3882.56; Kist 1847:171–73; Raşid:3.222]
(64) 1719 May 25*
Preceded by damaging foreshocks a major earthquake occurred in the east part of the Sea of Marmara. Villages and towns on either side of the Gulf of Izmit, in Yalova, Pazarköy, Karamürsel, Kazikli, Izmit, in the region of Sevenit(Sapanca?) and as far as Düzce were destroyed or badly damaged; it is said that more than 6000(?) people were killed in this earthquake. Considerable damage was done to houses, buildings and to the city walls of Istanbul, where 40 mosques and 27 towers were ruined. There was also significant damage in Akviran, Çatalca, Çekmece, and Heybeliada. The shock was strongly felt in Edirne, where it caused some minor damage, and in Chios, Izmir, Athos, Thessaloniki, Nish(?) and in Anatolia(?). Aftershocks continued for about a month.
[Raşid:5.161–62; Silahdar:306r,v; BBA: MMD 3934.61,138, MMD 9908.9, MMD 9906.451; Jansky 1933:277; Erdoğan 1968:184–86,189–90 Erdoğan 1977:179; AA: B1 (Salonique) 25.9.1719; Berryat 1761:672; Lampros 1910: 216; Maravalakis 1938:145], (+Demetrius Kananu Dp; *Mehmet dm; *Bayazit dm; *Sinan Paşa dm; *Bali Paşa dm; Old Palace dm; =Land & Haliç dm. Izmit: *Pertev Paşa dm; *Mehmet Bey Ds. Sapanca: *Rüstem Paba Ds. Pazarköy: *Sultan Orhan Dp)
(65) 1730 Jun 10
In this earthquake, the greater part of the castle in the district of Evreşe (n.Kadiköy) was destroyed (?) and much damage was done to villages along the road from Athos to Istanbul. The shock was strongly felt in Athos and was reported from Istanbul. We assume that the epicentral area was located offshore, in the Gulf of Muariz (Saros).
[Katip Celebi:156; Lampros 1910:219; BBA: MMD 3160.356,786]
(66) 1737 Mar 6*
A destructive shock in the kaza of Biga. Between Ezine and Giaurköy, villages were completely destroyed with great loss of life, while in Giaurköy itself, the ground was opened up; the town of Ezine was totally demolished. The castles of Plaghiari(Bolayir), Kilid ül-bahr, Sultanhisar, Sedd ül-bahr and Bozcaada(Tenedos) were heavily damaged, and in part destroyed. The shock was very strongly felt in Athos, in Chios – where it caused damage – and in Istanbul and Thessaloniki.
[AE: B1/1010 'Chios, B1/1047 Smyrna; BBA: MMD 3609.178,208,218,236–8, MMD 9948.520]
(67) 1752 Jul 29
A destructive earthquake in Thrace: Zerna (n.Ibriktepe), Hafsa and Hasköy were completely ruined and many people were killed. Considerable damage was done to houses and public buildings in Edirne where 100 people were killed; almost all minarets collapsed and part of the castle and wall were ruined. Some damage was reported from the Filibe area, from Evreşe (n.Kadiköy)(?), and from Enez, where the fort had to be extensively repaired. Some repairs were also needed in Bozcaada and Molivo, probably due to this earthquake. The ground was rent in places and elsewhere it liquefied, filling up wells. The shock was felt strongly in Istanbul and was perceptible in Izmir. Aftershocks continued for more than a year.
[Porter 1752:194v; Porter 1764:116–17, Örfi:36–39; Badi:i.458–60; BBA: D.BŞM BNE 15914.42,48,56,60,64; BBA: Cevdet Saray 4976; BBA: MMD 19584.2–3,10; MMD 3160.356; Gedeon 1912:xxii; Ayverdi 1966:294; Ayverdi 1972:160,421,424–35; Ayverdi 1973:206,282], (Edirne: *Hudavendigar Dp; *Eski ?; *Üç Şerefeli Dp; *Süleymaniye ?; *Taşlik ?; *Kilise ?; *Halebiye ?; minarets: *Ibrahim Paşa dm, *Defterdar dm, *Selimiye dm, *Muradiye dm; Ayşe Kadin Hani Dp; ↑ Manyas dm; ↑ Kafes dm; ↑ Top dm; ↑ Keçeciler; =Castle Dp. Hasköy: *Mahmud Paşa ?. Enez: castle dm)

(68) 1754 Sep 2*
A great earthquake in the Gulf of Izmit and further to the east where villages were totally destroyed and the ground was opened. It is said that about 2000 people were killed. The lighthouse at Bendereğli(Ereğli) on the Black Sea was destroyed. There was much damage done at Üsküdar and in the Balat, and in Istanbul many old masonry houses and buildings collapsed and 60 people were killed by the main shock and by damaging aftershocks that continued for weeks; some mosques and parts of the city walls were also damaged. The main shock was associated with a seismic sea-wave which caused no damage. The shock was also reported from Izmir and Ankara (?). The shock does not seem to have caused serious damage to the south of the Marmara Sea. Possible location of the epicentral area would be in the Izmit area.
[BBA: MMD 3609.np; BC: PD 77c.95r; Mackenzie 1754:819–20; Porter 1754:np; Porter 1764:117–19; Hakim:i.79r; Hammer 8.171], (*Ahmediye dm; *Bayazit dm; *Fatih dm; *Küçük Ayasofya dm, *Ayasofya dm?; Kantarci Hani Ds; Kara Han Ds; Şekerci Hani Dp; Vezir Hani dm; Galata prison Dp; Eski Odalar dm; ?Saray dm; = from Yedikule to ↑ Edirne dm; Yedikule Dp; Galata Tower dm; seven minarets Ds)
(69) 1766 May 22*
A destructive earthquake in the east part of the Sea of Marmara. Heavy damage extended from Rodosto(Tekirdağ) to Izmit and to the south coast of the Sea from Mudanya to Karamürsel. Damage to buildings and tall structures was reported from as far as Gelibolu, Edirne, Izmit and Bursa. In Istanbul many houses and public buildings collapsed, killing 880 people. Part of the underground water supply system was destroyed. Damage extended inland, mainly to the north and west, as far as Edirne and to Gelibolu. In Çatalca and surrounding villages all masonry houses were totally destroyed. The Ayvad dam on the upper Kağithane, north of Istanbul, was damaged, and in the city, in the vicinity of Sultanahmet, the roof of an underground cistern caved in. It is said that about 4000 people lost their lives. The earthquake was associated with a seismic sea-wave which was particularly strong along the Bosphorus, and in the Gulf of Mudanya where it caused considerable damage. The shock was felt strongly at Aydin, Athos, Thessaloniki, Aytos in Bulgaria and along the west coast of the Black Sea. Damaging aftershocks continued for weeks, the sequence lasting for over a year. We have assumed that the epicentral region of this earthquake was offshore in the Sea of Marmara.
[TKSA: D.9567, D.10129, E.4211; BBA: Cevdet Evkaf 29571; BBA: MMD 9995.206; Şamdanizade:85; Çesmizade:53; Hakim.ii.226r-227v; Vasif:245v-246v; Bees 1944: 267–70; AE: BIII/83 Constantinople; AG: S.Est.L.5.880, R.d.Sicilias:pz.115; Murray 1766:44v–45v; Mamoni 1956:158; Comninos 1870:414; Ayverdi 1972:287; Ayverdi 1973:284; Simsar 1940:185; Müller-Wiener 1977:427], (*Ayasofya dm?, *Bayazit dm; *Çorlulu Ali Paşa Ds; *İbrahim Paşa at ↑ Silivri ?; *İbrahim Paşa at ↑ Isa dm; *Daud Paşa Dp; *Fatih Dp; *Firuz Ağa dm; *Gazi Atik Ali Paşa dm; *Hafiz Ahmed Paşa dm; *Hüseyn Ağa at Tavukpazari dm; *Hüseyin Ağa at Küçük Ayasofya dm; *Hoca Paşa dm; *Haseki Sultan dm; *Kayiş Mustafa Ağa dm; *Sinan Ağa dm; *Gazi Murad Paşa dm; *Iskender Paşa dm?; *Eyup Ansari ?; *Kariye dm; *Koca Mustafa Dp; *Mahmut Dp; *Mihrimah Dp; *Nişanci Mehmet dm; minaret of *Sultan Ahmed?, *Süleymaniye dm; minaret of *Sultan Selim dm; =Land from ↑ Eğri to Yedikule dm; 2 towers of Yedikule Ds; ↑ Bahçe Dp; ↑ Odun Ds; Vezir Hani Dp; Yeni Han dm; Valide Han dm; Kalpakçilar Hani dm; Şekerciler Hani dm; Baltacilar Hani dm; Çokacilar Hani dm; Kapali Çarşi dm; Esirbazari dm; Topkapi Palace dm; Old Palace dm; Beşiktaş Palace dm; Part of aqueduct system Dp. Çatalca: *Gazi Ali Paşa Dp. Edirne: *Sultan Murad dm. Gelibolu: *Yeni Cami dm, *Zal Mahmut Dp. Dil: *Ahmet Paşa Ds. Bursa: *Emir Sultan. Izmit: *Mehmed Bey dm)
(70) 1766 Aug 5*
A major earthquake in the west of the Sea of Marmara completed the destruction caused by the shock of 22 May and enlarged the affected area west of Rodosto(Tekirdağ). The region between Silivri and Tenedos (Bozcaada) was ruined with loss of life. The district of Ganohora(Tekirdağ) was totally destroyed and that of Gelibolu suffered heavy losses. The castles along the Dardanelles up to Sedd ül-bahr and in Evreşe were damaged. Damage extended to Bursa, Istanbul, throughout Thrace to Edirne, and in the district of Biga. The shock was strongly felt in Athos, Thessaloniki, Aydin and Izmir and was perceptible throughout the Balkan peninsula as far as the Carpathian mountains. Damaging aftershocks throughout the Marmara Sea area continued for almost a year.
[IBBA: MMD 3160.354ff,424,590ff,608ff,618,644,650,786, MMD 3610.642, MMD 19584.18–19; BBA: Cevdet Evkaf 21592,29571; Murray 1766:68r; Bees 1944:268–70; Rethly 1952:432; Press], (Gelibolu: *Gazi Süleyman Dp, *Gazi Hudavendigar Ds, *Mesalih Paşa Ds, *Sari Baş Dp, *Yeni dm?, dockyard, mevlevihane, lighthouse. Şarköy: *Ali Çelebi dm. Enez: *Fatih ?, castle dm. Malkara: minaret of *Gazi Süleyman Paşa dm. Edirne: *Muradiye dm?, *Dizdarzade Efendi dm)
(71a) 1776 May 29
An earthquake caused widespread but minor damage along the coast from Gelibolu to Istanbul. Buildings and houses affected by the large earthquakes of 1766 and since repaired, were again damaged. Most probably this earthquake originated offshore.
[BBA: MMD 3162.4,818; Lampros 1910:242; Müller-Wiener 1977:374], (*Atik Ali Paşa dm. Gelibolu: Şeyh Mehmed tomb Dp, minaret of *Iskenderzade ?)
(71b) 1800 Sep 26
A series of earthquakes was felt in Istanbul as a result of which a public building was damaged.
[Perrey 1850; Cevdet Evkaf 9003], (*Gazi Daud Paşa dm)
(72) 1802 Oct 26
A large earthquake in eastern Transylvania caused some damage to houses and to the covered bazaars in Istanbul and Edirne. The epicentral area of this event is outside the study area.
[Cevdet Tarih:173; Seetzen 1803:20–23; Anonymous 1802:np; Müller-Wiener 1977:93], (*Ayasofya dm)
(73) 1809 Feb 7
A large earthquake with an epicentre probably located offshore the Dardanelles, almost totally destroyed the region of Eskistanbul (the part of the mainland opposite Bozcaada(Tenedos), and caused damage on the island of Imroz. The shock was strongly felt by ships in the Aegean Sea and in Izmir harbour. It was also felt in Istanbul and in other parts of Asia Minor.
[Hobhouse 1813:680; Zolotas 1921:93.; HHW: Turk.K.7]
(74) 1826 Feb 8
A relatively large magnitude shock with a probable epicentral area in the west part of the Karesi district caused considerable damage and loss of life in the region of Ezine. About this time the town of Bayramiç was damaged but details are lacking. The shock was felt strongly in Istanbul, Izmir and Athos.
[Maravelakis 1938:148; Press]
(75) 1845 Oct 11
A destructive earthquake centering between the island of Lesvos and the coast of Asia Minor opposite. Many villages were ruined by the main shock and the long sequence of foreshocks and aftershocks that caused rockfalls and springs to dry up. The earthquake was strongly felt as far as Chios, Izmir and Bolayir, and it was perceptible in Istanbul.
[HHW: Türk.8.K/22; Press]
(76) 1850 Apr 19
A destructive earthquake in the district of Hudavendigar. Heavy damage and loss of life was concentrated between Lubat(Ulubat) and Susurlu(Susurluk). Near Lake Apolyont the ground opened up and in places liquefied. There was minor damage done in Bursa and to villages along the central part of the south coast of the Marmara Sea. The shock was strongly felt as far as Istanbul, Gelibolu and Izmir.
[Sandison 1850:127; Press]
(77) 1855 Feb 28*
Preceded by a violent foreshock 15 minutes earlier, another destructive earthquake in the Hudavendigar district almost totally destroyed Bursa and the villages from Yenişehir to Çeltikçi. In Bursa (pop. 35,000) many public buildings, mosques, churches, about 3300 houses and shops, and many silk filatures collapsed, with the loss of about 220 lives. Few of the 125 minarets in the city collapsed and many large buildings and wooden houses survived the shocks almost intact but the ensuing fire completed the destruction. The worst hit area in Bursa was the Castle quarter. A much larger number of people, in excess of 2000, were killed around Lake Apolyont and to the north as far as Mudanya. In places the ground was rent, springs of water dried up and rockfalls added to the destruction. Damage extended to Edirne, Balikesir and Istanbul where some old buildings and walls partly collapsed. In Gelibolu, Balikesir and Kutahya minarets and pigeon towers were damaged and free-standing walls collapsed. The shock was felt as far as Athens, Rhodes and Yozgat.
[Sandison 1855:FO 78/1111.71-138(various); AN: Brousse.5d.19–41; Cevdet Tezakir:33–35; Ayverdi 1966:51,58,67,94,106,116,230,270,289,427,447,466; Ayverdi 1972:54,315,327; Telcioğlu 1981:6ff; Pamukçiyan 1986; Schmidt 1879:45; Press], (Bursa: *Alaeddin Paşa Dp; *Çelebi Sultan Mehmed dm; *Davullu Ds; *Emir Sultan Dp; *Yeşil dm; *Hudavendigar Dp; *Hayrettin Paşa Ds; *Kaygan Ds; *Muradiye dm; *Üftade dm; *Ulu dm; *Yildirim Dp; *Orhan Ds; *Haci Evrenoz Ds; *Şehadet Ds; *Nakkaş Ali Ds; Orhan & Osman Tombs dm; Yildirim Tomb Dp; Nalincilar hamami Ds; Eski Yeni Han Ds; Karacabey Hani Ds; Kaygan Han Dp; Mudanya Hani Ds; Tahtakale Han Dp; Timur Hani Ds; Balik Pazari Dp; minarets: *Ulu Dp, *Orhan Ds, *Üftade dm; Bursa Castle Dp; bridges on Gökdere dm, Boyacikulu dm, Irgandi Dp, Setbaşi Dp. Istanbul: *Gazi Davut Paşa dm)
(78) 1855 Apr 11
This was the largest aftershock of the earthquake of 28 February that affected mainly the area north of Bursa, from near Kios(Gemlik), to Soğanli and Mudanya. The shock destroyed totally a number of villages already damaged by the mainshock and completed the destruction in Bursa killing about 140 people. A fire that broke out soon after the earthquake consumed all that the shock had left in the centre of the city. Those public buildings, mosques and churches remaining were all so much damaged that they were shut up as dangerous. The government was obliged to borrow to finance reconstruction and arrest massive emigration. The shock was strong in Edirne, Lesvos and Aydin.
[Sandison 1855:FO 78/1111.106–09, 1855:FO 195/393.478; AN: Brousse 5d.31–41; Press]
(79) 1857 Sep 17
A damaging earthquake in the region northeast of Bursa. The villages between Gemlik, Katirli and Iznik were ruined and the shipyard in Gemlik was partly destroyed. In Bursa 30 houses collapsed and hundreds suffered different degrees of damage. The shock was strongly felt as far as Büyükdere and Izmit.
[Press]
(80) 1859 Aug 21
A damaging earthquake with an epicentre offshore the Dardanelles. It caused heavy damage on the island of Imroz and on the mainland from Çiblak to Ezine. In Imroz the villages of Panaya and Iskinid were totally destroyed without casualties. Rockfalls and liquefaction of the ground were reported from the southeast part of the island. The shock was very strongly felt at Enez, Limnos and Mytilini and it was perceptible as far as Athens, Zante, Thessaloniki, Sofia and Kutahya. It was also reported by ships sailing in the North Aegean.
[Press; Schmidt 1879:67]
(81) 1860 Dec 2
A damaging shock in the area of Tavşanlu ruined a number of villages and destroyed a few houses in Kutahya. The shock was felt as far as Gelibolu, Chios and Izmir.
[Press]
(82) 1863 Nov 6
A damaging earthquake in the region of Lake Iznik. Many houses collapsed at Umurbey and to the east in Kurla and Mahmecik where springs dried up. Damage extended to Bursa, and Gemlik where a minaret and many chimneys were destroyed. The shock was strongly felt in Istanbul, Gelibolu and Bolu.
[Press], (Bursa: Osman Tomb Dp)
(83) 1865 Jul 22
Destructive shock with an epicentral area in the Gulf of Edremit. It ruined villages in Mytilini and in the mainland to the north, and caused some loss of life around Molivo and Behram(Behramkale). The shock affected the yield of springs and triggered rockfalls. It was widely felt.
[Press]. (Molivo: Fort Dp)
(84) 1867 Mar 7
A destructive shock in the Gulf of Edremit. The island of Lesvos and the coast of Asia Minor opposite were ruined with heavy loss of life. Ground deformations extending for more than a kilometre were reported from the north side of the island of Lesvos where part of the coast sunk beneath the sea. A small seismic sea-wave was observed in the port of Mytilini where, out of 2500 houses, 1500 were destroyed or damaged beyond repair with the loss of 145 lives. Damage extended to Kumköy, Edremit, Foça and Chios. The

shock was felt in Istanbul Edirne, Kavalla, Athens and Aydin.
[AA: Smyrne.51.114; Damiano 1867:np; Press], (Izmir: *Hisar dm)
(85) 1873 Jan 13
Damaging shock in the island of Imroz and on the coast of the Gulf of Saros. The earthquake was felt in Istanbul and Thessaloniki, but not in Izmir.
[Press]
(86) 1877 Oct 13
An earthquake with an offshore epicentral area in the Sea of Marmara caused heavy damage to the Marmara Islands. The shock was felt on board ships and as far as Ezine, Edirne and Istanbul.
[Press]
(87) 1878 Apr 19
A locally destructive earthquake in the region between Esme, Sapanca and Adapazari caused considerable loss of life. Damage extended to Akyazi, Bursa and Izmit. In the Gulf of Izmit the shock set up a sea-wave which propagated into the Sea of Marmara. The earthquake was strongly felt in Istanbul and it was perceptible throughout Thrace.
[Press]
(88) 1889 Oct 26*
Destructive earthquake in the Gulf of Edremit almost totally ruined the west part of the island of Lesvos with loss of life. Damage extended to Ayvalik and to a lesser extent to Sultaniye. The shock was widely felt and it was perceptible as far as Istanbul and the island of Rhodes.
[Press], (Lesvos: +Theologos Ordymnos Ds; +Limonos dm)
(89) 1893 Feb 9
This earthquake had an offshore epicentre in the Gulf of Saros. It caused considerable damage in the islands of Samothraki and Imroz. Minor damage also extended to Athos, Dedeağaç and Sultaniye. The earthquake was felt as far as Sofia, Vratsa, Istanbul, Chios and Volos in Greece. A damaging sea-wave was generated that caused considerable damage in Samothraki and Dedeağaç.
[Christomanos 1899; Badi.ii.393); Press]
(90) 1894 Jul 10*
A destructive earthquake in the Gulf of Izmit and further to the east caused extensive damage in the area between Silivri, Istanbul, Adapazari and Katirli. Maximum effects were reported from the region between Heybeliada, Yalova and Sapanca where most villages were totally destroyed with great loss of life. The shock caused the Sakarya river to flood its banks and the development of mud volcanoes. In Adapazari 83 people were killed and another 990 in the Sapanca area. In Istanbul damage was widespread and in places very serious. Many public buildings, mosques, and houses were shattered and left on the verge of collapse, while most of the older constructions fell down, killing 276 and injuring 321 people. Three of the dams for the water supply of Istanbul were badly damaged. The shock was associated with a seismic sea-wave, which at St. Stephanos (Yeşilköy) had a height of 1.5 m, and caused the failure of submarine cables. Liquefaction of the ground and landslides were reported from the epicentre region, particularly from the area between Sapanca and Adapazari. The shock was felt as far as Bucharest, Sofia, Yannina, Crete and Konya, and it was not followed by a significant aftershock sequence.
[Eginitis 1895; Azarian 1894; Badi:ii.18; Dybowsky 1894; Press; Watzov 1902:40–42; Müller-Wiener 1977:489], (*Atik Ali Paşa dm; *Atik Ibrahim dm; *Atik Mustafa dm; *Azapkapi dm; *Ayasofya dm; *Bali Paşa Dp; +Benoit dm; *Cerrah Paşa Dp; *Davut Paşa Dp; +Euphemie in Kadiköy Dp; *Isakapusu Dp; *Fatih dm; *Haseki dm; *Imrahor dm; *Ivaz Efendi dm; +St John Antigoni dm; *Kasim Ağa Dp; *Mesih Paşa dm; *Mihrimah Dp; *Sancaktar Dp; *Sultan Selim Dp; *Topkapi Dp; *Yavuz er Sinan dm; *Zal Mahmut dm; Dams of Ayvad Dp, Belgrat Dp, Bahçeköy dm; =Land Dp; Kapali Çarşi Dp; † Golden dm).
(91) 1896 Apr 16
This was a small magnitude earthquake that caused some damage in the region of Emet. The shock was not felt very far and caused no loss of life.
[Agamennone 1896; Press]
(92) 1896 Sep 14
A small earthquake in the region of Balikesir caused minor but widespread damage. The shock was not felt beyond Izmir, Istanbul and Kavalla.
[Agamennone 1899; Press]

(93) 1912 Aug 9*
This earthquake destroyed more than 300 villages and towns mainly to the north of the Dardanelles, killing over 2000 people. The shock was associated with a 50 km long faultbreak and with the liquefaction of the ground up to epicentral distances of 180 km. Damage extended over a relatively large area and long-period ground motions were responsible for serious damage to public buildings as far as Edirne and Istanbul. The shock was accompanied by a small seismic sea-wave and it was felt within a radius of about 450 km.
[Ambraseys & Finkel 1987,1988; Press]; (*Izzet Paşa dm; *Ortaköy dm; *Edirnekapi dm; medrese of *Faith dm; Bayazit Tower dm; minarets of *Kumrulu dm, *Izzet Paşa dm; =between † Edirne and † Çatalca. Edirne: Rüstem Paşa Hani dm: Ali Paşa Çarşisi dm)

Spurious events

1532 Nov 21 An earthquake in Istanbul which caused the quay wall near Kadirga Kapisi to collapse and overturned (?) a nearby monumental set of columns. We could find no reliable contemporary evidence for this event.
[Sanuto 1902:346–7; Sagredo 1673:319; Mordtmann 1892:54; Millingen 1899:270], (Bucoleon Palace Dp?)
1574 This earthquake in Istanbul is given by Hammer on the authority of Peçevi. However, no reference to such an event has been found in the printed edition of Peçevi's History, which refers at this time to the damaging effects of floods. Thus, lacking further data, we cannot say if Hammer's manuscript copy of Pecevi's narrative may indeed have alluded to such an event, or whether Hammer is in error.
[Hammer 3:615]

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