

**Data from investigation on seismic Sea waves events
in the Eastern Mediterranean from 1000 to 1500 A.D.**

Part 3

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INTRODUCTION

Tsunamis from 1000 to 1500 A.D. in the Eastern Mediterranean Sea between 31-44 N and 18-36 E excluding the Black Sea and the Italian coasts of the Adriatic Sea is the object of the present paper.

2. DESCRIPTION OF EVENTS

1. *1034 AD. January 4. Coasts of Lebanon and Israel. Acre (m = iv -).*

Ref.: 5a (P. 216), 9. 19 (p. 207).

On February 17th, 1034 AD, many cities in Syria were destroyed by a violent earthquake, Cedrinos (p. 732D). Also Abul-Farag mentions this event, who says that:

« ...in the year 425 AH there was an earthquake in Egypt and Palestine, and men went forth from (their) houses

and remained under the heavens for eight days. And one half of the city of Balash fell down. And the earth swallowed up many villages in Syria with their inhabitants. Portions of the walls of the temple in Jerusalem fell down, and a minaret of the Arabs in Ascalon and the top of a minaret in Gaza and half of the city of Ako (Akka). And the sea retired three parasanges (ten miles!) and men went into it to collect fish, but the waters returned and drowned some of them » (p. 216).

As-Soyuti, in his « *Kashf as-Salsalah* » confirms Abul-Farag's statement and adds that Ramlah was destroyed at that time. He states quite clearly, however, that all these events were not caused by the same earthquake but by many. This is evident from similar statements that we found in the works of the writers of the *Corpus Scriptorum Historiae Byzantinae*. For instance, Cedrinus, in connection with the seismicity of 425-426 AH, says: « ...in September 1035 AD, Jerusalem was damaged by an earthquake where many died and many churches and buildings collapsed; the tremors continued for forty days (p. 737B) ... and before that, in May, an earthquake opened up chasms in Voukelarious, and five villages perished... » (p. 738B).

This differentiation is also shown by Glycas (p. 315D), (p. 316A), Ibn al Athir (vol. ix, p. 298) and also by Nasir-i-Khusrau who adds that:

« ...on Muharram 15 of the year 425 (December 10, 1035 AD) there was an earthquake of great violence which threw down a large number of buildings (in Ramlah) but that not a single person sustained any injury ». (Ad. 18418, MSS, Or. 1991, Brit. Mus § 21).

In many recent earthquake catalogues (1) we find all these distinct shocks erroneously treated as one earthquake; moreover Sieberg (1932a, b) dates this earthquake as March 6th, 1033 or 1034 AD, and grades it as an exceptionally strong one.

(1) Perrey (1850) p. 16, Mallet (1852) p. 18, Sieberg (1932a) p. 193, (1932b) p. 802, Montandon (1953) p. 180, Huot (1837) p. 109.

From the study of the available information on these individual earthquakes, and in particular of the texts in the *Corpus Scriptorum Historiae Byzantinae*, it appears that, in fact, there are at least four major distinct earthquakes which occurred between the years 1033 and 1035 AD. We were able to identify a strong earthquake on December 10, 1033 AD, which damaged the Ramlah-Gaza-Ascalon area and which was probably felt in Jerusalem. A second shock on February 17th, 1034 AD, which centered in the Al-Hulan area and which damaged Akka, Balash and probably Jedmus. A third very strong earthquake, which occurred in April or early May 1035 AD and which damaged the northern provinces of Syria. Finally, an earthquake which should have occurred in the first week of September 1035 AD and which damaged many towns in southern Palestine and Egypt, among which, Jerusalem.

It appears that the earthquake which should be kept responsible for the seismic sea-wave that of April or May 1035 AD. During this earthquake, extensive faulting and most probably some crustal deformation occurred in the Saida-Sur area.

2. 1039* *January. Constantinople (Istanbul).*

Ref.: 18a.

Dück (p. 133) quotes Cedrinus (ii, P. 532) for this seismic sea-wave, but we can find no mention in that author.

3. 1050* *Grecian Archipelago. Thera (Santorini).*

Ref.: 20.

Imamura (1937) alludes to a seismic sea-wave in the Grecian Archipelago produced by a submarine eruption of the volcano of Thera (Santorini).

It is obvious that there is a missprint in the year. What Imamura had in mind was the seismic sea-wave of 29 September 1650. Heck (1947) carries forward this missprint in his catalogue.

4. *1068 March 18. Coasts of Israel at Holots, Ashod and Yaune (m = iv).*

Ref: 10a (p. 441), 10b, 6. (iii, 211), 9. 4.

As-Soyuti in his work on « Al Kaim-bi-Amrillah » says:

« ...in the year 460 a tremendous earthquake occurred at Ramlah which destroyed it, and even the water rose over the mouths of the wells and 25,000 of its inhabitants perished. The sea retreated from the shore the space of one day's journey and people went down to its bed gathering fish when the waters returned upon them and destroyed them » (p. 441).

Ibn-al-Athir adds that the shock was felt throughout Palestine and Egypt, while As-Soyuti in his « Kashf as-Salsalah » fixes the date of the earthquake at the 11 th Jomadalawwal of 460 AH (18 March 1068 AD) (1). The same event is described by Mukhtar, Abul-Peda (Annales Muslem. p. 211, vol. iii).

5. *1202 May 22. Syrian Coasts (m=v), Cyprus (m=iv), Egypt (m=iii).*

Ref.: 7. (ii.2, P. 265), 10,b (f. 34b-36b), 9. 15.

During the latter half of 1201 and the beginning of 1202 AD Syria and Palestine were shaken by a number of severe earthquakes. The seismic activity during this period is described in many texts (2).

One of these earthquakes, is described in detail by Abd-Allatif, who says:

« ...on the 26th day of Shaban of the year 298 (22nd May 1202 AD) a great earthquake shook the world. In Cairo

(1) Huot (1837) p. 109 dates this event in 1169 AD, and Perrey (1850) p. 16, in 1069 AD. Sieberg (1932) p. 193 gives November 11, 1067.

(2) As-Soyuti (Kashf as-Salsalah); (An Nasir Li Din-L'Ilah); Mukhtar; Abul-Feda (Annales Muslem. vol. iv, P. 195); Abul-Farag (Chronogr. P. 407); Nowairi (26 parts MS Leyde, fol. 118, v); Abd-Allatif (P. 262-270); Muratori (vol. xxvi, p. 85); Dom Bouquet (vol. xviii, p. 97, 99, 255); Baronius (vol. xiii, p. 81).

we felt three shocks in the morning which damaged those buildings which were either weak or too tall. At noon we had more shocks which were felt by few people since they were very seak; nevertheless ceilings were ckraked and lintels deformed... These shocks were felt at the same hour of the day in many other countries... in Alexandria, Damiette, in Syria, Cyprus, The shock was particularly strong at Akka, Akhlat, Nablus, Baalbek, Damas, and Hamat. Jerusalem did not suffer much, but on the Syrian coasts and as far as Cyprus the sea was lifted up by the shock and rushed inland; the sea in places opened up in hudge masses of water big as mountaines and surged the land raising to the ground buildings and filling the place with dead fish ». (P. 262-270).

Abd-Allatif then proceeds and describes the damage in Hamat and Damas. From his narrations it appears that the shock centered about Nablus and that on the 23rd of May a second shock occurred at the Sur-Akka area, followed by a large number of aftershocks.

From Abd-Allatif's account and from other accounts it appears that the seismic sea-wave was felt along the coasts of Syria, from Jafa to Djebelh and also in Cyprus.

6. 1222. May. Cyprus. Limassol and Paphos (*m=iv*).
Ref.: 23, 24, 25, 17.

Ogerius Panis and Marchisius Scriba (1) as well as Oliverus Scholasticus (2) record a strong earthquake in Cyprus on May 1922, which did much damage at Lemessos, Nicosia and elsewhere. Paphos, they say, suffered most, the city and its castle were completely ruined and its inhabitants were wiped out. In

(1) In « Annali Genovesi di Caffaro e de' suoi continuatori dal 1280 al 1293 », Ed. L.T. Belgrano, C. Imperiale di Sant'Antonio, fol. 2, p. 179, Genova, 1902. Cf. Röhricht (1882), pp. 9, 24G.

(2) Oliverus Scholasticus (1450) « Historia Damiatina », in Eckhart, J.G. (1723), Corpus Historicum Medii Aevi, Ed. Hoogeweg, vol. 2, § 86, p. 279, Leipz.

one place, Coggeshall (1729), informs us that a church fell, burying the bishop who was saying mass and all his congregation. The Franciscans, says Enlart (1909), who had a church in Paphos after this earthquake abandoned it.

Marchisius Scriba (1) and Oliverus Scholasticus (2) add that during this earthquake:

« ...the sea abandoned its habitual places and retreated far into the open sea. Baffa (Paphos) and Limisso (Lemessos) were then submerged by the sea... » and « ...the harbour (of Paphos) dried up, and then the town was submerged by the sea... ».

From the information available on this seismic sea-wave nothing can be said about its origin. It appears that its source should be sought not far from the southern coasts of the island, since from what we know it attacked the shores immediately after the earthquake. There is no doubt that this event occurred on May 1222 AD.

In all earthquake catalogues this Cyprian earthquake is dated December 25, 1222. The reason for this is that many Latin chronographers (3) considered the shaking of Cyprus as result of the great Lombardian earthquake of 25 December 1222 which shook also Tyrol, and southern Germany and which was followed by many aftershocks till January 11, 1223. This, once more, shows how misleading was the tendency of early chroniclers to treat collectively different earthquakes.

7. *1273 September. Albanian coasts. Durazzo (m=iii).*

Ref.: 3 (v, P. 242), 22 (p. 143).

(1) In « Monumenta Germaniae Historica », Ed. G.H. Pertz (1854), vol. 18, p. 149, Hannover.

(2) Oliverus Scholasticus (1450) « Historia Damiatina » in Eckhart, I.G. (1723), Corpus Historicum Medii Aevi, Ed. Hoogeweg, vol. 2, 86, p. 279, Leipzig.

(3) Tomaso di Spalatro (1266) in « Monumenta Germaniae Historica » Ed. Heinemann (1892), vol. 29, p. 589. Cf. Chron. Alber. Mon., ibid. vol. 23, p. 912.

8. 1303 August 8. *Egyptian coasts* ($m = v$ -), *Syrian Coasts* ($m = iv$), *Crete* ($m = vi^2$),
 (GC: $36\frac{1}{2}$ N - $27\frac{1}{2}$ E, $I = X$).
 Ref.: 8a (P. 581-583), 8b 10b, 6 (v, P. 191), 3 (v P. 273), 24
 (vol. 9, p. 254c; vol. 14, p. 1123d).

In the summer of 1303 AD a catastrophic earthquake occurred in Egypt. Many historians and chronographers (1) describe this earthquake and its aftershocks that lasted till the end of the year, and affected the whole basin of eastern Mediterranean.

It appears that the main shock occurred in Egypt on the 8th of August 1303 AD. Makrizi says:

« ...in the morning of 23rd day of Dhul-bijja in the year 702, a tremendous earthquake shook Cairo. The oscillations of the ground, the cracking of walls, the fall of houses and mosques, caused a frantic panic... the Nile threw its boats a bow-shot on land smashing their anchors; then, the water retired leaving the boats on land; and those which were sailing in the middle of the river were thrown on its banks... In Cairo and in Fostat not a single house was left without some sort of damage; the city looked like a place that had been wrecked by a conquering army... The same happened in the district of Garbiah where Sakha and Scharkiah were ruined... five mosques were destroyed in Cairo and in Alexandria the « Phare » opened up in many places, loosing forty of its battlements. The sea in Alexandria rose and crashed against the gates; it carried and threw on land the Franckish ship carrying together part of the walls of the city... On the same day Akka, Kus, Damas and Safad were also shaken

(1) Pachymeris (lib. v, p. 273); Muratori (vol. ix, p. 254C; vol. xiv, p. 1123D; vol. xxii, p. 177A, 772E); As-Soyuti (Kashf as-Salsalah); (al Mustakfi Bi'llah Abur Rabbi); Abul-Feda (Annal. Muslem., vol. v, p. 191); Taki Eddin Ahmed Makrizi (Melik-Naser-Mohammed-Ben-Kelaoun p. 581-583), (Descr. Aegypt., vol. ii, MS 798, fol. 239 v); Abd-Allatif (p. 263-270); Abou'Imahasen (MS 663, fol. 61, r); Ebn-Aias (Hist. Aegypt., vol. i, fol. 126, r. & c).

and half of Safad was thrown down. The sea at Akka retired ten mile sand left its bottom dry on which all sort of merchandise could be seen: then it returned flooding the shores... ».

Arab, Persian and Syrian (1) writers devote many pages in their MMS describing in detail this earthquake and the sea-wave which followed. There is no doubt that the epicentre of the shock was south-east of Cairo and that the earthquake was a deep-focused one of considerable magnitude. Its effects in Crete were considerable and if we trust what Muratori says:

« ...in the morning of August 8th, 1303 AD, a great earthquake occurred in the island of Crete and the city of Candia perished with many castles in the island. The sea rushed upon the city with such an impetuous that many buildings collapsed and many people were drowned. Soon after, the sea retired and the harbour was left dry; where the sea was deep, now one could see its floor. The shock was felt in Alexandria and throughout the Adriatic Sea. God's mercy saved Venice, where the shock was felt but caused no damage... ».

Many contemporary writers take this statement as referring to the effects of the Cairo earthquake in Crete. This they do because of the same date of the two events. But we noticed that although Muratori dates this Cretan earthquake in August 1303, in his annales places it chronologically after Pope Benedict XI was ordained, namely after November 6, 1303 AD. This inconsistency and Pachymeris's statement that what Muratori describes happened during the last week of December 1303 AD, suggest that during 1303 we had in fact two distinct shocks which took place, one in Egypt and the other in Crete, at least four months apart. It is of interest to see what Pachymeris says:

« ...on the eighth day of the month of Poseideon an earthquake occurred. It was felt very little here (Constantinople) and very few people noticed it. In the region of the island of Rhodes however, and further on, the shock was

so severe that it is said to have surpassed in destructiveness all previous earthquakes; the city of Rhodes was utterly destroyed. The cities of Coroni and Methoni (1) (Sth. Peloponnesus) many other places in the Peloponnesus as well as a considerable part of the island of Crete suffered much. The shock was felt as far as Alexandria and even further... ».

The date of this earthquake is not difficult to fix. It was felt in Constantinople on the eighth day of the month of Poseideon on the 22nd year of Andronicos. The month of Poseideon is the sixth month of the Attic year answering to the latter half of December and first half of January, so that the eighth day of this Attic month corresponds to the beginning of the last week of December. The 22nd year of Andronicos corresponds to the period 1303-1304, so that, according to Pachymeris, the shock was felt in Constantinople during the first days of the last week of December 1303 (2).

On the basis of the available evidence seems plausible that at least two major earthquakes occurred in 1303 AD. One in August 8th with an epicentral area south-east of Cairo, and another in December which centered in the Lybian sea (3); most probably half-way between Crete and Egypt. Both earthquakes were followed by seismic sea-waves.

9. *1303 December. Crete (m = iv). Southwest Coasts of Peloponnesus and Rhodes (m = iii). Egyptian Coasts and Adriatic Sea (m = iii?).*

Ref.: 3 (v, P. 273), 10b (f. 39b), 24 (vol. 22, P. 177a, 772e), 12.

(1) Sieberg (1932) mistakes Methoni for Methana.

(2) Conf. Blair (1844), Ostrogorsky (1956), Rossini (1835), both in the *Corpus Scriptorum Historiae Byzantinae* and in Migne's *Patrologia Graeca* (1865) vol. 144, p. 906, translates Pachymeris's date into August 8th, 1304 AD; this we were unable to justify, indeed, as it indicates 23rd of Andronicos.

(3) The epicentre may be in the vicinity of that of the 1856 earthquake, cf. Schmidt' (1879) p.p. 47-54, Plate v.

10. 1332 February 12. Sea of Marmara. Constantinople ($m=iii+$).
Ref.: 2 (P. 283), 9.

From Nikiphoros Gregoras we learn that on February 12, 1332, an earthquake shook Constantinople. This was preceded by an eclipse of the sun and it was followed by huge sea-waves. Gregoras (p. 283) says:

« ...sea-waves, with heights surpassing those of the mountains surged the east walls of Byzantium and uprooted them; they passed under the gates of the walls and levered the gates loose like a surging foe; they surged the houses inside the walls and overwhelmed them... » (1).

It is doubtful whether Gregoras here describes a seismic sea-wave. His statement on the earthquake and the ensuing sea-waves seem to be rather incoherent. It is not improbable that what he describes is a strong gale at Constantinople.

11. 1344 October 14. Sea of Marmara. Thracian Coasts ($m=iv$),
($L=2$ km).
Ref.: 2 (P. 434-435), 9, 22 (p. 76).

In the middle of the autumn of 1344 AD (2) many and violent earthquakes occurred in Constantinople. During one of them, a great seismic sea-wave is said to have caused considerable damage to the western coasts of the Sea of Marmara. A description of this event we found in the *Byzantina Historia* by Gregoras (p. 434-5):

« ...during this year (1344) a number of terrible earthquakes shook Byzantium (Constantinople) and its environs and the sea was thrown up... These earthquakes began in the middle of autumn... In the first day God shook the earth twice... many houses and the greatest part of the wall of Byzantium (Constantinople) collapsed. And as for the hedges around the vineyards and the enclosures of

(1) Free translation.

(2) Conf. Boivini (1830); Codex Colbertino Nr. 6044.

gardens, I would not concern myself, because all were thrown down, foundations and all in a very short time... At the same time a wave dashed from the sea and inundated the land for a great distance; where the land was cultivated the sea surged inland for over one mile. In some places the wave swept away a number of vessels which happened to be either in harbour or sailing near the coasts, and crashed them on land. This happened in many places and many people, herds of livestock and beasts of burden perished. When the sea began slowly to retire back to its habitual places one could see it leaving behind everything covered with mud and dead fish. The earthquake shock having its seat in Byzantion (Constantinople) spread little by little all around it, shaking towns and cities on its way with an impetus that seemed to diminish with distance. It is said that this earthquake was felt in Lysimachia and all round Kherronisos. The shaking of the earth, sometimes stronger and sometimes weaker, continued day and night throughout the summer till the following autumn when again strong earthquakes shook the earth... » (1).

From this narration it appears that the major earthquake shock as well as its force and aftershocks affected mostly the European coasts of the Sea of Marmara. Most probably this was the result of a series of fractures along the Constantinople-Saros fault-line, with the epicentre of the principal shock situated closer to Constantinople than that of the earthquake of August 9, 1912.

12. 1389 March 20, Island of Chios ($m=iii$).

(CG: $38\frac{1}{2}$ N — $26\frac{1}{2}$ E. $I=X$).

Ref: 27 (p. 46).

Galanopoulos (1955, p. 22) and (1961, p. 9) gives a strong earthquake at the island of Chios which was followed by a devastating

(1) Free translation.

seismic sea-wave. The wave destroyed the fortress of the town and razed many buildings to the ground. This earthquake was felt also in Asia Minor, and in particular at Smyrna.

Galanopoulos quotes this event on the authority of Sieberg (1932b). But we can find no mention of it in that author. We have been unable to find other evidence of its occurrence but according to the follow description taken from the « Neos Ellinomnimon » (Spyros Lambrou) derived from the Ottovonian Codex 381 of the Vatican Library, it seems that Tsunami was created as a result of the earthquake:

« ...a terrible earthquake took place on the island of Chios, ...and many houses outside the castle collapsed, particularly those which are near the shore of the so-called New village... it so happened that at the same time the sea rose and even reached the middle of Commerce square, It destroyed Smyrna and the small castle of New Phekea... (« Neos Ellinomnimon ») Vol. 7, 1910, p. 147. Taken from the Ottovonian Codex 381, of the Library of the Vatican.

13. *1403 November 16. Syrian Coasts, Asia Minor, South Coasts (m = iii).*

Ref.: 10b (f. 42a), 24 (vol. 18, P. 974).

Muratori (1731) mentions an earthquake in 1402 which he says:

« ...in many places overseas and in particular in certain localities in Greece caused great damage. Many cities were ruined and many houses and walls collapsed. Fires caused great damage. Mountains were tern apart and overthrown. The sea abandoned its shores and retired for more than a mile so that the sea floor could be seen; then it returned to its ordinary place with a great rush... ».

Muratori does not specify neither the month or day of this

event nor a particular place in Greece. We have been unable to find other evidence of this occurrence (1).

14. 1481 May 3. Rhodes ($m=iii$), ($H=1,80m$), ($L=60m$).

Ref: 18, 14, (p. 292-293).

In 1481 the island of Rhodes was shaken by earthquakes which lasted ten months. This seismic activity is described by Coronelli and Parisotti (1688) who say:

« ...the first of these shocks was felt in the city of Rhodes at nine in the morning of March 15 (1481); this shock was followed by many other which threw the populace in consternation. At 3 in the night of May 3, a much stronger shock occurred and at the same time it began to rain, with such an impetuosity, that it was thought that the island was sinking under the weight of the sky. While the land was shaking with great violence, a strong wind coming from the high seas caused the water to rise over ten feet above sea level, and flooding the land threatened the city of Rhodes with total and final destruction. The wind was so violent, and the shocks so numerous (the ground was shaken, seven times that day) that the Rhodians thought their island was bound to sink. Soon after, however, all of a sudden, the waters retired to their habitual places, the sea became calm again, and the shaking of the ground stopped. It was found that not a single house in the city collapsed. In the harbour only, the violence of the waves caused the cables of a large ship to snap, which drifted and crashed on a reef, sinking with all its crew. The shaking of the ground continued till the 3rd of October when it stopped for a few weeks. But the

(1) Mallet (1858) on the authority of Muratori (1731) gives Syria as the place in which this earthquake took place. But we can find no mention of it in that author. Tholozan (1879, p. 1054) on the authority of Arab chronographers which he does not quote, gives a strong earthquake for 1403 AD in Aleppo which was followed by lengthy aftershocks.

physical primer mover of these subterraneous phenomena which produce earthquakes, soon after, built up again, and repeated earthquakes reoccurred on December 18. The ground was shaken three times, at 6 and 10 in the morning, each time with greater violence. These shocks threw on the ground many churches, oratories, the Hall of Justice, and many houses, burying under their ruins many Rhodians... » (p. 158-164).

15. 1489. *South Coasts of Asia Minor. Antalya (m=iii).*

Ref: 21.

From a manuscript of Leonardo da Vinci, which is kept at the Leicester Library, we learn that:

« ...in eighty 9 an earthquake occurred in the sea of Atalia near Rhodes, as a result of which the floor of the sea opened up, into which such a quantity of water poured that for over three hours the floor of the sea was left uncovered by reason of the sea which was lost in it, and then it closed again to the former level ... ».

It is obvious that here da Vinci refers to a withdrawal of the sea in the gulf of Atalia (Adalia), a phase of a seismic sea-wave which preceded or followed the earthquake which he mentions.

Richter (1883) (1939) and Baratta (1903) date this event in 1489. This they do on the authority of As-Soyuti. Richter says that in his earthquake catalogue As-Soyuti mentions a terrible earthquake in Syria in the year 867 of the Muslim Era (hijri) during which a hundred persons were killed by it in the fortress of Kerak. He translates this Muslim date into the year 1489 which he considers to be the complete year of the event described by da Vinci. But we can find neither mention of an earthquake in Kerak for 867 hijri in that author (1), nor 867 hijri corresponds

(1) As-Soyuti mentions an earthquake at Kerak (Kerk) in the year 863 hijri which corresponds to the period 8 November 1458 and 28 October 1459.

to the year 1489 alluded to by Richter (1). It seems that Richter's, and on his authority, Baratta's argument for the date of this event is untenable.

It is scarcely likely that da Vinci should here mean any other year but 1489. According to Calvi (1923) this manuscript was written between 1504 and 1506. It is said to reflect da Vinci's own experience of such a phenomenon during his travels in the orient. This we very much doubt. Of what da Vinci's travels may have been we know comparatively little, and although there are unexpected gaps in the chronology between 1481 and 1487, a period which he may have spent in travels, it is very doubtful whether in 1489 he was in the orient (2). The style and expressions he uses to describe this phenomenon make it seem highly probable that he derived this information from others.

The casual manner in which da Vinci writes the year of this event indicates that it should have been a year of his era. Frizzoni (1884) argues that since earthquake catalogues do not mention an earthquake in Asia Minor or in Syria for this year, the phenomenon which da Vinci describes may be that of 1481 in Rhodes. But da Vinci's hand-writing in this manuscript is very neat and the figure 9 is very clearly written. Moreover, Calvisius (p. 901), on the authority of the « *Annales Turci* », which we were unable to consult, gives an earthquake for 1489 which occurred in Asia Minor and which was felt as far as Constantinople. The same event is also mentioned by Brewster (1830) and Mallet (1850)*.

To our mind it is very unlikely that here da Vinci refers to the Rhodian seismic sea-wave of 1481. We are inclined to think

(1) The Muslim Era is based on the hijra. This was the migration of Muhammad from Mecca to Medina, which took place in the Arab year beginning 16 July 622. It is obvious that Richter calculated 1489 by adding 622 to 867. But the Muslim year is purely lunar and has 354 days and 867 hijri corresponds to the period between 28 September 1462 and 15 September 1463, and not as Richter calculated 1489.

(2) If we trust Gunnis (1936) Leonardo da Vinci was in Cyprus in 1481. As a matter of fact, in Lefkara, where he purchased lace for the altar-cloth at Milan Cathedral.

that what he describes is a sea-wave produced by an earthquake, most probably by that mentioned by Calvisius and Brewster, which occurred in 1489 on the southern coasts of Asia Minor.

16. 1494 AD. July 1, Crete. Herakleion (Candia) ($m=ii+$).

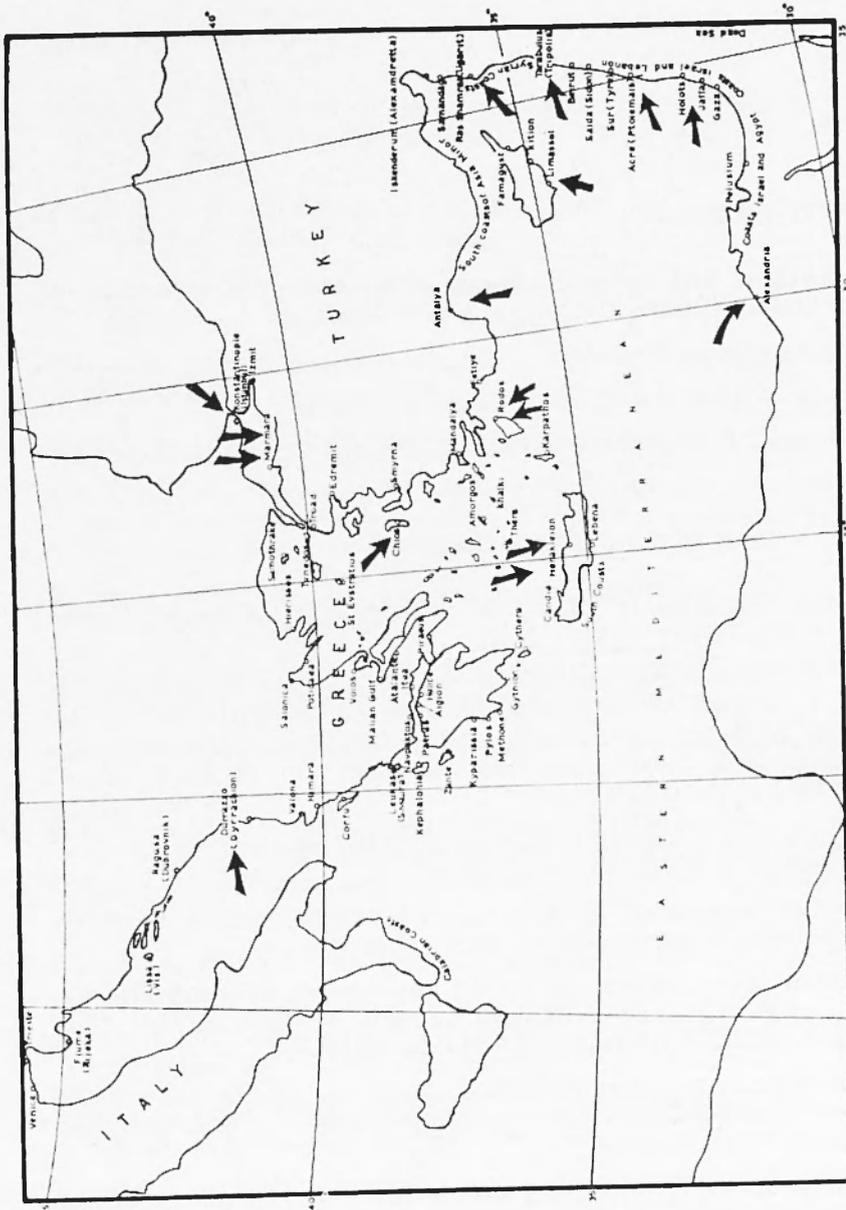
Ref.: 16.

From Pietro Cazolis or Casola (1498?) (1) we learn that while he was in Candia on his way to Jerusalem, a strong earthquake shook the island. Casola says:

« ...on Tuesday July 1st (1494) at about four in the afternoon, an earthquake shook Candia; it was so severe that I was nearly thrown to the ground... At the friary of San Francesco in Candia the place was filled with dust, and creaking sounds as beams were coming out of their places... In the city the shock caused much damage in particular to bellfries churches and private buildings... The population was thrown into panic... At the harbour great waves made the ships anchored there dash one against another so furiously that it appeared as if all would be smashed to pieces; and the sea changed many colours. I was told by our captain that he had never seen the like before... On Wednesday the 2nd of July at three in the morning new shocks were felt... Messages to the Governor from several parts in the island confirmed that this earthquake had destroyed many places in Crete ».

Apparently the earthquake which is described by Casola was of local nature and it was not felt very far. We were not able to find any other reference to this event. It seems that it was followed by a sea-wave since the behaviour of the sea at Candia quite clearly indicates characteristics of such a wave most probably involving turbidity currents.

(1) MS of Pietro Casola kept at the Trivulzian Library Milan. Also Newett (1907) p. 198.



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