

European Center for Byzantine and Post-Byzantine Monuments



# Mo.Na: MONUMENTS IN NATURE: A CREATIVE CO-EXISTENCE

**International Conference**

Athens, July 7-9, 2021

**PROCEEDINGS**

**Thessaloniki 2022**

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**Edited by Sapfo Tanou**

In the frame of the project "Mo.Na: Monuments in Nature: A Creative Co-existence"

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**Thessaloniki 2022**

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Address: Leoforos Stratou #2, GR 54640, Thessaloniki  
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#### **Greek Planners' Association**

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Website: <https://sepox.gr/>

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# Preventing Risks and Responding to Natural Disasters in Byzantine Cities: The Textual Evidence

Maria Leontsini<sup>1</sup>, Kelly Mavrommati<sup>2</sup>, Alexander Liarmacopoulos<sup>3</sup>

1. Senior Researcher, PhD, Institute of Historical Research/NHRF, Greece

2. Independent Researcher of Byzantine History, PhD, Greece

3. Archaeologist, PhD, Greece

**Abstract:** The prevention and treatment of catastrophes and natural phenomena (*θεομηνία*) were particular challenging issues for past societies. Our presentation attempts to detect in what ways state strategies strived to prevent or minimize construction risks. The central administrative policies and legal measures were actually affirming the legitimacy of the emperor as a founder of cities (*κτίσις*, *φιλοκτίστης*) and justified his authority in the renewal of public works (*ἐπανόρθωσις*, *renovatio*). Analysis focuses on perceptions and practices related to natural disaster management of urban infrastructures and is based on the indexing of written evidence.

Natural hazards and their immediate or long-term effects on cities, monuments and infrastructures (aqueducts, streets, or fortifications) are issues often mentioned in Byzantine sources, due to the heavy consequences they had for the empire's urban structures and facilities. Historical narratives, as well as other literary genres (epistolography, rhetoric and exegetical literature, poetry hymnography), recount natural events (earthquakes, tsunamis and volcanic activity), and climatic phenomena (extreme temperatures, droughts, floods, storms) among incidents worth remembering and enlisting in the cities' "calendars".<sup>1</sup> Recent scholarship found that the Aristotelian conception of nature was considered accurate by Byzantine scholars but the perception of natural phenomena as signs of divine wrath was more widespread, being also conceptualized as essentially belonging to a series of blows, nowadays characterized by a different etiology, like epidemics, civil wars, and invasions.<sup>2</sup> Environmental history integrated natural phenomena into the study of historical change to form a clearer idea of survival and resilience strategies for the Byzantine state.<sup>3</sup> With the exception of research on climate and earthquakes, few attempts have been made to estimate the effects of natural phenomena on the urban spatial structure. The issue is better approached in this regard through the study of the archaeological documentation in an attempted to re-evaluate urban development.<sup>4</sup>

Cities, although being of particular importance for the political and economic life of the empire, were vulnerable to human and material damage and their maintenance was a costly endeavor. The founding of cities (*ktisis*), and the construction or reconstruction of buildings, churches and other structures, their adornment (*kosmesis*) and renewal (*ananeosis*, *renovatio*) as well as the regard for their preservation made manifest the idea of imperial benevolence. Construction and repair works, financed and supervised by the emperors, were conceived as actions performed by the earthly exponents of the creation of the world by God.<sup>5</sup> Natural disasters in reverse were interpreted as signs of God's wrath and were therefore considered as events that denounced inappropriate behavior and disrespectful imperial policies.<sup>6</sup> The implementation of reconstruction projects as strategies that promoted the welfare of cities were framed by legal measures governing construction activity in the urban environment. The legislation reflects the emperor's decisive position in the building development of cities, which has continued the Roman and earlier legal traditions that were then adapted to the new needs of the Byzantine state. The consistent inspection of cities by the imperial government started to focus on sustainability and security, so that cities could be protected from natural phenomena and external enemies in the difficult conditions that prevailed from the 6th century onwards.

The state functions adapted to this reality so that the construction activities to be largely based on the initiatives performed under the auspices of the imperial administration. The appointment of government officials, architects and qualified staff hired to carry out large-scale constructions allowed the development of skills that were particularly focused on repairs in the Middle Byzantine period. In fact, it seems that the difficult conditions of the time led to the application of inventive construction techniques, based on empirical knowledge, which together with the lack of materials were

1. Mango 1985, 60–62; Maguire 1987, 45–55, 73–74, 82; Meier 2001, 179–202; Telelis 2004, vol. 2, 753–782; Saradi 2006, 91; Magdalino 2018; Kraft 2021, 158–171.

2. Downey 1955; Grumel 1958, 457–481; Congourdeau 2009, 151–163; Sideris 2009; Drocourt 2011, 97–125; Izdebski 2019, 367–370.

3. Maguire 1987, 17–21, 31–33, 54; Karpozelos 1991; Telelis 2014, 737–760.

4. Bouras 1998, 89–98; Ousterhout 1999, 3–5 and passim; Saradi 2006, 13–45; Lavan 2020, 1–15.

5. Saradi 2006, 142, 184.

6. Karpozelos 1991; Limousin 2005; Yannopoulos 2012, 272–289; Allen and Neil, 2013, 71–96; Leontsini 2014, 337–356.



certainly the causes of construction errors and failures, which reduced the buildings' resistance to pressures exercised by natural phenomena. Large-scale repairs to demolished or dilapidated buildings and public works were made only possible with the mobilization of government mechanisms. Engineers or architects who were in charge of damage repairs and coordinated restoration plans were rarely mentioned while the presence of masons was occasionally occurring.<sup>7</sup> Building crews engaged in public works under the supervision of officials and aristocrats, managed to maintain a remarkable continuity with the past, despite the fact that their techniques were adapted to the new conditions of insufficiency of materials and means. Eventually the patronage networks organizing construction projects tended to be subjected to the direct supervision of the emperor.<sup>8</sup>

These networks, which are not clearly visible, were supported by the political and ecclesiastical authorities or the leaders of monastic communities who were trying to repair building facilities that had been ravaged by natural or other disasters. Not infrequently, these magnates resorted to the emperor in their search of material and technical assistance to carry out construction works. Kelly Maurommati, in Appendix 1, entitled "Reconstruction and Recovery in the aftermath of Natural Disasters", delves into the issue of imperial intervention in relation to social recovery in inflicted urban areas. The ideas that connected the natural and man-made environment with the divine and imperial oversight were also conveyed in Christian worship and rituals and transmitted through religious imagery.<sup>9</sup> The historical perspective of the political cultural, intellectual, and emotional settings of natural disasters set down in the hymnography, the *euchologia* and prayer books are identified in Appendix 2, by Alexander Liarmacopoulos, entitled "Hymnography as a Source of the History of Natural Threats and Disasters in Byzantium".

The recording of government actions to repair damage caused by natural disasters in historical narratives and inscriptions referring to the restoration of buildings or other public works is nevertheless irregular, which shows the discontinuity in the tradition of the organization of the residential web of cities, towns or other types of settlement. Despite the limited information on the prevention of natural hazards and the lack of instructions in specialized manuals, such as Vitruvius' work on architecture, few cases document the observance of relevant rules. Byzantine legislation contained a set of regulations aiming at controlling the quality of construction works and for the beautification of cities and the preservation of their monumentality. The issuing of rules for different parts of the empire and their adaptation to different circumstances reveal the emerging difficulties in ensuring the preservation of public infrastructures.<sup>10</sup> However, we assume that construction activities in the cities were not always carried out in accordance with legal rules, while renovation works made structures vulnerable to natural disasters. The supervision of state services mainly concerned public buildings, churches and walls.<sup>11</sup> The prevention of accidents or damage that could be caused by natural phenomena is reflected in the instructions that cities should be established in locations that ensured prosperity and the proper foundation of buildings as also their protection from risks that could threaten their stability, such as erosion.<sup>12</sup> Textual sources, including legal texts, referred to natural phenomena as *theomeniae* (*θεομηνίαι*), a fact that betrayed the feeling of weakness towards a superior force. This view differs from the mundane fear of imminent risks that could be caused by the four natural elements (air, water, earth and fire) that were understood as potential causes of environmental disasters. The consequences of these phenomena on different types of buildings are enumerated in the preamble of the treatise compiled by the architect Julian of Ascalon (first part of 6th century).<sup>13</sup> The character of the text is customary, but some of its instructions and provisions, retained also in later legislation, focus attention on the natural conditions that could make a building vulnerable to erosion, such as low winter temperatures (32.5) and humidity (48.1).<sup>14</sup> Julian's treatise that laid down building regulations, which were relating to the urban environment, is unique, although many of its provisions are repeated in later legal texts. The regulation of construction activity from then on became more centralized or at least that is what the written sources imply.

This perspective is obvious in Prokopios' *De Aedificiis*, which was intended to praise imperial supervision of public building activities. The emperor is idealized for the works that revitalized the capital and the construction actions taken in the provinces to protect facilities and infrastructures from natural threats.<sup>15</sup> One such action was the assignment of Justinian I to the architect Anthemios and his assistant Isidoros to plan and supervise the construction of flood control structures at the Dar'ā stronghold in Mesopotamia.<sup>16</sup> The emperor thus emerged as the authority that could guarantee the survival of

7. Ousterhout 1999, 44–45, 53; Bouras 2002, 547–551; Bouras 2010, 11–13, 37.

8. Ousterhout 1999, 3–5, 12, 46–58, 106–107; Bouras 2002, 539–554; Schibille 2009, 360–379; Bouras 2010, 38; Baldini 2013, 232; Haldon 2020, 314.

9. Maguire 1987, 73–80.

10. Troianos 1998, 26–35; Baldini 2013; Lavan 2020, 423, 445–448.

11. Tourptsoglou–Stephanidou 1998, 11–30; Bouras 2002, 542; Baldini 2013, 230–233; Bougiatioti and Oikonomou 2017, 651–657.

12. Anon. On strategy (Ποῦ δεῖ κτιζεῖν πόλιν), 11, Dennis 1985, 32, 2–9.

13. Julian of Ascalon 1, Saliou 1996, 32; Tourptsoglou–Stephanidou and Hakim 2001, 4–25.

14. Saliou 1996, 55, 69.

15. Saradi 2006, 77; Pickett 2017, 95–125; Ousterhout 2018.

16. Huxley 1959, 53–58.



urban centers despite the depletion of their resources, a recession which also struck Constantinople.<sup>17</sup> Although it mentions no explicit measures to prevent damage caused by earthquakes, the legislation provides specific provisions for fires. Emperor Leo I after the fire of Constantinople in 462, enacted such rules for the reconstruction of the Byzantine capital which are known through the “Law of Zeno”; similar rules were also repeated in later legislative provisions. Written sources moreover, testify to the repairs of public works in adverse conditions under the supervision and with the subsidy of emperors and in collaboration with architects and local authorities.<sup>18</sup> The repairs implemented under imperial supervision after the repeated collapses of the dome of Agia Sophia by the earthquakes are well-documented cases. The imperial intervention may have helped the repair of the fire damage in the cathedral of Agios Dimitrios in Thessaloniki, probably caused by an earthquake mentioned in the third miracle of the second collection of the Miracles of this saint, dating to the late 7th century.<sup>19</sup>

A known example of a similar policy which aimed at the recovery of Constantinople after an earthquake, is the repair of the Aqueduct of Valens during the period of drought in 766/7. Constantine V transported craftsmen from different parts of the empire and also appointed construction experts as supervisors, and a high official as the head of the project.<sup>20</sup> This information is instructive for the specialization of craftsmen, their organization and the supervision of works but also for the significant needs for a skilled workforce of builders. Although relevant references are fragmentary, this pattern does not seem to have changed over time. Building rules stipulated that craftsmen and construction engineers enjoyed special privileges and were exempted from obligations to the state.<sup>21</sup> Their presence in construction activities and other technical projects related principally to the needs of military campaigns is not yet regularly recorded. However, they reappear in the provisions of the *Book of the Eparch* in the chapter for construction professionals. According to this chapter contractors were relieved of the responsibility of repairing damage caused by violent natural phenomena unless the problems were due to faulty construction.<sup>22</sup> The concern for the durability of large construction works, which were found throughout the empire, became a priority for the central government, having passed from the jurisdiction of the praetorian prefecture to services supervised by the emperor in the Middle Byzantine era. State reconstruction policies, both through damage prevention and renovation, promoted the adaptability of the construction skills of architects and builders to the Mid-Byzantine conditions, when cities were reduced to smaller settlements and enclosed by fortifications. This reality was also valid for construction projects that served military needs as shown by the treatises identified and commented by Charalambos Bouras.<sup>23</sup> In a rare reference to an engineer-architect recruited by the emperor, made in order to accuse Nikephoros I of negligence in the construction of defense equipment, the *Chronography* of Theophanes mentions the appointment of an engineer and spatharios Eumathios or Eythymios.<sup>24</sup>

We consider also that resources, materials and technical support required the joint effort of the central government, local authorities or monastery abbots. A known later case is the donation of lead by Constantine IX Monomachos after the petition of Georgios Hagiorites, the superior of Iviron Monastery, which was necessary for the repair of the roof of the church of the Theotokos after it was damaged by rain.<sup>25</sup> An eloquent imperial inscription in the bema of Agios Dimitrios cathedral in Thessaloniki that refers to repair works conducted at the expense of Michael IX Palaiologos also mentions the repairing of the roof as the tiles were damaged and could not withstand rain or snow.<sup>26</sup> It is obvious that imperial oversight focused on monuments, and not on cities, as in the Early Byzantine era, and provided the necessary resources for repair and reconstruction even in difficult times, when the periphery had lost its previous political dynamics. The sanctity of imperial power was valued thus as a symbol of countervailing resistance to natural threats as an idea and as materiality.

17. Ousterhout 1999, 39–43; Saradi 2006, 78–91; Arthur 2020, 10.

18. Saradi 1995, 37–56; Ousterhout 1999, 48–49; Saradi 2006, 186–208; Telelis 2022; Zanini 2022.

19. Codex Justinianus (Corpus Juris Civilis, II). 8.10.12.5d, ed. Krueger 1877/1997, 336: “...so that both as a result of this safer structure and of solarium not being so close to each other, the dangers of fire, which threaten both the city and its householders, occur less severely and frequently – (although) they do sometimes occur – and end more easily, cf. Julian of Ascalon, 2, Saliou 1996, 32; Frier 2016, 2051; Saliou 2018; Papagianni 2019, 6, n. 31. On Agia Sophia cf. Mainstone 2001, 89–91; Bouras 2002, 551. On Agios Dimitrios cf. Mentzos 2010, 27–28, 39–43, 58–60, 81 (with references and bibliography); Goutzioukostas 2020, 165–200 (with references and bibliography).

20. Theoph., *Chron.*, 440.14–24; Nikephoros, *Chron. Brev. Hist.*, 85, 160.1–12; Crow 2012, 49–50; Crow 2018; Magdalino 2018.

21. Early Byzantine rules were developed in the Basilika see: Bouras 1998, 9–98; Troianos 1998, 34–35, 42–43.

22. Liber praefecti, 22.1, 22.4, Koder 1991, 138–142; Ousterhout 1999, 39–44, 50; Bouras 2010, 12–23;

Papagianni 2019, 1–16, esp. 10.

23. Bouras 2010, 14–22.

24. Niavis 1987, 233–234.

25. *Life of George the Hagiorites*, 58–59, 64–65; Ousterhout 1999, 149–150 (see also pp. 36 and 41, on Basil’s I restoration projects, p. 51 on experienced masons sent from Constantinople to Hosios Loukas, and pp. 55–56 on architects sent by Leo V to Italy and Spain); Bouras 2002, 544–545.

26. Goutzioukostas 2020, 213–233 (with sources and bibliography).

## Appendix I. Reconstruction and Recovery in the Aftermath of Natural Disasters Kelly Mavrommati

The following presentation is a commentary on Table I. which records indicative cases drawn from Byzantine texts on the reconstruction of buildings affected by natural disasters. Data are listed in chronological order whereas the columns provide details on the place, the incident, the overall damage, terms and phrases used to describe the reconstruction, and references to sources. The objective of the present report is to offer some selective remarks on issues related to reconstruction activities and social recovery. A remarkable set of data on the restoration of damage caused by natural disasters in cities concerns earthquakes and meteorological phenomena.<sup>27</sup> New themes for research have recently emerged that address natural hazard prevention and disaster recovery systems, which were of particular importance for social resilience.<sup>28</sup> The study of the reactions of government mechanisms and the implementation of recovery strategies could integrate data from interdisciplinary research, to investigate the rate of reconstruction of damage in relation to social development and environmental conditions. The co-examination of a detailed list of natural events with data from different research fields offers the opportunity to reveal information invisible to historical or archaeological sources for a range of natural events, including measuring the duration, intensity and scale of various disasters that have destructively affected the appearance of cities and smaller settlements.

Historical data regarding recovery are in fact quite limited. Terms like *anoikodomo* (ἀνοικοδομῶ), *episkeuazo* (ἐπισκευάζω), *anastelono* (ἀναστηλώνω), *ananeono* (ἀνανεώνω), etc., appear in various literary sources to highlight restoration acts of both imperial and private initiative. In rare cases, however, these actions are associated directly with a specific natural phenomenon. Byzantine scholars referred to natural catastrophes following standard literary patterns, focusing primarily on the dimension of the incidents (usually with words reflecting the broad meaning of *severe*); they also emphasize the material damage and casualties providing details of a more or less obscure and generic character.<sup>29</sup> Comparatively few references are accompanied by mention of reconstruction processes and rebuilding projects that followed natural disasters. In these cases, Byzantine scholars pay attention mostly to the imperial initiative to provide funds and resources for the repair of selected buildings and structures of strategic and religious importance, rarely mentioning those involved in the reconstruction programmes or the type of repair.<sup>30</sup> It is however fruitful to conduct a systematic inquiry into how the state mechanisms adapted to the circumstances.<sup>31</sup> Obviously, emperors managed to reinforce their image and power by transforming the civic euergetism into a central state policy.<sup>32</sup> Imperial piety was also enhanced by public displays of humility and mourning, possibly seeking a blessing for the reconstruction work, a distinction unique to Byzantine imperial ideology compared to the Roman times.<sup>33</sup> The forms of political responses varied depending on the circumstances. The measures taken in favor of the affected populations provided for the issuance of tax exemptions and debt relief but also for the imposition of special taxes on the unaffected population to secure the provision of humanitarian aid and financing of the reconstruction.<sup>34</sup> An immediate start of reconstruction works can be viewed as a strategy to restore not only security of urban centers but also normal living conditions which, thus, ensure the recovery of the local economy as soon as possible. Rebuilding and, thus, recovering was nevertheless dependent on the occasional finances of both the state and the private sector and priority was given to public buildings, such as walls and aqueducts for obvious reasons.<sup>35</sup> In this respect, these issues need to be addressed on

27. Downey 1955; Evangelatou Notara 1993; Guidoboni 1994; Ambraseys and Finkel 1995; Spyropoulos 1997; Telelis 2004; Guidoboni and Comastri 2005; Aldrete 2007; Meier 2007; Ayalon 2014.

28. On issues of social resilience after various natural disasters and on the relevant scientific debate see McAnany and Yoffee 2010; Haldon and Rosen 2018; Izdebski et. al. 2018; Mordechai 2018; Haldon et. al. 2020a.

29. Telelis 2004, vol. 2, 713–714.

30. See examples (fig. 1) in cases of 522, 525, 553–554, 766–767, 986, 1032, and 1343–1344, Evangelatou Notara 1993, 50–64; Spyropoulos 1997, 214–215, 432–434; Telelis 2004, vol. 1, 199–207, 249–250, 355–356. For instance, from 60 earthquakes from 13th to 15th century only nine mention restorations or building of new structures (based on Evangelatou Notara 1993).

31. Reconstruction and recover actions continued hellenistic and roman traditions. Cf. Aldrete 2007, 91–128; Höghammar 2010, 262–273; Hughes 2013, 134.

32. On philanthropia as an imperial virtue see Constantelos 1968, 43–61, 111–136.

33. Theodosios II, for example, marched barefoot in a procession on the streets of the capital accompanied by the senate, clergy and population, after Nicomedia's disastrous earthquake in 447 (Malalas, *Chron.*, 14.22.4–5). Justinian refused to wear his crown on the Christmas day of 557, due to the earthquake of 557 that devastated parts of the capital (Glykas, *Ann.*, 500.10–11), c.f. Meier 2007, 249–250.

34. On political response and other measures (tax exemption, debt relief, taxes imposed to unaffected population, funds for reconstruction, attempts to alleviate food shortage), see the cases of 374, 740, 766–767, c.f. Spyropoulos 1997, 393–395; Telelis 2004, vol. 1, 121–122, 355–356; vol. 2, 535–536, 615.

35. In many cases the reconstruction did not begin immediately, even for the capital city. See e.g. cases of 740 and 1354. Damages caused by natural disasters are linked to reconstruction projects implemented after a long time. An example, in a letter of 1222, the metropolitan of Naupaktos Ioannes Apokaukos is requesting assistance to repair the building of the Diocese of Naupaktos. Apokaukos, Ep. 104.8–9. Cf. Lambropoulos 1998, 227.

a case-by-case basis, as complex socio-economic conditions led to different responses to environmental challenges.<sup>36</sup> For the population, the huge economic burdens and the insecurity that calamities caused could lead to flight and abandonment. It would be thus worth investigating if the state policies intended to protect valuable human resources from deserting the cities.

Disaster shocks and the emotional stress from the sudden turn of events, could be treated with assistance and religious consolation, even though we cannot evaluate easily the consistency and the direct effects of these policies. In this regard, actions taken by central, local or private institutions after a disaster are also worth investigating. We wonder if social bonds were strengthened by common traumatic experiences, which is vital to recovering from natural hazards.<sup>37</sup> Thus, we need to examine why certain local social networks became tighter and others were disorganized or entirely dissolved. Aspects of these subjects can be found in the study of the various social manifestations and religious connections described in the sources; practices that could be linked to deeper recovering mechanisms, which can also support the social web.<sup>38</sup> The invocations to the divine, litanies and rituals, often with the emperor leading the groups, reflect various political and social dimensions of the phenomenon. It may also underline deeper therapeutic roles necessary to regain the capacity to rebuild life.<sup>39</sup> Likewise, the surviving commemorations (*mneme*) of disastrous events that, reveal popular notions and collective experiences, whether religious or secular, can create an understanding of disaster risk reduction and recovery that has yet to be studied thoroughly in Byzantium.<sup>40</sup> Obviously, the issues mentioned in this preliminary outline as well as many of the manifold research questions presented here are still open to discussion and leave wide space for further research on natural disasters in Byzantine history, especially around the pole of reconstruction and resilient recovery.

36. Haldon et al. (2020b, 2021) have successfully addressed many of these angles that play a crucial role in responses to environmental catastrophes. Cf. also supra n. 28.

37. Local networks collaborated to find solutions. See relevant examples in Sidéris 2009, 167–169.

38. Sources provide references on the psychological reactions of major shocks. For example, Agathias (Hist., 62.9–11) presents the people of Kos after the earthquake and tsunami of 554. Most abandoned their settlements, while the few remaining were wondering in the ruins in despair (σκυθρωποί τε ἄγαν – κατηφείς) “like their life has ended”. Cf. Sidéris 2009, 172–173. In another case, Nikephoros Gregoras notes that after the earthquake of 1354, the people of Constantinople were so terrified of the shattered walls of the city that they could not distinguish the cries of women seeking their own in the wrecks from the yelling of Turks possibly invading the city. Gregoras, Hist. Rom., 3.225.17–21. Cf. Zachariadou 2000, 7–11. On the post-disaster psychological trauma from modern evidence, indicatively see Aldrete 2007, 154–160.

39. Telelis 2004, vol. 2, 713–714, 766–782; Sidéris 2009, 176. Cf. Meier 2007, 255–256.

40. See e.g., Theophanes, *Chron.*, 229.13–14.

Fig. 1. Table I. Reconstruction in the aftermath of natural disasters (A selection).

Year	Location	Natural Phenomena	Affected constructions	Restoration works	Quotations	Source reference
374	Rome	Flood of Tiberis	city	General reference: <i>Buildings</i>	(food provisions and restorations of buildings by the eparch of Rome)	Amm. Marcellinus, <i>Res Gest.</i> , XXIX 6. 17–18
522	Dyrrachium – Epidamnos	Earthquake	city	(no specific reference)	<i>Ιουστίνος πολλά παρέσχεν εις ἀνάευσιν</i>	Malalas, <i>Chron.</i> , 17.15
525	S.E. Asia Minor – Edessa	Heavy rainfall – Flood of river Skirtos of river Skirtos	city	<i>τῶν οἰκοδομημάτων τὰ κάλλιστα</i> – walls	(...) <i>βασίλευς ἀνοικοδομησάμενος σύμπασαν</i> (...) <i>ἀνακαίνισας ἐν πόλεσιν εὐπρεπέταίς</i> (...) <i>πολλά δὲ παρέσχεν ὁ βασιλεύς</i> <i>Ιουστίνος εἰς ἀνάευσιν ἀμφοτέραις ταῖς πόλεσι</i>	Prokopios, <i>De aed.</i> , 2.7. 1–18 Malalas, <i>Chron.</i> , 17.15 Kedrenos, <i>Comp. Hist.</i> , 1.639.20–640.5
553–554	Mesopotamia – Daras	Flood of river Kordis	city	(no specific reference)	(...) <i>βασίλευς</i> <i>Ιουστινιανὸς κατεστήσατο</i> (...) <i>ἀνακαίνισας ἐν πόλεσιν εὐπρεπέταίς καὶ τοῖς σοφθεῖσι πολλὰ χρηρισάμενος</i>	Prokopios, <i>De aed.</i> , 2.2–3. Malalas, <i>Chron.</i> , 17.15
554	Kos island	Earthquake – Tsunami	city/island	(no reference)	<i>ὑφ' ἐτέροις αἰθῆς οἰκισταῖς ἀνορθωθῆναι</i>	Agathias, <i>Hist.</i> , 61.19–62.22
582–602	Asia Minor – Galatia – Skourdis	Frequent Stroms Hail River flood	<i>Private buildings</i>	(no reference)	(Saint exorcises hail)	<i>Vita Theod. Syc.</i> , c. 141.
740	Propontis – Nikomedia – Prainetos – Nikaia	Earthquake	<i>Private buildings</i> – <i>Churches</i> – <i>Galleries</i> – <i>Columns</i> – <i>Monasteries</i> – <i>Shrines</i> – <i>Walls</i>	(no reference)	(...) <i>καὶ λαμβάνει αὐτὸ ἡ βασιλεία καὶ κτίζει τὰ τεῖχη.</i> <i>προσθήκην ἐν τοῖς δημοσίοις φόροις</i> (...) <i>ἵνα τὰ ὑποκλάσαντα τῶν τευχῶν ἀνακατασθῶσιν ἐξ ἀναλωμάτων βασιλικῶν.</i>	Theophanes, <i>Chron.</i> , 412. Zonaras, <i>Epit.</i> , 3. 264.7–9.
766–767	Constantinople	Drought – Drying of springs	city	Aqueduct	<i>τὸν τοῦ ὕδατος ὄλικὸν ἀνακαταξίνεν</i> (...) <i>ἀνακαταξίνεν τὸν Ὀβαλέντιανου ἄγωγόν</i> (...)	Nikephoros I., <i>Brev. Hist.</i> , 85. Theophanes, <i>Chron.</i> , 440. 11–28.

Fig. 1. Table I. Reconstruction in the aftermath of natural disasters (A selection).

Year	Location	Natural Phenomena	Affected constructions	Restoration works	Quotations	Source reference
986	Constantinople	Earthquake	Agia Sophia – Private buildings – Churches	Agia Sophia	ὁ βασιλεὺς φιλοτίμως ἐπανορθώσατο (...) Βασιλείας ἐν ἑξ ἑνιαυτοῖς ἐδομήσατο.	Glykas, <i>Ann.</i> , 576.7–13. Kedrenos, <i>Comp. hist.</i> 2. 438.
ca.1025-1028	Constantinople	Earthquakes	(no specific reference)	Hostels – Leprosariums – Aqueeduct	καὶ τούτους βασιλεὺς ἀνεκαίνισε καὶ τοῦ τὸ ὄδιον εἰς μεγαλόπολιν εἰσάγοντος ὀλίκοι διαρρηχθέντος ἐπεμελήσατο	Zonaras, <i>Epit. Hist.</i> , 3.581.2–5.
1032	Constantinople	Earthquake	Churches – Agia Sophia	Churches – Agia Sophia	βασιλεὺς ἀθῆς αὐτοὺς ἀνορθώσατο	Zonaras, <i>Epit. Hist.</i> , 3.434–435.
1231	Constantinople	Earthquake	Walls – Churches – Private buildings	Church of the Holy Apostles	(...) βασιλικὸς ἐπεσκέψατο καὶ χρήμασιν ἱκανοῖς ἀνακτασθῆναι πεποίηκεν (...)	Skutariotes, <i>Add.</i> , fr. 33.91–93.
1296	Constantinople – Asia Minor – other places	Earthquake	Walls – Churches – Private buildings – Fortresses	Church of All Saints – Adrian column	(...) ὅση τε περὶ τὸ βῆμα καὶ ὅση περὶ μέσον ἀνοικοδόμητο. (...) ἐπεσκέυασε καὶ ἀνεστήλωσε	Pachymeres, <i>Hist.</i> , 2.234.15–16. Gregoras, <i>Hist.</i> , 1.202.7–14.
1343-1344	Constantinople, Thrace and other places	Earthquakes – tsunami	Walls – Churches – Fortresses – Cities	Walls of Const. – Agia Sophia – Adrian column	καὶ σπεύσας ἀγόρευσε ἀθῆς καὶ ἀνεπαύηρουσεν (...) εἰ τί που τοῦ μεγάλου τείχους τῆς πόλεως τεθραυμένον (...) πρὸς ἀνδρομήκες ὄψος αὐτὸς ἀνήγειρεν ἐξωτερῶ, περὶ τὰ χεῖλη τὸν μεγίστων καὶ θαυμαστίων τείφων (...) (...) τὴν μὲν οὖν μεγάλην στοάν μετὰ τοῦ βήματος ἡ βασιλεὺς ἀνήγειρεν ἀθῆς ἄγνα. Φακεολάτων ἐπιστήσασα τῷ ἄρην· τὸ ἐπέκεινα δὲ μετὰ τῆς ὄροφης βασιλεὺς ὕστερον ἀνέστησεν	Note on manuscript: Chalke, Mon. of the Virgin 78 (ed. Athenagoras 1935: 178). Gregoras, <i>Hist. Rom.</i> , 2. 696, 711.12–21. Kantakouzenos, <i>Hist.</i> , 3.29.3-8.
1354	Constantinople – Kallipolis – Thracian cities	Earthquake	Walls – Private buildings – Fortresses	(no references)	(...) ἡ γυνὴ τοὺς οἰκείους ἀνακαλιόμενὴ σὺν δάκρυσιν αἰχμαλώτους, τεθνήαια μικροῦ τῷ δέει συμβαίνει σφῶς, ἐν ὑποψία γινόμενους εὐθὺς μὴ οἱ βάρβαροι εἰσπεπῆδησαν τείχους ἐντός.	Gregoras, <i>Hist. Rom.</i> 3. 224–225.



## Appendix II. Hymnography as a Source of the History of Natural Hazards in Byzantium Alexander Liarmacopoulos

Hymnography served Christian worship but was also a literary composition that reflected particular dimensions of historical reality and cultural perspectives. Byzantine hymnographers were well-known personalities of their time and expressed, among other things, the anxieties and fears caused by natural disasters. Their verses echoed the dominant beliefs about the role of emperor as renovator of cities. It is also particularly important that they convey details related to natural disasters, which are missing from other sources. The following brief account is an introductory presentation commenting on Table II.

Instances of natural disasters resulting in the sudden death of people are found in asmatic canons, such as the canon of Theodore (the Studite?, 759-826) on the Saturday before Meatfare (*Carnisprivium*). This particular canon makes reference to the perish of human lives by drowning, earthquake, fire, lightning, freezing weather, hailstorm, rainwater flood, or even by waves (tsunami) caused by sea earthquakes<sup>41</sup>, while also mentioning the loss of human lives from the collapse of buildings.<sup>42</sup> Moreover, the asmatic canon on the Saturday before Pentecost composed by Arsenios illustrates the sudden death by drowning during floods.<sup>43</sup> The hymnographic production of Symeon Thaumastorites (Stylites the Younger, 521-592) renders various details on the natural disasters in Justinian's I time. Symeon recalls and vividly recounts the feelings of fear deriving from the seismic shaking, which he had already prophesied<sup>44</sup>, as well as from the catastrophic waves of sea earthquakes, which caused the recession of the sea and subsequently its violent rise. This latter calamity triggered a strong wave, which crushed ships and washed them ashore.<sup>45</sup> Allusions to this incident are found recurrently in a number of sources.

The most important testimony referring to the same time period is encountered in the kontakia of Romanos the Melodist (died after 555), some verses of which make mention of natural disasters caused by fires and earthquakes followed by sea waves. In fact, the chronicles of Justinian's time record several threatening natural phenomena, which Romanos unhesitatingly uses as a motif in order to urge the faithful to repent. The greatest and most severe of these disasters is the earthquake; the phenomenon is presented as frequent and strong, shaking the ground and instilling a sense of danger in everyone and everything on earth, whilst no chance of salvation from the catastrophe appears to exist.<sup>46</sup> One of the consequences of the sea earthquake was the peril of waves, which sometimes struck coastal cities, especially Constantinople. Romanos makes an allusion to this in the verses<sup>47</sup> that are based on information provided by John Malalas and other historians and chronographers.<sup>48</sup> With admirable skill, the poet incorporates in kontakion 54 "On earthquake and fire" (Εἰς σεισμὸν καὶ ἐμπρησμὸν) the image of the rebellious crowd setting Constantinople on fire during the Nika riots in 531; the fire spread rapidly throughout the city destroying every single structure it came across.<sup>49</sup> The occurrence of all these natural disasters resulted in the devastation of a large part of the city and especially the cathedral of Agia Sophia.<sup>50</sup> That is the reason why in Romanos' verses Justinian appears as the imperial renovator of New Rome, which is reborn from its ashes, restored (*renovatio*).

In addition to hymnography, we could also quote some euchological texts in which such threatening phenomena are also portrayed. The text of the Liturgy quite plainly emphasizes man's request that God grants "peaceful" rain for crop production (ὄμβρους εἰρηνικοὺς τῇ γῆ πρὸς καρποφορίαν)<sup>51</sup>, so that floods and other incidents that can be disastrous to human actions may be prevented. Moreover, the Liturgy of St. Basil encapsulates the primordial supplication of the weak man to benevolent God in the face of threatening nature: God is entreated to offer His protection from earthquakes, floods (σεισμοῦ, καταποντισμοῦ) and other afflictions.<sup>52</sup> This petition is also found in the insistent litany (*ectenēs*) of the procession to protect cities and the whole country from earthquake, fire and shaving man-made losses (εἰς πᾶσαν λιτὴν, where the people pray: "Υπὲρ τοῦ ἄσειστον καὶ ἄφλεκτον καὶ ἀναίμακτον διαφυλαχθῆναι τὴν πόλιν ἡμῶν ταύτην καὶ πᾶσαν πόλιν καὶ χῶραν").<sup>53</sup>

41. Papagiannis 2014, 28, 29, 33.

42. Triōdion 1879, 24.

43. Pentēcostarion 1883, 383.

44. Pétridēs 1902; Vita Symeonis Iunioris 1962, 85; Phountoulēs 1985, 117–118.

45. Phountoulēs 1985, 129.

46. Grosdidier de Matons 1981, 300–312.

47. Maas 1906, 7–8; Grosdidier de Matons 1981, 300, 304, 277–279; Gatier 1983, 234, 236–237; Mētsakēs 1985, 392.

48. Malalas, *Chron.*, 413.87–414.89

49. Grosdidier de Matons 1981, 484–488.

50. See supra n. 46, 494–498.

51. Trempeles 1935, 18710–11.

52. See supra n.51, 18713–16.

53. See supra n.45, 150, 158–159.

Characteristic among the texts of occasional prayers is the εὐχή ἐπὶ σεισμοῦ composed by Symeon archbishop of Thessalonike (died mid-Sept. 1416). His text comprises a supplication for the prevention of earthquakes, heat waves, tornados and floods.<sup>54</sup> Furthermore, the εὐχή ἐπὶ θεμελίῳ ἐκκλησίας asks that the foundations of the church are kept “ἀρραγῆ καὶ ἀσάλευτα...”<sup>55</sup> from catastrophes, while in the prayer ἐπὶ θεμελίου οἴκου the Church requests that “...οὐκ ἄνεμος, οὐχ ὕδωρ, οὐχ ἕτερον τι καταβλάψαι...”<sup>56</sup>, as wind and rain can pose a serious threat to human construction activity. Finally, the invincible force of fire is inferred from the ἀκολουθία εἰς κάμινον, given that a leak can cause fires with incalculable consequences (“εὐλόγησον τὴν κάμινον ταύτην καὶ τοὺς ἐνεργοῦντας αὐτὴν τῷ σῶ φόβῳ διατήρησον καὶ ἀβλαβεῖς αὐτοὺς ἀπὸ τῶν ἀντικειμένων διαφύλαξον...”<sup>57</sup>).

Although several hymnographical texts on the threat of earthquakes and other violent natural events have survived, specific references to deaths, injuries and the destruction of human works are rare. All the above, however, underscore man’s inability to challenge the unconquerable power of natural phenomena and the subsequent recourse to the protection of God as the sole omnipotent and benevolent regulator of the forces of nature.

**Fig. 2. Table II. Natural disasters in Byzantine hymnography (A selection).**

Year	Natural Phenomena	Affected constructions	Quotations	Source reference
	Flood/ earthquake/ fire	city	Οὓς περ κατεκάλυψεν ὑγρὰ/..., σεισμός δὲ οὓς συνέσχε/... καὶ πῦρ οὓς ἐτέφρωσε/...	Theodoros, Canon in Sabbato Carnisprivii, 1.4, Papagiannis 2014: 28
	Earthquake/ cooling	city	Τοὺς αἰφνιδίως ἀναρπασθέντας,/ καταφλεχθέντας ἀστραπαῖς/ καὶ ἐναποψύξαντας ἐκ κρύους καὶ πάσης πληγῆς...	Theodoros, Canon in Sabbato Carnisprivii, 3.2, Papagiannis 2014: 29
	Lightning / flood/ earthquake/ tsunami	city/ports	Τοὺς θεομηνία/ θανατικῆ ἐκτριβέντας,/ κεραυνῶν παντοίων/ ἐξ οὐρανοῦ ἐνεχθέντων,/ γῆς σχισθείσης,/ ἐπικυσάσης θαλάσσης/...	Theodoros, Canon in Sabbato Carnisprivii, 9.2, Papagiannis 2014: 33
	Hail / snow / rain cooling	city / buildings	Οὓς ἀνεῖλε ψύξ/... /χάλαζα, χιῶν/ καὶ ὄμβρος πλεονάσας, οὓς δὲ ἀπέπνιξε πλίνθος/ ἢ χροῦς συνέσχε/...	Theodoros, Canon in Sabbato Carnisprivii, 4.4, Triōdion 1879: 24
	Flood of river	city	Ναμάτων ἐν κλύσμασι/ καὶ ἐν ρεῖθροις ποταμῶν,/ καὶ τοὺς ἐξαίφνης θνήξαντας/...	Canon in Sabbato Pentecostē, 6.2, Pentēcostarion 1883: 383
557	Earthquake/ tsunami	city	Τῇ δὲ ἐξῆς περὶ ὥραν δεκάτην τῆς ἡμέρας ἐσείσθη πᾶσα ἡ γῆ σεισμῷ μεγάλῳ, οἷον οὐδὲ αἱ παρελθοῦσαι πολλαὶ γενεαὶ ἀπεμνημόνευον γενέσθαι, καὶ ἔπεσαν πόλεις καὶ χῶραι τῆς παράλου κατὰ τὴν ὀφθεῖσαν αὐτῶ θεωρίαν καὶ τὰ ὄρη ἐθρύβη βία σχισθέντα, καὶ ἡ γῆ χάσματα ἔσχε κατὰ τόπους καὶ ἡ θάλασσα ἐφυγεν ἐκ τοῦ τόπου αὐτῆς ἐπὶ πολλὰς τὰς ὥρας, καὶ τὰ πλοῖα ἐπὶ τοῦ ξηροῦ καταρραγέντα συνετριβήσαν.	Vita Symeonis Iunioris 1962: 85
6th c.	Earthquake/ tsunami	city	3.2-6: Γρηγόρησον κἄν νῦν πρὸς ὃ βλέπομεν-/ ἀπειλαὶ ἐπαχθεῖς καὶ σεισμοὶ συνεχεῖς/ καὶ τῶν πολέμων κτύποι ἐπάλληλοι/ συνετάρραξαν γῆν μετὰ τῶν ἐν αὐτῇ/ καὶ ἐφυγάδευσαν καὶ τὴν θάλασσαν. 4.1-9: Ταῦτα καὶ νῦν θεωροῦμεν, ψυχὴ-.../ καὶ λιμοὶ καὶ [λο]μοὶ καὶ σεισμοὶ συνεχεῖς,/ ...οὐκ ἔστι ποῦ σωθῆναι· πανταχοῦ γὰρ ὁ κίνδυνος-/ οὐδαμοῦ καταφυγῆ, φυγὴ δὲ πᾶσιν· 7.3-4: τῶν σεισμῶν ὁ ἀυχ[μός] ὡσπερ καύσων σφοδρὸς/ ἐπὶ τὴν ἄρουραν περικέχυτ[αι]. 9.2-4: καὶ νῦν ἐσμεν ὡς πρὶν <οἱ> Αἰγύπτιοι/ ἐν ὀμίχλῃ πληγῶν καὶ θυέλλῃ σεισμῶν/ καὶ τῶν πολέμων ζόφῳ κρατούμενοι· 11.1-6: [Υπε]ρθε τῆς κεφαλῆς ἡ πληγὴ, καὶ ἡ καρδία οὐ λυπεῖται-/ .../ Ὡς ἰμάντα Χριστὸς τὸν σεισμόν καθ’ ἡμῶν/ ἀνεκαίνισεν], ὅτι ἐξήλωσεν...	Romanus Melodus, Canticum 51, Grosdidier de Matons 1981: 300-312

54. Phountoulēs 1968: 16–18.

55. Goar 1730: 485.

56. Goar 1730: 483.

57. Goar 1730: 571.



Year	Natural Phenomena	Affected constructions	Quotations	Source reference
6th c.	Earthquake – tsunami	city	5.5-6: ὅτε φεύγει βυθὸς καὶ ὁ τούτου πυθμῆν/ ἀναφανήσεται ὡς οὐδέποτε	Romanus Melodus, Canticum 51, Grosdidier de Matons 1981: 304
6th c.	Earthquake / tsunami	city	Ἐν δὲ τῷ καιρῷ τοῦ σεισμοῦ ἔφυγεν θάλασσα εἰς τὸ πέλαγος ἐπὶ μίλιον ἓν, καὶ ἀπόλοντο πλοῖα πολλὰ· καὶ πάλιν τῇ τοῦ θεοῦ κελεύσει ἀπεκατέστη ἡ θάλασσα εἰς τὴν ἀρχαίαν κοίτην.	Malalas, Chron., 18.112
6th c.	Fire	city	14.5-10: ...καυθῆναι συγχωρήσας τὰ ἅγια τὰ τῆς ἐκκλησίας/... καὶ ἐξεχέετο ὁ θρήνος τοῦ πλήθους/ ἐν πλατείαις τε ὁμοῦ καὶ ἐκκλησίαις/ τὰ πάντα γὰρ πῦρ διέφθειρεν, εἰ μὴ ἔσχον/ † Θεὸν τὸν παρέχοντα πᾶσι † ζωὴν τὴν αἰώνιον. 15.5-6: Τὸ πῦρ μὲν γὰρ ταῖς ὕλαις ἐτρέφετο σπεῦδον διατρέχειν./ ὑπ' ἀνέμων ἐπιφύβων ὠθούμενον πρὸς τὸ κατακαίειν· 16.1-4: «Νεφέλης δίκην μὲν τὸ πῦρ ἐν ὄλῳ τῷ ἀέρι ἐκτύπει ἐξαστράπτων/ καὶ πάντα καταφλέγον, ἦχον καὶ φόβον ἐμποιοῦν,/ οὐκ ἀνέμοις εἶκον ἐναντίοις καὶ πολλοῖς,/ οὐχ ὕδατα φοβούμενον.	Romanus Melodus, Canticum 54, Grosdidier de Matons 1981: 484-488
6th c.	Earthquake/ fire		Λαὸς μὲν ὁ τοῦ Ἰσραὴλ ναοῦ ἀποστερεῖται· ἡμεῖς δὲ ἀντ' ἐκείνου/ Ἀνάστασιν ἁγίαν καὶ τὴν Σιών ἔχομεν νῦν./ ἦνπερ Κωνσταντῖνος καὶ Ἑλένη ἡ πιστὴ/ τῷ κόσμῳ ἐδωρήσαντο/ μετὰ διακοσίους πενήκοντα χρόνους τοῦ πωθῆναι./ Ἄλλ' ἐνταῦθα μετὰ μίαν τῆς πτώσεως ἦρξαντο ἡμέραν/ τὸ τῆς ἐκκλησίας ἐγείρεσθαι ἔργον./ καὶ φαιδρύνεται λαμπρῶς καὶ τελειοῦται./ οἱ μὲν βασιλεῖς δαπάνην φιλοτιμοῦνται./ ὁ δὲ δεσπόστης ζωὴν τὴν αἰώνιον. 23: Μεγάλα ὄντως καὶ φαιδρὰ καὶ ἄξια θαυμάτων καὶ ὑπερβεβηκότα/ ἅπαντας τοὺς ἀρχαίους βασιλεῖς ἔδειξαν νυνί/ οἱ ἐν τῷ παρόντι τῶν Ῥωμαίων εὐσεβῶς/ τὰ πράγματα διέποντες./ ἐν χρόνῳ γὰρ ὀλίγῳ ἀνέστησαν ἅπασαν τὴν πόλιν,/ ὡς καὶ λήθην ἐγγενέσθαι τοῖς ἀσχοῦσι πάντων τῶν δυσκόλων./ ὁ οἶκος δὲ αὐτὸς ὁ τῆς ἐκκλησίας/ ἐν τοσαύτῃ ἀρετῇ οἰκοδομεῖται/ ὡς τὸν οὐρανὸν μιμῆσθαι, τὸν θεῖον θρόνον./ ὃς καὶ παρέχει ζωὴν τὴν αἰώνιον. 25.1-5: Σῶτερ, [ἀθάνατε υἱὲ] πατρὸς προαιωνίου, πᾶσαν σῶσον τὴν πόλιν./ σῶσον τὰς ἐκκλησίας, σῶσον δὲ καὶ τοὺς βασιλεῖς./ λύτρωσαι τὸ ἄστυ ἀπὸ πάσης ταραχῆς./ σεισμοῦ, λιμοῦ καὶ θνήσεως./ πᾶσαν τὴν πολιτείαν περισώσον, πάνσοφε δυνάστα,...	Romanus Melodus, Canticum 51, Grosdidier de Matons 1981: 494-498
4thc.?	Earthquake	city	Ῥῦσαι, Κύριε, τὴν πόλιν ταύτην καὶ πᾶσαν πόλιν καὶ χώραν ἀπὸ λιμοῦ, λοιμοῦ, σεισμοῦ, καταποντισμοῦ, πυρὸς, μαχαίρας, ἐπιδρομῆς ἀλλοφύλων καὶ ἐμφυλίου πολέμου	Liturgy of St. Basil: Trembelas 1935: 187 <sup>13-16</sup>
	Earthquake/ fire	city	Ὑπὲρ τοῦ ἄσειστον καὶ ἄφλεκτον καὶ ἀνάιμακτον διαφυλαχθῆναι τὴν πόλιν ἡμῶν ταύτην καὶ πᾶσαν πόλιν καὶ χώραν...	Phountoulēs 1985: 150, 158-159
15th c.		city	Διὸ καὶ ὁ πρὸς οἰκονομίαν καὶ σύστασιν ἡμῶν κόσμος αἴτιος πολλάκις ἡμῖν φθορᾶς δικαίως καθίσταται, ὅτι καὶ φθαρτὸς ὑπῆρξε δι' ἡμᾶς. Ὅθεν ἡ τὸ πῦρ σφοδρότερον ἡμᾶς ἐκθερμαίνει, ἢ ὁ ἀήρ ὑπὲρ τὸ οἰκεῖον κινεῖται μέτρον. δυσκρασίας καὶ βλάβας φέρων καθ' ἡμῶν, ἢ τὸ ὕδωρ πολλάκις μὲν ἐπιλείπει, πολλάκις δὲ ραγδαίωτερον καὶ μετὰ πληγῆς καταφέρεται καὶ ἡ γῆ δὲ ἢ κλονεῖται φόβον ἐμποιοῦσα ἡμῖν, ἢ ἴσταται μὲν, τοὺς καρποὺς δὲ οὐ κατὰ τὸ προσήκον τελεσφορεῖ. Πρὸς τούτοις τῇ ἀλλοιώσει τῶν στοιχείων καὶ ἀλλοιώσει ἡμῖν ἐπιγίνεται, ὡς ἐξ αὐτῶν συγκειμένους καὶ τὰ σώματα ἡμῶν συμπάσχουσι τούτοις καὶ νόσοι διὰ τοῦτο καὶ θάνατοι γίνονται	Symeon Thessalonicensis, Oratio in terraemotus periculo, Phountoulēs 1968: 16-18

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