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Climatic Fluctuations in the Eastern Mediterranean and the Middle East AD 300–1500 from Byzantine Documentary and Proxy Physical Paleoclimatic Evidence – A Comparison*

With 2 plates

1. INTRODUCTION

The increased awareness of man's susceptibility to the vagaries of climate has led during the last decades to a widening international cooperation aiming at the reconstruction of climatic change in historical time. Knowledge of climate variation in the "Late Holocene" is of particular interest for modern and future climate prognosis. Though short-term climate change of the ancient and medieval time in the industrial era must be viewed through the lenses of human activities such as farming, forest clearing and coal polluting, the scale of human impact on climatic change during the recent global warming process is far from considerable and critical in climatic evolution. Thus, climate variability of the preindustrial era may function as a baseline over which anthropogenic forcing of environmental variables related to recent and future climatic changes can be projected[1].

Among the sources for natural climate variability in the past – especially for periods prior to the establishment of national meteorological networks – modern paleoclimatic research is obliged to pay attention to non-instrumental man-made paleoclimatic evidence, as well as to proxy evidence obtained from natural archives. The role and the value of documentary paleoclimatic data derived from historical texts of the preinstrumental era have been emphasized during the last three decades. Direct and indirect observations of meteorological parameters (temperature, precipitation, snow-cover, cloudiness, wind etc.) in terms of narrative descriptions and/or early instrumental measurements are systematically surveyed and analyzed. The recent developments in historical climatology have pointed out the need of temporal and geographical expansion of the documentary paleoclimatic research in areas other than Northern America, Japan, Eastern Asia, Northern, Western and Central Europe. The advantages and the insufficiencies of the analysis of documentary paleoclimatic evidence have been also surveyed in detail by historians of climate[2].

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1 P. Jones – M. Mann, Climate over past millennia. *Reviews of Geophysics* 42 (RG2002) (2004) 1–42.

2 The pooling of data in large regional and international databanks, and the expansion of the research to geographical regions with long written tradition have produced significant and comprehensive studies: e.g. M. Ingram – D. Underhill – G. Farmer, The use of documentary sources for the study of past climates, in: Climate and History. Studies in past climates and their impact on Man, eds. T. Wigley – M. Ingram – G. Farmer. Cambridge – London – New York – New Rochelle – Melbourne – Sydney 1981,

The reconstruction of European climate history on the basis of medieval documentary historical evidence has provided multidisciplinary research with precious methodological tools for approaching and analyzing historical sources from a paleoclimatological point of view. The application of sophisticated methodological standards has led modern research in historical climatology to overcome shortcomings consolidated by the use of earlier studies (e.g.: the contribution of "weather compilations" in the reproduction of chronological and geographical faults). In the last three decades of the 20th century, the development in the field of historical climatology has delivered studies that exploit the wide range of documentary sources of the European Middle Ages[3]. A glance at the geographical framework that those studies cover reveals that emphasis was given to the study of documentary medieval sources of Northern, Western and Central Europe. This emphasis can be explained by the fact that paleoclimatologists of the European climate history had easy access to ready literary data from earlier "weather compilations", that took advantage of the wealthy paleoclimatic material collected from European Medieval historical texts. However, the literary paleoclimatic material built in Byzantine historical texts remained until recently underexploited – though not neglected – as fieldwork for paleoclimatic research[4]. The commonly known "weather compilations" of Rudolf Hennig (1904), Cornelis Easton (1928) and Curt Weikinn (1958), where extreme weather events from Antiquity through the early 20th century were catalogued, have included citations of accounts derived from the ancient Greek literature, as well as from some Byzantine sources[5]. Nevertheless, this material, deriving from the Greek literary tradition, is far from systematic and complete. It is obvious that the geographical focus of those authors was the medieval Northern, Western and Central Europe. On the other hand, paleoclimatologists fostered research on the Ancient Greek literature much more than the Byzantine one. References to climatic change derived from the Ancient Greek literature were investigated by Neumann[6]. Panessa published documentary evidence on the climate and environmental history of Ancient Greece[7]. Recently, a conference was devoted to the climate history of the Greek Antiquity[8].

As documentary sources of the Byzantine period had not been investigated by the researchers of historical climatology until recently, the need for researching Byzantium from a historical-climatological point of view was emphasized[9]. A considerable amount of documentary paleoclimatic data relevant to the Late Holocene climate history of the Eastern Mediterranean and the Middle East had to be uncov-

180–213; D. Fischer, Climate and history: priorities for research, in: Climate and history: studies in interdisciplinary history, eds. R. Rotberg – T. Rabb. Princeton 1981, 241–250; Jones – Mann, *ibid.*; R. Brázdil – C. Pfister – H. Wanner – H. von Storch – J. Luterbacher, Historical Climatology in Europe. The State of the Art. *Climatic Change* 70 (3) (2005) 363–430.

[3] P. Alexandre, Le Climat en Europe au Moyen-Âge. Contribution à l'histoire des variations climatiques de 1000 à 1425, d'après les sources narratives de l'Europe occidentale. Paris 1987; B. Frenzel – C. Pfister – B. Gläser, European climate reconstructed from documentary data: methods and results (2nd EPC/ESF Workshop, Mainz, 01.–03.03.1990) (*Paläoklimaforschung/Palaeoclimate Research* 7). Stuttgart 1992; E. Le Roy Ladurie, Times of Feast, Times of Famine. A History of Climate since the Year 1000. London 1972; C. Pfister – R. Brázdil – M. Barriendos, Reconstructing Past Climate and Natural Disasters in Europe Using Documentary Evidence. *PAGES News* 10 (3) (2002) 6–8. The progress of the historical-climatological research done so far has been compiled in the lengthy paper of R. Brázdil [et al.], *ibid*.

[4] I. Telelis, Medieval Warm Period and the beginning of the Little Ice Age in Eastern Mediterranean. An approach of physical and anthropogenic evidence, in: Byzanz als Raum. Zu Methoden und Inhalten der historischen Geographie des östlichen Mittelmeerraumes, eds. K. Belke – F. Hild – J. Koder – P. Soustal (*VTIB* 7). Wien 2000, 223–243.

[5] R. Hennig, Katalog bemerkenswerter Witterungsereignisse von den ältesten Zeiten bis zum Jahre 1800. Berlin 1904; C. Easton, Les hivers dans l'Europe Occidentale. Étude statistique et historique sur leur température: discussion des observations thermometriques 1852–1916 et 1757–1851: tableaux comparatifs: classification des hivers 1205–1916: notices historiques sur les hivers remarqables: bibliographie. Leyden 1928; C. Weikinn, Quellentexte zur Witterungsgeschichte Europas von der Zeitwende bis zum Jahre 1850. I. Hydrographie. I. Teil: Zeitwende – 1500. Berlin 1958.

[6] J. Neumann, Climatic change as a topic in the classical Greek and Roman literature. *Climatic Change* 7 (1985) 441–454.

[7] G. Panessa, Fonti Greche e Latine per la storia dell'ambiente e del clima nel mondo Greco. 2 vols. Pisa 1991.

[8] C. Winkle, Klimageschichte der Antike. Kolloquium veranstaltet von der Ernst Kirsten Gesellschaft und der Abteilung Alte Geschichte des Historischen Institutes der Universität Stuttgart vom 4. bis 6. Dezember 2003 in Stuttgart-Vaihingen. http://www.ahf-muenchen.de/Tagungsberichte/Berichte/pdf/2004/017-04.pdf: AHF-Information 2004, Nr. 017.

[9] C. Pfister, The potential of documentary data for the reconstruction of past climates in Europe. Discussion Papers ESF-OLIVAR Workshop, April 17–20, 2002. Lammi Finland 2002; Pfister – Brázdil – Barriendos, *op. cit.* (note 3).

ered[10]. The idea of reconstructing the climate history of Byzantium has become a research topic for specialists in Byzantine history as early as in the 1980's. The need of a systematic compilation of all available paleoclimatic documentary evidence derived from the Byzantine literary sources was emphasized in some early papers[11]. Recently, the climate history of the Byzantine Empire has become a topic of modern historical research[12]. There exist some papers which deal either with the analysis of meteorological events *per se*[13] or with the inclusion of climatic factors as agents of historical and/or cultural change[14].

The climatological information of this category of historical documentary sources – spanning over twelve centuries of textual coverage for the Eastern Mediterranean and the Middle East – is explored in this paper. Problems of interpretation and methodology are discussed on the basis of philological and historical criteria. The study attempts: (i) to evaluate the potential of the obtained dataset to reconstruct the climatic fluctuations for the Eastern Mediterranean and the Middle East during the period 300–1500 AD, and (ii) to compare documentary paleoclimatic data with existing proxy physical paleoclimatic evidence.

2. DESCRIPTION AND CHARACTER OF THE SOURCES

This section provides a survey of the documentary sources of the Byzantine period. It is generally accepted – though not without controversy – that the Byzantine period begins in AD 324, the year of the ceremonial foundation of Constantinople and ends in AD 1453, the year of the sack of this capital by the Ottomans[15]. In this research, AD 300 and 1500 were chosen as starting and ending chronologies for a technical reason. The nature of the historical sources investigated for this research is of annalistic and/or narrative form. This means that the slight expansion of the chronological thresholds of the research was selected, so that existing paleoclimatic accounts dated after AD 1453 would not be excluded from the statistical analysis. The dates quoted in this paper are computed according to the New Style calendar[16].

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10 P. Farquharson, Byzantium, Planet Earth and the Solar System, in: The Sixth Century – End or Beginning? Eds. P. Allen – E. Jeffreys (*Byzantina Australiensia* 10). Brisbane 1996, 263–269.

11 B. Croke, Climatology and Byzantine Studies (summary). *Byzantine Studies in Australia, Newsletter* 24 (1990) 7; J. Koder, "Zeitenwenden". Zur Periodisierungsfrage aus byzantinischer Sicht. *BZ* 84/85 (1991/1992) 409–422; I. Telelis, The great climatic risks of the past: The drought described by Byzantine sources (4th–6th cent. A.D.), in: Proceedings of SEP Pollution Meeting in Padova, Italy, 29.3.–2.4.1992. Padova 1992, 289–301.

12 D. Stathakopoulos, Reconstructing the climate of the Byzantine world: State of the problem and case studies, in: People and Nature in Historical Perspective, eds. J. Laszlovszky – P. Szabó. Budapest 2003, 241–250.

13 I. Telelis – E. Chrysos, The Byzantine sources as documentary evidence for the reconstruction of historical climate, in: European climate reconstructed from documentary data: methods and results, eds. B. Frenzel – C. Pfister – B. Gläser (*Paläoklimaforschung* 7 / *European Palaeoclimate and Man* 2). Stuttgart – Jena – New York 1992, 17–31; J. Koder, Climatic Change in the Fifth and Sixth Centuries? in: The Sixth Century – End or Beginning? Eds. P. Allen – E. Jeffreys (*Byzantina Australiensia* 10). Brisbane 1996, 270–285; A. Arjava, The mystery cloud of A.D. 536 in the Mediterranean sources. *DOP* 59 (2005) 73–94; I. Antoniou – A. Sinakos, The sixth-century plague, its repeated appearance until 746 AD and the explosion of the Rabaul Volcano. *BZ* 98 (2006) 1–4.

14 J. Koder, Historical aspects of a recession of cultivated land at the end of the late antiquity in the east Mediterranean, in: Evaluation of land surfaces cleared from forests in the Mediterranean region during the time of the Roman empire, ed. B. Frenzel (*European Palaeoclimate and Man* 5). Stuttgart – Jena – New York 1994, 157–167; B. Geyer, Physical Factors in the Evolution of the Landscape and Land Use, in: The Economic History of Byzantium from the Seventh through the Fifteenth Century, ed. A. Laiou (*DOS* 39). Washington, D.C. 2002, 31–45; M. Meier, Zur Wahrnehmung und Deutung von Naturkatastrophen im 6. Jahrhundert n. Chr. in: Naturkatastrophen. Beiträge zu ihrer Deutung, Wahrnehmung und Darstellung in Text und Bild von der Antike bis ins 20. Jahrhundert, eds. D. Groh – M. Kempe – F. Mauelshagen (*Literatur und Anthropologie* 13). Konstanz 2003, 45–64.

15 C. Mango, Byzantium, the Empire of New Rome. London 1980.

16 For the chronological systems used during the Byzantine period and the calculation in the New Style or Gregorian Calendar see: V. Grumel, La chronologie (*Traités d'études byzantines* 1). Paris 1958 and F. Dölger, Das Kaiserjahr der Byzantiner (*Sitzungsber. d. Bayer. Akad. d. Wissensch., phil.-hist. Klasse* 1). München 1949.

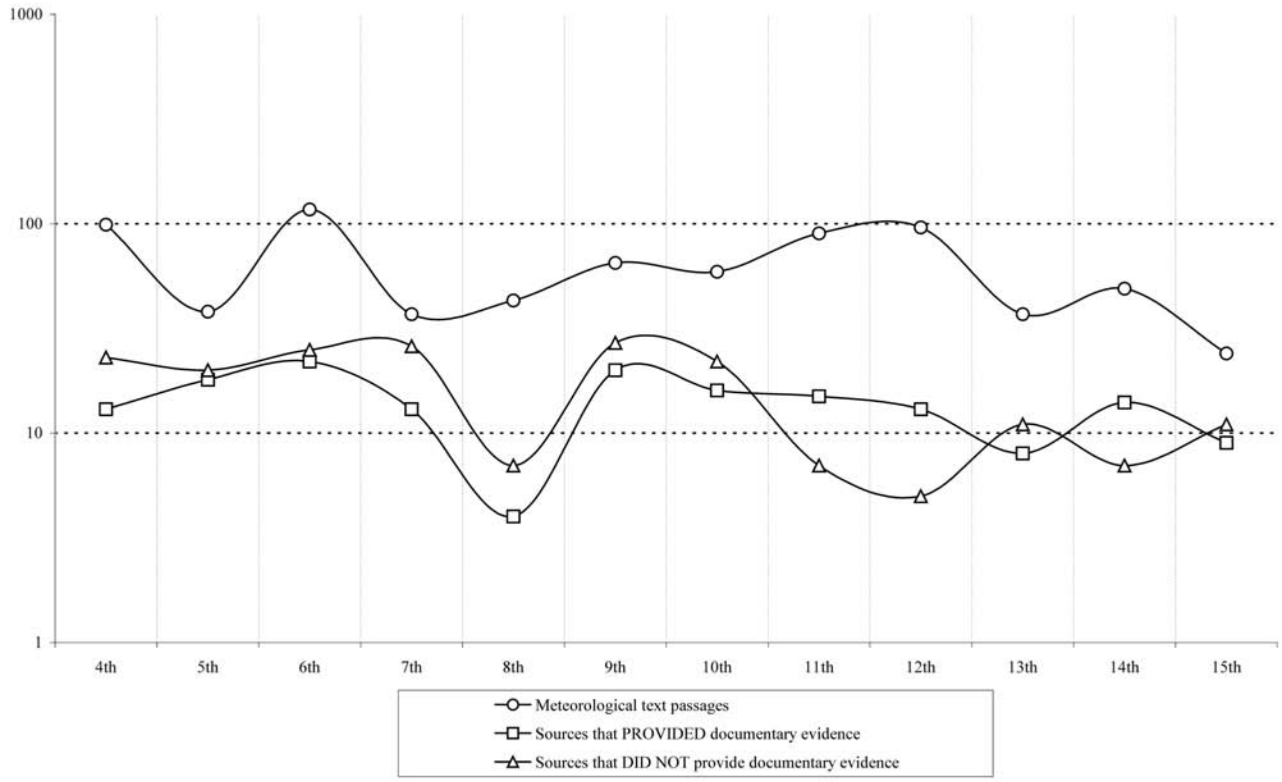

Figure 1. Chronological distribution of documentary sources and meteorological text passages.

The bulk of the documentary weather and climate information concerning the above mentioned geographical, chronological and cultural framework is contained mainly in the Byzantine narrative texts[17]. Such texts are dispersed in numerous manuscripts kept in state, public, private or monastery libraries all over the world. For the needs of this research I have excerpted the most recent editions of these texts. In total, 359 documentary sources were gone over thoroughly to discover accounts of meteorological interest. Meteorological text passages were found in 166 sources while 193 sources did not provide any relevant account (Figure 1).

A selection of sources based upon qualitative philological criteria was necessary, so that the possibility of uncovering as many as possible meteorological text passages would be higher. The philological study showed that this possibility was higher for specific genres of Byzantine narrative sources than for sources of other types (e.g. official documents, law texts, correspondence letters, commentaries and sermons, liturgical texts, literature etc.).

The most informative genres of the Byzantine narrative sources surveyed were produced by:

(i.) The historians,

(ii.) The chronographers who wrote universal chronicles starting from the Creation of the World up to their days,

(iii.) The church historians,

(iv.) The biographers who compiled Saints' Lives (*Vitae Sanctorum*) of the Byzantine Church.

[17] H. Hunger, Die hochsprachliche profane Literatur der Byzantiner. Erster Band: Philosophie, Rhetorik, Epistolographie, Geschichtsschreiburg, Geographie (*HdA* XII = *Byzantinisches Handbuch* V/1). München 1978; J. Karayannopoulos – G. Weiss, Quellenkunde zur Geschichte von Byzanz (324–1453) (*Schriften zur Geistesgeschichte des östlichen Europa* 14), 2 vols. Wiesbaden 1982.

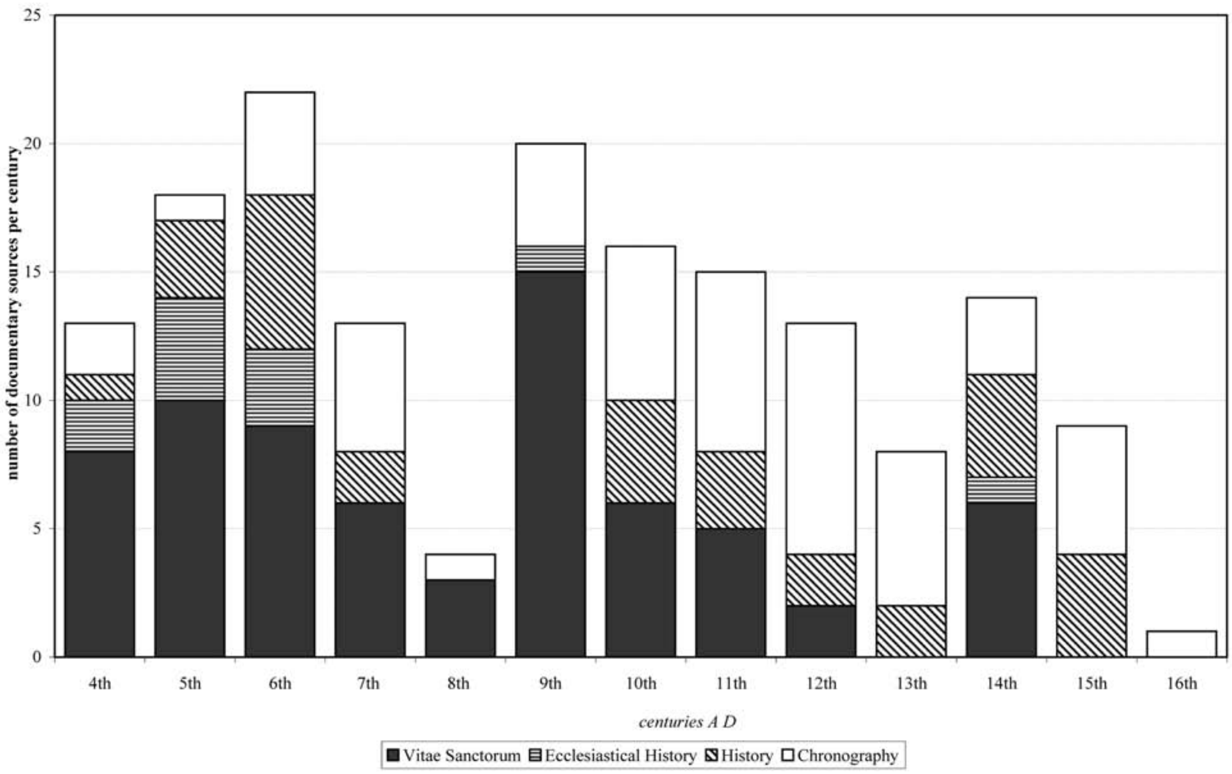

Figure 2. Genres of Byzantine narrative sources that provided documentary paleoclimatic evidence.

Furthermore, some historical writers and chronographers belonging to adjacent lingual and cultural areas of the Orient (e.g. Arabic, Syrian, Armenian or Coptic historians and chronographers the work of whom could be accessed through a translation into some European language) were explored, in order to crosscheck the material gathered from Byzantine sources and enrich it with additional material from these non-Greek, but chronologically and geographically parallel, sources. A quantitative distribution per century of the four genres of Byzantine narrative sources that provided documentary paleoclimatic evidence is shown in Figure 2.

From Figures 1 and 2 it is obvious that the documentation for the period AD 300–1500 is not uniform. The number of sources providing meteorological text passages is higher for the Early Byzantine period (4th–6th centuries AD) because of the existence of a flourishing Late Roman historiographical tradition and the composition of early ecclesiastical texts (e.g. ecclesiastical histories and Saints Lives). The 8th century is a period of a well known gap in literary tradition (the so called “Dark Age” of the Byzantine literature). The significant rise in texts over the following three centuries reflects the recovery of intellectual life during the Middle Byzantine period. The revival of the 9th–11th centuries AD is attributed to the compilation of universal chronicles and to the systematization of the production of Saints’ Lives. During the Later Byzantine period (12th–15th centuries AD) lengthy works of actual historical writers were composed[18].

A more distinct view of the periods that the meteorological text passages cover is shown in Figure 3. The longest chronological lines belong to works of chronographers who wrote universal chronicles starting from the Creation of the World up to their days.

[18] *Ibid*.

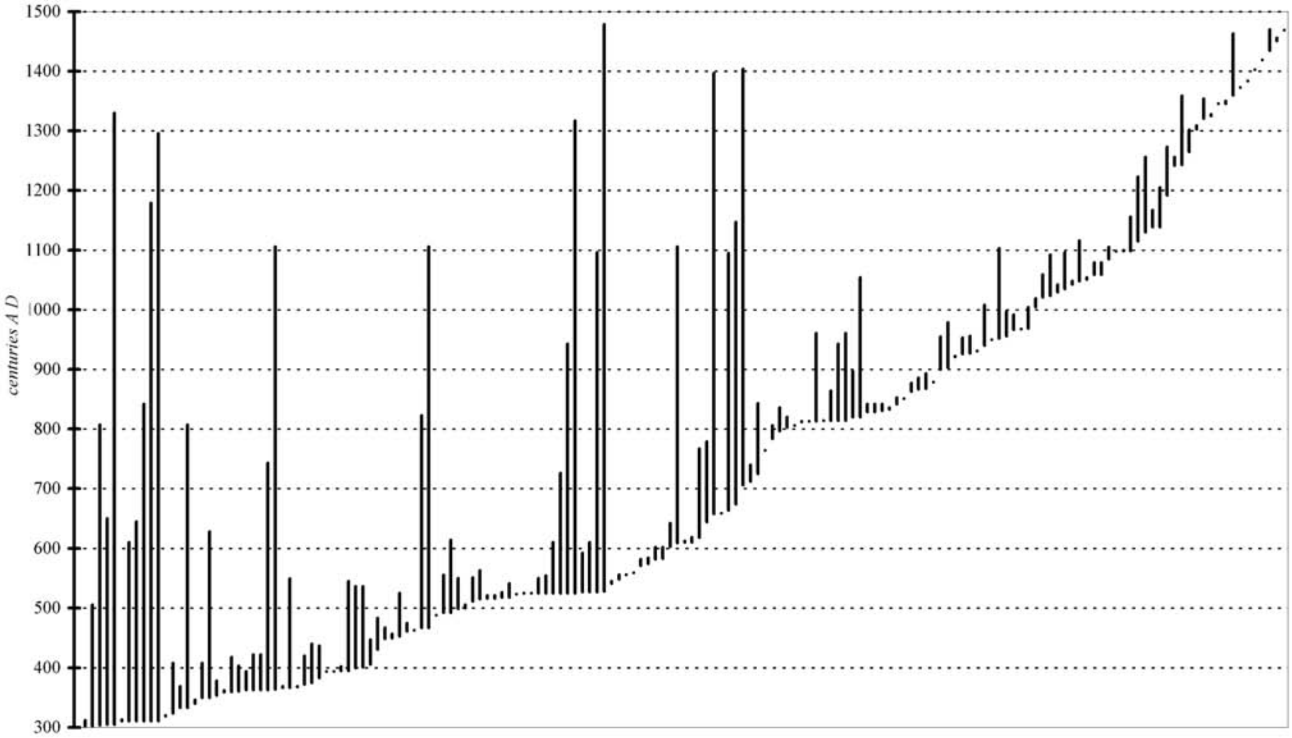

Figure 3. Chronological coverage of documentary paleoclimatic evidence for every documentary source.

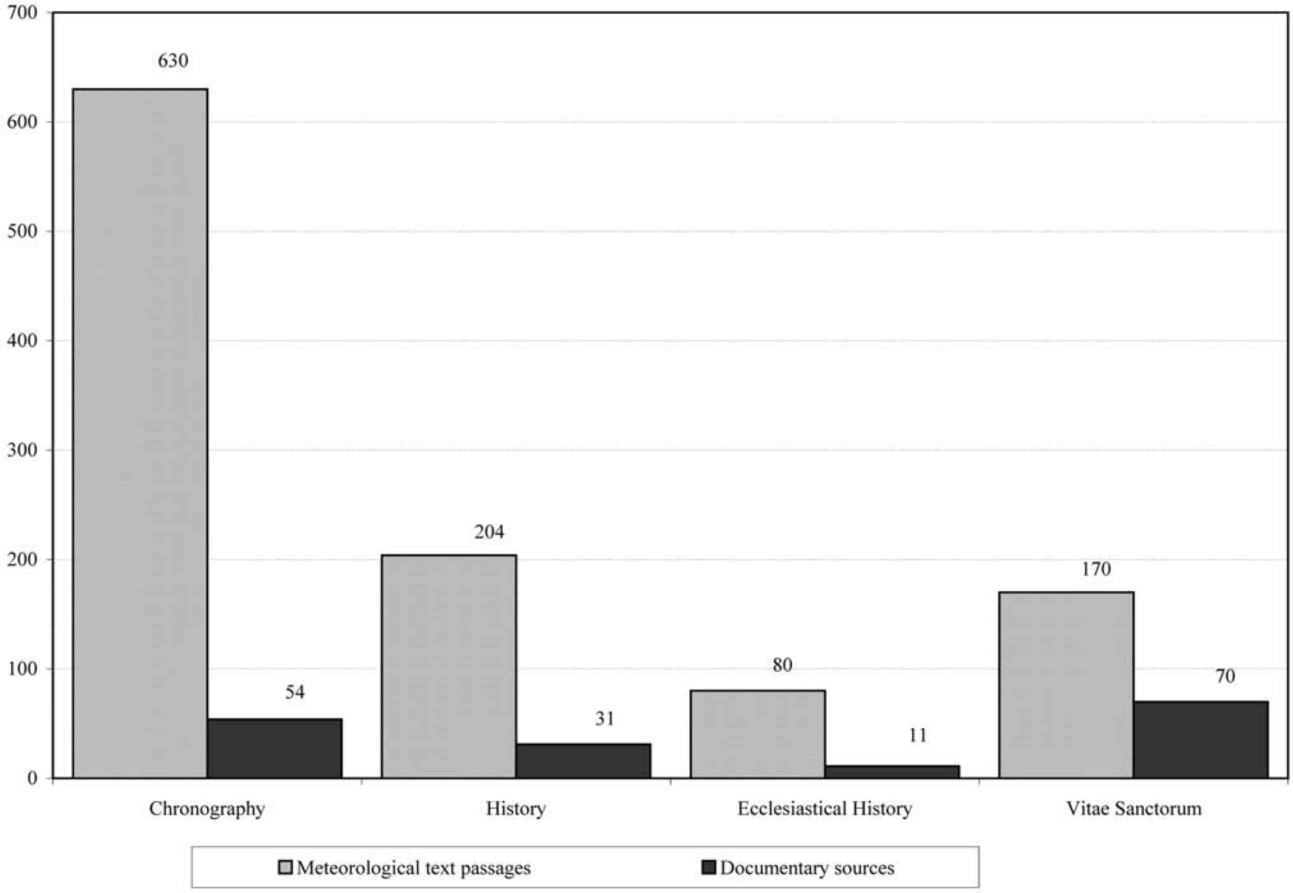

Figure 4. Distribution of total numbers of documentary sources and meteorological text passages per genre.

The contribution of the chronographic sources was decisive for the documentation of the research. More than half of the near 1083 collected meteorological text passages belong to chronographical sources (58%), while 19% to actual historical writers, 16% to Saints' Lives and only 7% to church historians (Figure 4).

3. PROBLEMS OF INTERPRETATION AND METHODOLOGY

This section discusses the characteristics of documentary paleoclimatic evidence derived from Byzantine sources and explores their limits and potentials for the reconstruction of the climate history of the Eastern Mediterranean and the Middle East during the period AD 300–1500.

The documentary data included in Byzantine sources can be classified according to the way in which meteorological variables are observed to the category of direct observations of meteorological parameters (temperature, precipitation, snow-cover, cloudiness, wind etc.) in terms of narrative descriptions[19]. The form of information is mainly narrative. The dominant mode in which the Byzantine authors used to incorporate paleoclimatic information in their texts is that of mentioning the phenomena by the use of qualitative terms (e.g. "winter severe", "cold harsh" etc.). Numerical documentary proxy data (e.g. dates on which the harvest was opened, volume of grape harvest etc.) are absent, but there are cases where data of this type are contained (e.g. "it rained for 5 days").

The researcher who attempts to reconstruct the climate history of the Byzantine period from historical documentary sources should be familiar with certain methodologies of historical research. These methodologies deal with problems concerning the dating of the sources, the establishment of the manuscript tradition and mutual relationship of sources that were copied in multiple manuscripts, the elucidation of the dating of the described events. In most cases the sources do not specify which style was used for dating events that they describe. Several chronological styles were in use during the Byzantine period. The most common was the "indiction style", in which the New Year began on September 1st[20]. Most of the sources report just one year to date an event. So, it is decided from the context or from the use of parallel sources whether the "old" or the "new" year is meant. The contemporaneity of the authors to the events they were recording is not always granted. For the Byzantine period we deal with meteorological evidence which is not strictly contemporary in the sense that the events were recorded shortly after their occurrence. Most of the surviving reports may have been copied once or several times and, consequently, in some cases the year to which an event is attributed may be only approximately calculated.

In general, the approach of the Byzantines towards natural phenomena was determined by social and religious preconceptions. For chronographers meteorological phenomena were nothing more than curiosities or marvels that were mirroring the Divine Will. In most cases their aim was to demonstrate the steady and powerful interference of God in the development of human history through a concrete eschatological scope. Because of this, they used to present the meteorological events as God's acts for the education or punishment of people. This theological internal meaning of natural phenomena did not prevent the authors from emphasizing their consequences upon material and social life. Meteorological records deal partly with cases where the phenomena caused some damage. Weather and climate were not approached from any proto-scientific perspective by Byzantine intellectuals (e.g. clergymen, early scientists), so they did not make any systematic attempt to explore the working of weather phenomena by compiling weather diaries or recording early instrumental measurements in order to make reliable

[19] Pfister – Brázdil – Barriendos, *op. cit.* (note 3).
[20] Dölger, *op. cit.* (note 16).

weather predictions[21]. It is difficult to pattern the thoughts, the feelings and the method through which the Byzantines perceived the phenomena and the changes of natural environment; especially because this understanding passes through the investigation of sparse and fragmentary accounts. Byzantine historians, chronographers or biographers were not concerned with the physical explanation of meteorological phenomena. Also, they did not go to great length by defining them in terms of time and space, because they were more interested in reporting their material consequences and supernatural interpretation. More concrete in terms of time and space were the chronographers, because of the use of annalistic patterns in reporting the events. The tendency to report damage of buildings and casualties (deaths and injuries) is more remarkable than the reporting of the experiences and reactions of those who were affected by the event. Some interest in the meteorological phenomena as links in the chain of military events can be detected in the work of historians[22]. It comes as no surprise, then, that the explicit weather observations are scanty. References to sunny or cloudy days are very sparse. Information on precipitation, extreme heat, cold (not to speak of “normal” temperatures), or snow and ice cover – though existent – lose their value because of low chronological and geographical precision. Generally speaking, the paleoclimatologist is obliged to extrapolate climatic fluctuations from crude documentary reports about extreme events (e.g. severe winters, droughts, freezing of water bodies, snow cover, heat waves, heavy rainfalls, hailfalls, storms, floods etc.). But, despite these shortcomings, the task of uncovering and analyzing all available meteorological evidence concealed in Byzantine documentary sources is worth undertaking.

Paleoclimatic research has standardized the classification of documentary paleoclimatic information derived from historical sources in various categories of direct and indirect data[23]. Documentary paleoclimatic evidence from Byzantine texts can be classified into three categories according to the meteorological data that they include (Figure 5):

(i.) Meteorological information about phenomena of long duration (weeks, months, years): e.g. severe winters, droughts, continuous rainfalls etc. This type of record is the most comprehensive in paleoclimatic information and allows for further interpretation.

(ii.) Meteorological information about meteorological phenomena of short duration (e.g. gales, hailfalls, blow of winds etc.).

(iii.) Information about flood events of unspecified cause / river’s Nile flood anomalies.

For a reliable calibration and interpretation of the obtained information the construction of criteria derived from historical and philological content analysis was necessary so that the degree of reliability of each piece of evidence could be assessed. The form and content (language, style, possible literary common places) of the meteorological text passages were approached, so that the meaning of meteorological terms and the nature of authors’ biases could be estimated.[24] Meteorological terminology was interpreted in its contemporary historical context, so that the reported climatic events could be correctly evaluated. From the textual elaboration of the material became obvious that the Byzantine authors – either contemporary to the events they describe or compilers of earlier sources – used to report what they evaluated as most interesting and significant or what they thought their readers would appreciate.

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[21] As an exeption we can mention the use of the Nilometer, namely the gauge in which the annual rise of the river was measured, that has provided the unique dataset of early scientific instrumental measurements in Eastern Mediterranean from AD 640 through modern time, cf. F. Hassan, Historical Nile Floods and Their Implications for Climatic Change. *Science* 212 (1981) 1142–1145; T. Evans, History of Nile Flows, in: The Nile. Sharing a Scarce Resource. A Historical and Technical Review of Water Management and of Economical and Legal Issue, eds. P. Howell – J. Allan. Cambridge 1994, 27–64, esp. 37–40.

[22] Telelis, *op. cit.* (introductory note *) 780–782.

[23] Cf. C. Pfister, Wetternachhersage. 500 Jahre Klimavariationen und Naturkatastrophen (1496–1995). Bern – Stuttgart – Wien 1999, 14–19.

[24] Ingram – Underhill – Farmer, *op. cit.* (note 2).

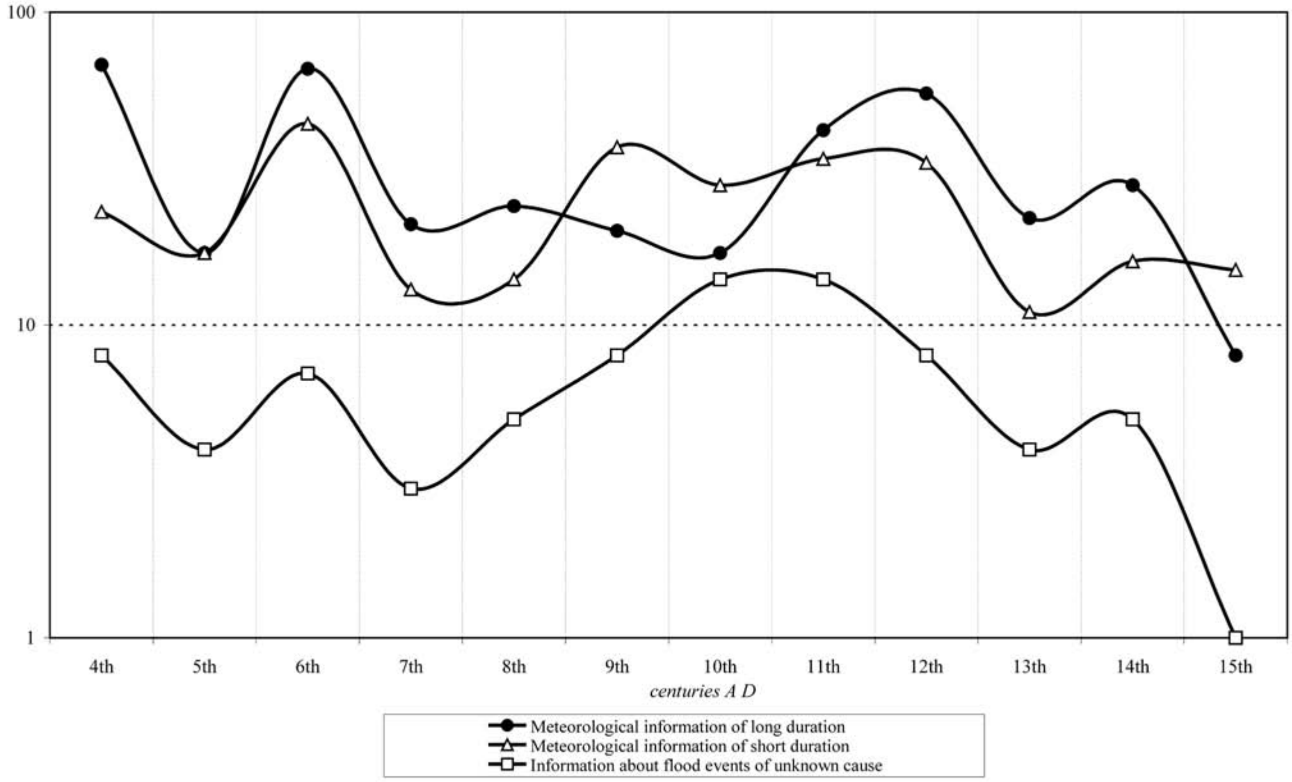

Figure 5. Chronological distribution of total numbers of paleoclimatic information (in logarithmic scale).

As it will be shown in the following sections, the meteorological information collected from Byzantine sources cannot form a systematic data series. The evidence is highly sparse, discontinuous, non-homogeneous and biased towards the recording of extreme events. The recorded observations of weather anomalies are neither annually recurrent nor systematically carried on. The character of the Byzantine narrative sources is determined by the fact that their authors – in contrast to the chronographers of the European Middle Ages – did not feel, in most cases, the need to express the intensity and the duration of a meteorological phenomenon with reference to concrete proxy climatic indicators such as the duration of precipitation, snow cover, the freezing-over of water bodies or the untimely activity of vegetation. The meteorological observations are of sporadic and general character and in most cases contain chronological inaccuracies. In many cases the analysis cannot determine the months of the year during which the occurrence of cold/hot or dry/wet takes place. On the other hand, grape harvest dates or phenological observations are absent. Unfortunately, Byzantines never began to record the dates of wine harvest or the blossoming of the trees leaving aside such types of observations. References about floods are classified in two broad categories resulting from the nature of information they contain. Reports about floods are common in cases of heavy rainfalls and they are included in the passages as consequence of them. In these cases the meteorological cause of the flood events is obvious and can be clearly associated with a wetness meteorological index. Some reports just mention the occurrence of floods without further meteorological causation or seasonal indication. In these cases the meteorological cause of the floods is not easily identifiable while these events can be associated either with a wetness meteorological index (because of the occurrence of heavy rainfalls) or with a thermal index (because of the abrupt rise of temperature in mountain massifs and the consequent melting of snow during late winter and early spring) that they are not mentioned in the passages. In any case of flood causes, references about floods are of general character and they rarely include description of their magnitude and duration as well as detailed accounts of the damage caused.

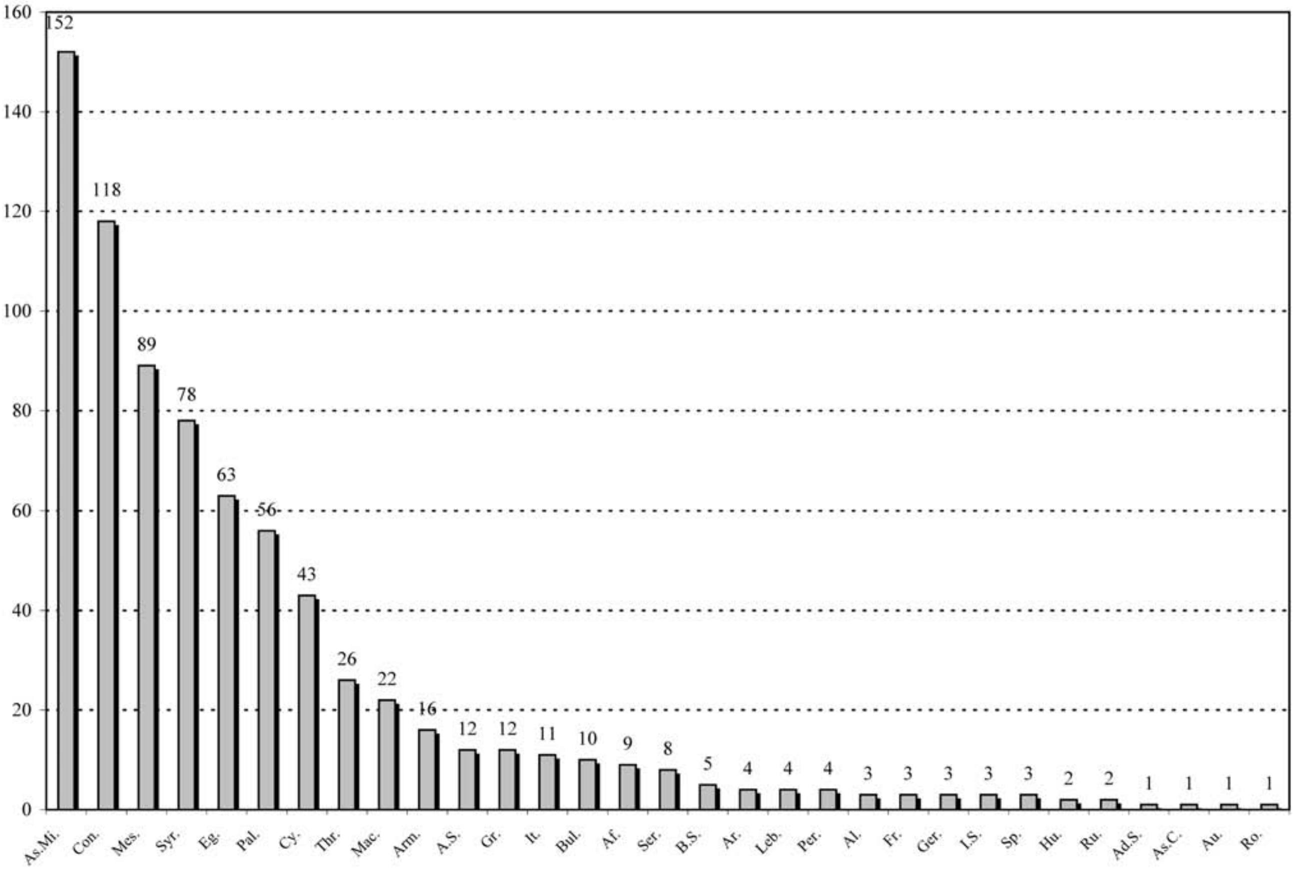

Figure 6. Geographical distribution of all meteorological text passages from Byzantine documentary sources (AD 300–1500). Legend in alphabetical order: A.S.: Aegean Sea; Ad.S.: Adriatic Sea; Af.: Africa; Al.: Albania; An.: Anatolia (Asia Minor); Ar.: Arabia; Arm.: Armenia; As.C.: Asia Central; Au.: Austria; B.S.: Black Sea; Bul.: Bulgaria; Con.: Constantinople ; Cy.: Cyprus isl.; Eg.: Egypt; Fr.: France; Ger.: Germany; Gr.: Greece; Hu.: Hungary; It.: Italy; I.S.: Ionian Sea; Leb.: Lebanon; Mac.: Macedonia; Mes.: Mesopotamia; Pal.: Palestine; Per.: Persia; Ro.: Romania; Rus.: Russia; Ser.: Serbia; Sp.: Spain; Syr.: Syria; Thr.: Thrace.

As it can be deduced from the total numbers of paleoclimatic information per century (Figure 5), the Byzantine documentary sources are poor in meteorological entries. The regional composition of the meteorological evidence shows that the data apply to a large geographical area (Figure 6). These two facts bring the problem of interpolation in space and reduce the reliability of the estimates, in particular for temperature and precipitation. Because of these characteristics, a realistic estimate of the meteorological variables of temperature and precipitation on the basis of the obtained documentary data could not be based on the widely accepted classification of documentary paleoclimatic evidence according to the methodology of developing monthly and seasonal semiquantitative thermal and wetness indices[25]. The documentary data which will be presented in the following section do not encourage the application of sophisticated statistical methods for ambitious paleoclimatic reconstructions. The deduction of weighted or simple thermal/wetness monthly indices and the summation of them in seasonal or annual scale

[25] R. Brázdil – O. Kotyza, History of Weather and Climate in the Czech Lands, vol. I (Period 1000–1500) (*Zürcher Geographische Schriften* 62). Zürich 1995; A. Ogilvie – G. Farmer, Documenting the Medieval Climate, in: Climates of the British Isles: Present, Past and Future, eds. K. Hulme – E. Barrow. London – New York 1997, 112–133; C. Pfister – J. Luterbacher – G. Schwarz-Zanetti – M. Wegmann, Winter air temperature variations in western Europe during the Early and High Middle Ages (AD 750–1300). *The Holocene* 8 (1998) 535–552.

are not feasible. This assumption has forced towards the adoption of a simple statistical method for interpreting the obtained paleoclimatic data. The use of an empirical "impressionistic" approach was necessary so that we could exploit the available data and might extract indications for possible climatic fluctuations, with – of course – all appropriate caution.

From a methodological point of view, the scheme of data classification had to be adapted to the low density and quality of data. An index of two discrete levels (-1, +1) was attributed to those phenomena of long duration (L class data of column 8 in the Catalogue of Appendix) which are documented in the sources as "cold" or "dry" (-1), and "hot" or "wet" (+1), irrespective of emphasis and intensity that was given by the authors. By the use of this simple index decadal frequencies of the meteorological anomalies were converted into an ordinal scale and by calculating decennial moving averages, it was possible to process the data in a broad semi-quantitative way. This methodology, introduced by H. Lamb for the study of historical paleoclimatic evidence, was applied also by P. Alexandre for an analogous study of medieval Western Europe[26].

Another problem was that of the regional composition of the data. The investigation of the sources revealed that the obtained paleoclimatic records were referring to wide geographical areas around the Mediterranean basin. Thus, the data should be treated in a meaningful way, so that the high geographical dispersion could be overcome and do not prohibit further statistical elaboration. For example, Anatolia (the large peninsula between the Black Sea and the Mediterranean Sea, i.e. most of modern Turkey), concentrating the higher density of documentary evidence, is dominated by various climatic regimes, that sometimes are only weakly related. In order to include the parameter of climatic variability and consider the spatial variability of the evidence, we regrouped the data set on the basis of features taken from physical geography. In particular, we identified groups of data according to the Wladimir Köppen (1931) scheme of climatic regions as modified by Glenn Trewartha (1981)[27]. This scheme, based upon average monthly temperature and precipitation values of large geographical regions, is widely accepted today for the classification of the climatic regions and respects spatial variability, which is the dominant characteristic of the Mediterranean climate (cf. Figure 8 [Pl. 1]).

With this procedure the handling of the highly dispersed data was achieved on the basis of an analogously wide-range geographical criterion and, then, by applying a broad semi-quantitative statistical analysis we were able to trace the possibility of pointing to some climatic fluctuations for the period and area under discussion.

4. PRESENTATION OF METEOROLOGICAL DATA

Meteorological evidence gathered from Byzantine documentary sources derives from the scrutiny of a total of 359 texts. This material is presented in chronological order and in code form in *Appendix*.

A general overview of the different types of meteorological information and their frequency as described in the Byzantine sources is shown in Table 1. The general impression from this table is that meteorological phenomena of long duration were the type of evidence concentrated in most of the references. From this type, lack of rain and drought as well as cold and freezing of water bodies were the most memorable types of data.

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[26] H. Lamb, Climate: Present, Past and Future, vol. 2: Climatic History and the Future. London 1977; Alexandre, *op. cit.* (note 3).

[27] W. Köppen, Klimakarte der Erde. Grundriss der Klimakunde. Berlin – Leipzig [2]1931; G. Trewartha, The Earth's Problem Climates. London [2]1981. The climatic regions and their symbols under which they are discussed in this study are presented in detail in Appendix>Sigla>Column 6.

TABLE I

Distribution of documentary paleoclimatic information derived from Byzantine sources for the period AD 300–1500

Meteorological phenomena of long duration		**Meteorological phenomena of short duration**		**Flood events**	
Winter severe (cold)	91				
Freezing of water (rivers, lakes, sea etc.)	59				
Cold harsh	59	Cold harsh	23		
Snow much	57	Snow much	14		
Flood	18	Flood	36	Floods of unknown cause	40
Rainstorm	3				
Summer rainy	1				
Winter mild	5				
Winter rainy	7				
Rainfall(s) normal	4				
Rainfall(s) heavy	42	Rainfall(s) heavy	86		
		Rainfall(s)	1		
		Rainstorm	51		
		Hailfall	35		
Heatwave	13	Heatwave	12		
Lack of rain	159				
Drought	183				
Blow of wind/s	19	Blow of wind/s	100		
		Whirlwind	2		
		Cloudy sky	6		
		Fog	2		
		Thunderbolt	32		
Various meteoro-logical phenomena (cited in general)	3	Various meteoro-logical phenomena (cited in general)	8		
				River's Nile flood anomaly	41

The regional composition of all meteorological evidence recorded in the Byzantine sources for the period AD 300–1500 is shown in Figure 6. Anatolia, Constantinople (Istanbul), Mesopotamia and Syria possess the lion's share of the references. Figure 7 shows the fluctuation of decennial moving averages of the frequencies of Temperature (warm / cold) and Rainfall (dry / wet) anomalies in various Mediterranean regions for the period AD 300–1500 as reflected in the Byzantine documentary sources. This meteorological information was included in references of phenomena of long duration. The data were grouped by the use of Köppen–Trewartha scheme of climatic regions (cf. Figure 8 [Pl. 1]).

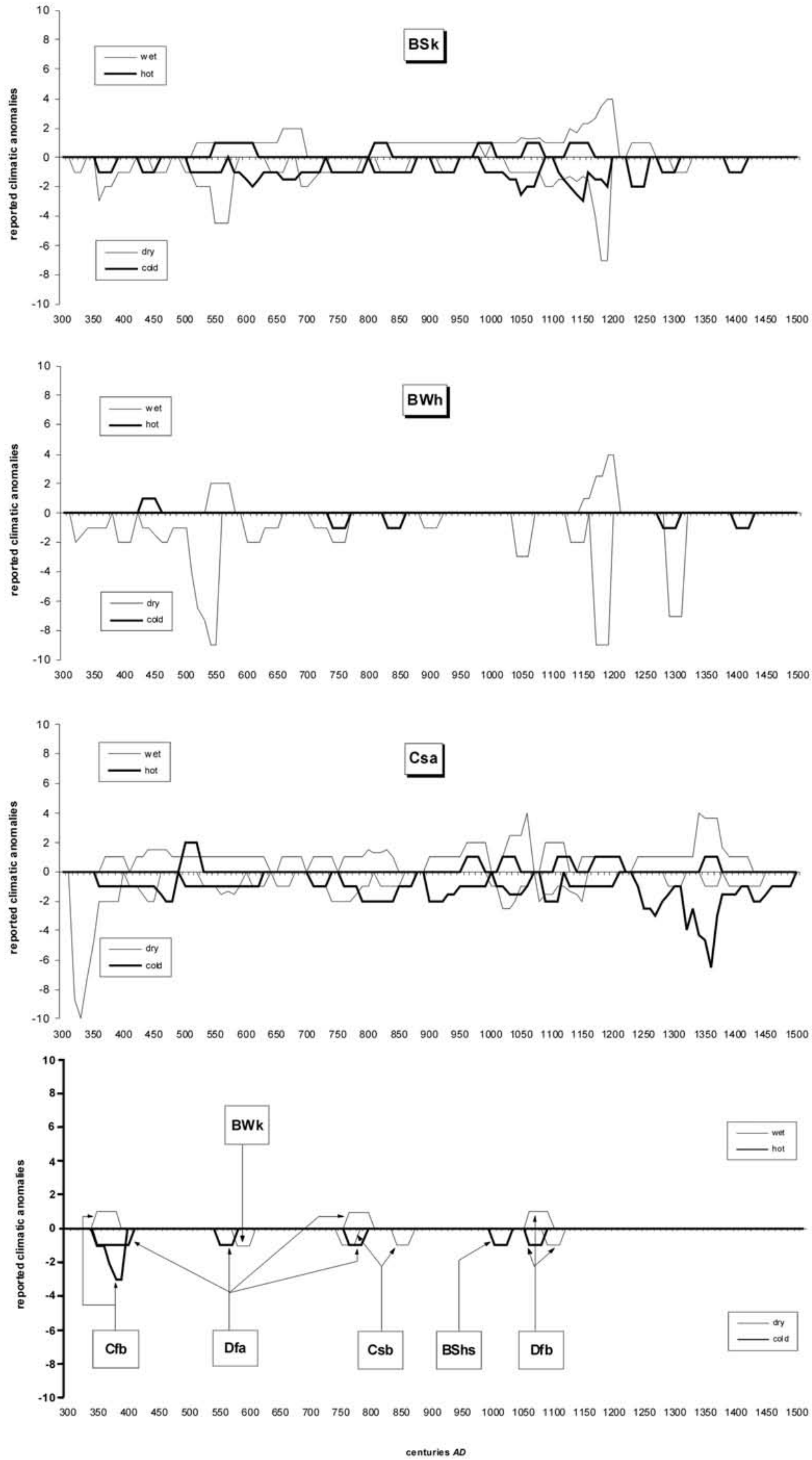

Figure 7. Fluctuation of decennial frequencies occurrence of temperature (warm / cold) and rainfall (dry / wet) anomalies in various Mediterranean regions for the period AD 300–1500 (the regions' symbols are explained in Appendix>Sigla>Column 6). Each record of reported climatic anomaly was converted into an ordinal scale by attributing simple indices (i.e. cold= -1, warm= +1; dry= -1, wet= +1), summed and the sequence normalized to account for the increase in available records through time. The curves presented are ten-year moving averages.

Though the geographical scale in the statistical elaboration of the data is very wide, some observations for possible climatic trends can be adduced (Figure 8 [Pl. 1]):

1) Temperate semi-arid [BSk], desert [BWh], and Mediterranean [Csa] climatic regions around the Mediterranean Sea concentrate the highest amount of documentary meteorological data derived from Byzantine sources. Data available for semi-arid [BShs], humid subtropical [Cfa], maritime temperate [Cfb, Csb], hot summer continental [Dfa] and warm summer continental or hemiboreal [Dfb] regions cannot support any hypothesis because of the extremely low amount of the relevant evidence.
2) From available data for specific areas around the Mediterranean Sea we obtain the following trends:
   (i.) Periods of higher frequency of cold episodes –i.e. with more than two cold events of long duration per decade– appear to be:
   for the temperate semi-arid regions [BSk]: AD 580–690, 1030–1090, 1120–1200, 1230–1260;
   for the Mediterranean regions [Csa]: AD 460–490, 790–850, 900–950, 990–1020,1030–1060, 1250–1300, 1320–1400, 1430–1450.
   (ii.) Periods of higher frequency of hot episodes (more than two hot events of long duration per decade) appear to be:
   for the Mediterranean regions [Csa]: AD 500–540.
   (iii.) Periods of higher frequency of dry episodes (more than two dry events of long duration per decade) appear to be:
   for the temperate semi-arid regions [BSk]: AD 360–390, 530–580, 690–720, 1090–1200;
   for the desert region [BWh]: AD 320–340, 390–420, 450–480, 510–560, 600–630, 740–770, 1040–1070, 1130–1200, 1290–1320;
   for the Mediterranean regions [Csa]: AD 560–590, 740–790, 1020–1050, 1070–1110, 1140–1160.
   (iv.) Periods of higher frequency of wet episodes (more than two wet events of long duration per decade) appear to be:
   for the temperate semi-arid regions [BSk]: AD 660–700, 1030–1210;
   for the desert region [BWh]: AD 540–580, 1160–1200;
   for the Mediterranean regions [Csa]: AD 440–480, 960–1000, 1030–1070, 1090–1130, 1340–1390.

The statistical analysis of the meteorological information derived from references of phenomena of short duration is shown in Figure 9 [Pl. 2]. The data were grouped by the use of Köppen –Trewartha scheme of climatic regions. From the numbers of the occurrences and the amplitude of the geographical dispersion of the data it is obvious that the statistical value of the sample is low. Despite that, we can observe a higher amount of meteorological events of short duration accumulated for the Mediterranean [Csa] regions during the 9th and 11th–12th centuries AD.

In Table II paleoclimatic information about flood events of unspecified cause and river's Nile flood anomalies is shown. The problem of the statistical insufficiency of the data is obvious here as well. A concentration of references of flood events for the Mediterranean [Csa] regions during the period AD 500–900 can be observed.

TABLE II

Decades of flood events of unspecified cause and river's Nile flood anomalies as recorded in Byzantine documentary sources AD 300–1500

decades A D	Flood events					River's Nile flood anomalies			
	BSk	BWh	Csa	Csb	Dfa	Delay	No flood	Prolonged flood	Low level flood
300–09		1	1						
350–59	1				1				
360–69	1		1						
370–79			1						
390–99						1			
400–09						1			
410–19			1						
460–69							1		
490–99	1								
500–09	1								
530–39	1		1						
570–79			1						
580–89	1		2						
660–69		1							
690–99	1								
720–99			1						
750–59						2		1	
790–99	1								
830–39	2		1						
850–59				1					
870–79	1		2						
890–99							1		
900–09	1								
940–49	1								
950–59			1				1		
960–69		1				1			5
970–79	1								
980–89							1		
990–99									1
1000–09						1			3
1040–49	1								
1050–59									3
1060–69									6
1100–09	2								
1110–19			1						
1150–59	1								1
1180–89			1						
1200–09									3
1230–39	1								

decades A D	Flood events					River's Nile flood anomalies			
	BSk	**BWh**	**Csa**	**Csb**	**Dfa**	**Delay**	**No flood**	**Prolonged flood**	**Low level flood**
1290–99									1
1310–19			1						
1370–79									2
1390–99	1								1
1400–09									1

5. DISCUSSION

Although this study has shown that documentary meteorological data pooled from Byzantine sources are sparse, the meteorological dataset emerging from the obtained evidence carries for some aspects information of admittedly limited statistical value. This information reflects the possibility of occurrence of some rough climatic fluctuations in a geographical area and time period about which meteorological scenarios remain limited and imperfect. For this task, it is important that obtained descriptive paleoclimatic documentary evidence may be correlated with the available proxy physical data so that we can evaluate any possible correlation between those two different types of proxy meteorological evidence. In this section, existing reconstructions of the climate history of the Eastern Mediterranean and the Middle East during the period AD 300–1500 are discussed and the general picture of climatic fluctuations – as obtained from the study of documentary paleoclimatic evidence derived from Byzantine sources – is compared to those reconstructions.

Until recently it was generally accepted that the climate of the past 2,000 years followed a simple sequence: the period from the 4th century BC until ca. 400 AD was characterized by a generally warm climate that possibly supported the height of the Roman Imperium; it is therefore sometimes called as "Roman Climate Optimum" (RCO). Until ca. 900 AD the climate was unstable characterized as the "Dark Ages Cold Period" (DACP). The following 500 years included a mild period (approximately 1080–1350 AD). However, remarkable oscillations are reported. This period is known as the "Medieval Warm Period" (MWP) which lasted roughly until the 14th century AD. There was a renewal of warmth between 1000 and 1200 AD at least in Europe and a significant colder phase between the 14th and 19th centuries, the so-called "Little Ice Age" (LIA) succeeded by the modern globally extensive warming[28].

There is some debate about the nature and temporal situation of the MWP, as well as the climate deterioration of the LIA that followed. The worldwide nature of these events and their chronology is still discussed. One can observe that this scheme of climatic change functions more as a model of periodisation for modern paleoclimatic research than a fully developed model of global or hemispheric climatic change documented by information which paleoclimate archives (tree rings, varved sediments, ice cores, historical records etc.) have provided[29]. Little is known, however, about the impact of this climatic variability on the southeastern European continent and the Middle East. From a recent comparative investigation of proxy paleoclimatic data[30] we can assume that neither MWP nor LIA had the

[28] Lamb, *op. cit.* (note 26); F. McDermott – D. Mattey – C. Hawkesworth, Centennial-scale Holocene climate variability revealed by a high-resolution speleothem $\delta^{18}O$ record from SW Ireland. *Science* 294 (2001) 1328–1331.

[29] R. Bradley, Climate paradigms for the last millennium. *PAGES Newsletter* 8 (2000) 2–3; W. Broecker, Was the Medieval Warm Period global? *Science* 291 (2001) 1497–1499; R.S. Bradley – K.R. Briffa – T.J. Crowley – M.K. Hughes – P.D. Jones – M.E. Mann, The scope of Medieval warming. *Science* 292 (2001) 2011–2012; R.S. Bradley – M.K Hughes – H.F. Diaz, Climate in Medieval Time. *Science* 302 (2003) 404–405.

[30] W. Soon – S. Baliunas – C. Idso – S. Idso – D. Legates, Reconstructing Climatic and Environmental Changes of the Past 1000 Years: A Reappraisal. *Energy & Environment* 14 (2003) 233–296. A recently published study attempts to review all available multidisciplinary studies concerning Mediterranean climatic variability in the past: J. Luterbacher (and 48 coauthors), Mediterranean climate variability over the last centuries: A review, in: The Mediterranean Climate: an overview of the main characteristics and issues, eds. P. Lionello – P. Malanotte-Rizzoli – R. Boscolo. Amsterdam 2006, 27–148.

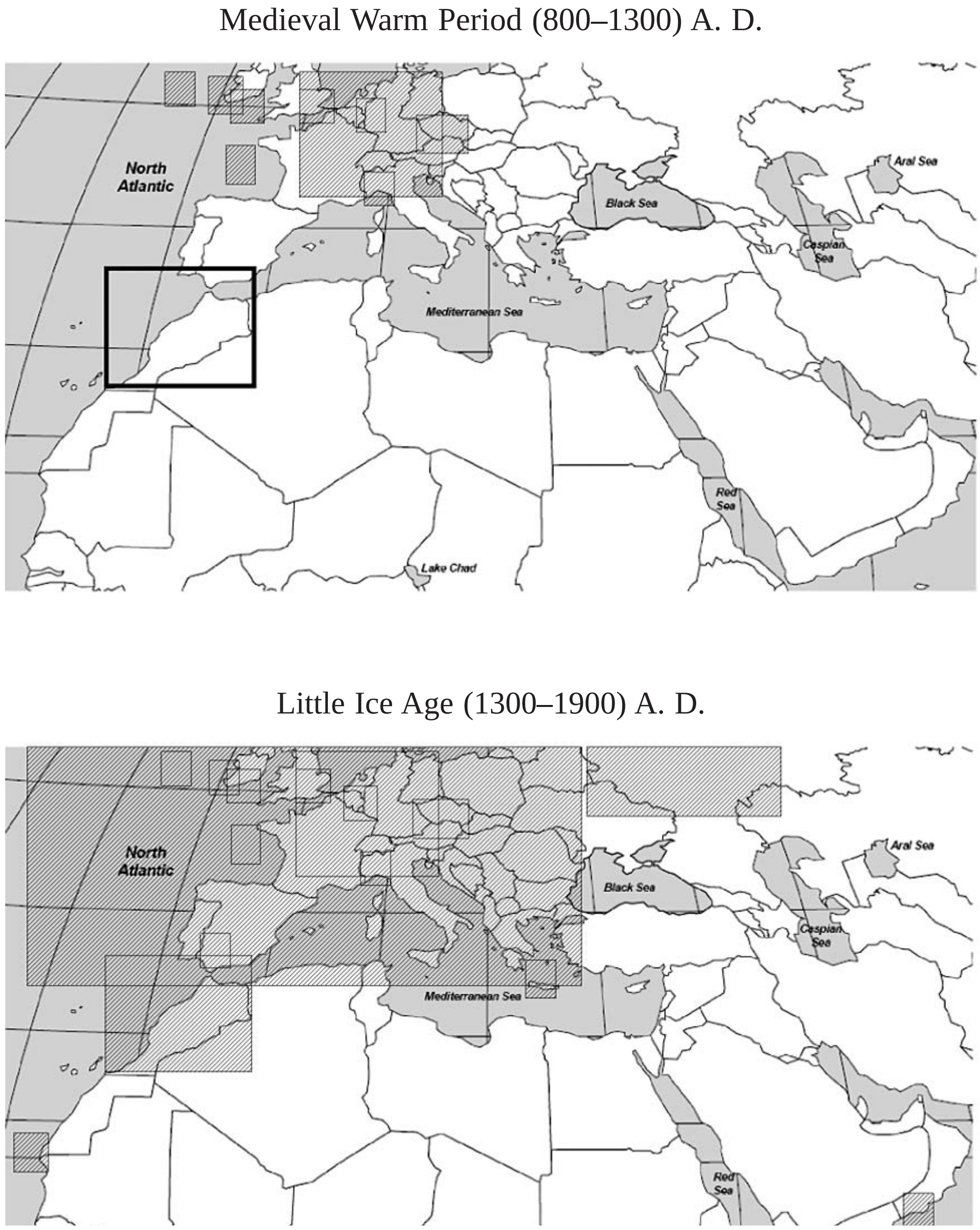

Figure 10. Geographical distribution of local answers to the questions "Is there an objectively discernible climatic anomaly during the Little Ice Age interval (1300–1900) and during the Medieval Warm Period (800–1300)?" In these plots the wider Mediterranean area is focused. "Yes" is indicated by light-filled-squares or unfilled boxes; "undecided" is shown with bold-unfilled-box.*.

same impact on the Eastern Mediterranean and the Middle East as on Central and Northern Europe (Figure 10).

Were temperature and humidity changes in the Eastern Mediterranean and the Middle East during the Late Antiquity and the Middle Ages a regional manifestation of global and/or hemispheric variability during the same periods? The answer to this question may be given through the correlation of regional proxy paleoclimatic evidence with hemispheric change data. The development of disciplines like dendrochronology, palynology, sedimentology and limnology during the last decades has allowed scientists to identify several major climatic fluctuations during the last 2,000 years using the proxy data analysis for the Eastern Mediterranean and the Middle East. An overview of these fluctuations follows.

* After W. Soon [et al.], *ibid*., 77–78

I. "ROMAN CLIMATIC OPTIMUM" (400 BC–AD 500)

Many scientists have come to the conclusion that, since classical times (400 BC), the Mediterranean has been experiencing a continuous trend towards drier conditions characterized by a gradual decrease in rainfall and a progressive rise in temperature, factors that favor a trend toward aridity[31]. Not without debate has been approached the climate history of North Africa and the widely held view that there has been significant climatic change in North Africa since Roman times[32]. Some scientists who investigated physical proxy paleoclimatic data in regional scale have come to opposite conclusions. During most of the period in which the Roman and Byzantine empires ruled the Mediterranean basin the climate is supposed to have been colder and thus more humid. From an ^{18}O core-isotope[33] curve from the Sea of Galilee (Israel) a cold and humid phase can be deduced around 2300 BP (±300 BC). At about 1700–1800 BP (±200–300 AD) an abrupt change in the $\delta^{13}C$ curve from the Sea of Galilee (Israel) core indicates a short phase of warm climate causing the level of the sea to rise[34]. The salt caves of the Mount Sedom (Israel) provide debris data that also testify a higher precipitation in Roman times. The cold climate most likely started sometime between 300–200 BC[35]. From a gradual shift to lower $\delta^{18}O$ values of marine sedimentary records from the Southeastern Mediterranean coast (Israel) ca. 2,000 BP until ca. 1000 BP (±100–1000 AD), a relatively short humid phase has been suggested.[36] More significant may be the finding that Lake Van in Turkey tended to be "abnormally" high between the years AD 250 and 550[37]. A highstand lake level of the Dead Sea (Israel) occurred in the 4th century AD during the early Byzantine period indicating a significant rise in the annual rainfall in the region[38]. Archaeological data from Palestine support the hypothesis of increased humidity during this period[39], while the analysis of teeth-enamels from archaeological sites in northern Jordan indicate that the Early Byzantine period $\delta^{18}O$ values correspond to wetter conditions compared to the Late Byzantine period.[40] Palaeoflood records inferred from slack water deposits and canyon palaeostage indicators for the hyperarid region of Nahal Zin in the

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[31] H. Lamb, Climate, History and the Modern World. London 1982; O. Reale – P. Dirmeyer, Modelling the effects of vegetation on Mediterranean climate during the Roman Classical Period, Part I: Climate history and model sensitivity. *Global and Planetary Change* 25 (2000) 163–184; B. Schilman – M. Bar-Matthews – A. Almogi-Labin – B. Luz, Global climate instability reflected by Eastern Mediterranean marine records during the late Holocene. *Palaeogeography, Palaeoclimatology, Palaeoecology* 176 (2001) 157–176; M. Bar-Matthews – A. Ayalon – M. Gilmour – A. Matthews – C. Hawkersworth, Sea-land oxygen isotopic relationships from planktonic foraminifera and speleothems in the Eastern Mediterranean region and their implication for paleorainfall during interglacial intervals. *Geochimica et Cosmochimica Acta* 67 (17) (2003) 3181–3199.

[32] R. Rubin, The debate over climatic changes in the Negev. *Palestine Exploration Quarterly* 121 (1989) 71–78; K. Engvild, A review of the risks of sudden global cooling and its effects on agriculture. *Agricultural and Forest Meteorology* 115 (2003) 127–137.

[33] The isotopes are forms of a chemical element. The word comes from the fact that all isotopes of an element are located at the same place on the periodic table. In scientific nomenclature δ is used as symbol of the isotope. The number of nucleons is denoted as a superscripted prefix to the chemical symbol (e.g. $\delta^{18}O$ = oxygen isotope, $\delta^{13}C$ = carbon isotope). $\delta^{18}O$ and $\delta^{13}C$ are stable physical isotopes created from natural chemical processes and can be found in various forms of natural deposits (eg. icesheets, peatbogs, speleothems etc). Recent scientific research has managed to analyze the presence of these elements in datable deposits and exploit their variations in order to extract proxy physical evidence regarding climatic change.

[34] A. Issar, Climate Change and History during the Holocene in the Eastern Mediterranean, in: Water, Environment and Society in Times of Climatic Change. Contributions from an International Workshop within the Framework of International Hydrological Program (IHP) UNESCO held at Ben-Gurion University, eds. A. Issar – N. Brown. Dordrecht 1998, 113–128, cf. 123–125.

[35] A. Issar – D. Yakir, The Roman period's colder climate. *Biblical Archaeology* 60 (1997) 101–106.

[36] Schilman [et al.], *op. cit.* (note 31).

[37] N. Brown, Climate Change and Human History. Some Indications from Europe, AD 400–1400. *Environmental Pollution* 83 (1994) 37–43.

[38] R. Bookman – Y. Enzel – A. Agnon – M. Stein, Late Holocene lake levels of the Dead Sea. *Geological Society of America Bulletin* 116 (5–6) (2004) 555–571.

[39] Y. Hirschfeld, A Climatic Change in the Early Byzantine Period? Some Archaeological Evidence. *Palestine Exploration Quarterly* 136 (2) (2004) 133–149.

[40] A. Alakkam, Climate change and archaeological site distribution during the past four millennia in northern Jordan utilizing oxygen isotope analysis of human tooth enamel and geographic information system. University of Arkansas (Ph.D.) 2002.

Negev Desert (Israel) suggest a phase with few and small floods for the period 1730–1380 yr BP (±270–620 AD)[41].

From more northern latitudes of the Eastern Mediterranean, pollen core data from northwestern Crete (Greece) suggest that no major climatic changes took place during the Holocene but the first two millennia of the Holocene tended to be drier than the late Holocene when there was an increase in moisture-demanding trees[42]. The $\delta^{18}O$ curve of Lake Van (Turkey) shows a short depletion trend at the same time and an opposite trend followed at ca. 1800 BP (±200 AD), most probably due to a warm period of about a century[43]. In the Balkan area, speleothem isotopic data from stalagmite profiles of the Ceremosjna cave (Eastern Serbia) has provided paleotemperature reconstructions indicating a general trend of lowering of the average temperature with significant long-term temperature fluctuations. Though the drawing of climatic conclusions based solely upon the changes of values of carbon-isotopes is not yet warranted, the period 0–520 AD is identified as cool[44].

The theory of progressive humidification of the Mediterranean climate has also been supported by the findings of sedimentology. The development of the "Younger Fill" –the recent erosional and alluviational aggradation in the Mediterranean rivers– is attributed to a phase of wetter and cooler climate. Vita Finzi has argued for climatic change as the key reason behind the erosion since late antiquity[45]. However, the causes of valley sedimentation are still controversial[46]. For the western side of the Mediterranean basin it has been suggested that fluvial-geomorphological records from Medjerda basin (Northern Tunisia) corroborate with marine pollen profiles indicating more arid conditions in Northern Tunisia which may correspond with Northern Hemisphere cooling periods during late Antiquity[47].

The findings obtained from our research do not seem to support seriously any of the above mentioned scenarios of climatic variability. The cold episodes of the period 460–490 and the wet ones c. AD 440–480 for the Mediterranean regions [Csa] seem to indicate a cold and humid scenario. The dry scenario seems to be supported by the dry periods AD 320–340, 390–420, 450–480 for the desert region [BWh] as well as the dry period AD 360–390 for the temperate semi-arid regions [BSk] (Figure 8 [Pl. 1]). From a pure statistical point of view the dry decades dominate.

II. "DARK AGES COLD PERIOD" (500–800 AD)

A period of cooler average climate was during the so-called "Dark Ages" which started at AD 536 by a two year unremitting world-wide chill of a sun darkened by volcanic dust in the stratosphere. About the possible causes, the perception and the consequences to climatic change of the AD 536 dust veil event a lot has been written so far[48]. If we set aside the controversy about this event, the study of the

[41] N. Greenbaum – A. Schick – V. Baker, The Palaeoflood Record of a Hyperarid Catchment, Nahal Zin, Negev Desert, Israel. *Earth Surface Processes and Landforms* 25 (2000) 951–971.

[42] S. Bottema – A. Sarpaki, Environmental change in Crete: a 9000-year record of Holocene vegetation history and the effect of the Santorini eruption. *The Holocene* 13 (5) (2003) 733–749.

[43] Issar, *op. cit.* (note 34).

[44] A. Kacanski – I. Carmi – A. Shemesh – J. Kronfeld – R. Yam – A. Flexer, Late Holocene Climatic Change in the Balkans: Speleothem Isotopic Data from Serbia. *Radiocarbon* 43 (2) (2001) 647–658.

[45] C. Vita-Finzi, The Mediterranean Valleys: Geological Changes in Historical Times. Cambridge 1969.

[46] J. Bintliff, Time, process and catastrophism in the study of Mediterranean alluvial history: a review. *World Archaeology* 33 (3) (2002) 417–435; R. Pope – K. Wilkinson – A. Millington, Human and Climatic Impact on Late Quaternary Deposition in the Sparta Basin Piedmont: Evidence from Alluvial Fan Systems. *Geoarchaeology* 18 (7) (2003) 685–724; M. Hounslow – A. Chepstow-Lusty, A record of soil loss from Butrint, southern Albania, using mineral magnetism indicators and charcoal (AD 450 to 1200). *The Holocene* 14 (3) (2004) 321–333.

[47] D. Faust – C. Zielhofer – R. Escuadero – F. del Olmo, High-resolution fluvial record of late Holocene geomorphic change in northern Tunisia: climatic or human impact? *Quaternary Science Reviews* 23 (2004) 1757–1775.

[48] J. Gunn (ed.), The Years without Summer. Tracing A.D. 536 and its aftermath (*BAR international Series* 872). Oxford 2000; Stathakopoulos, *op. cit.*; Arjava, *op. cit.*; Antoniou – Sinakos, *op. cit.*

paleoclimatic reconstructions for the period AD 500–800 in the Eastern Mediterranean and the Middle East provides contradictory evidence about the evolution of climate.

At about 1500 BP (500 AD), there is evidence of warming up, which, according to the isotope curves of the Sea of Galilee and the stalagmites in the caves of Galilee (Israel), peaked at ca. 1200 BP (800 AD). Towards the end of the Byzantine period and during the Arab period (1300–1000 BP = 700–1000 AD) the level of the Mediterranean Sea came up, indicating an increase in the global temperatures[49]. A period rich in high magnitude floods is identified by the study of catchments' paleohydrology of the northern Negev (Israel) in 1380–920 BP (620–1080 AD)[50]. During this period the gradual abandonment of the Nabatean cities of the Negev desert (Israel) and the farms surrounding them took place. The issue whether climatic fluctuations of that period can explain the cultural and physical desertification of the Negev is still under debate[51]. Evidence for maximum precipitation at about 1300 BP (700 AD) from various land records in the Eastern Mediterranean including tree assemblages have been estimated as typical to humid conditions[52]. Between the late 5th and late 8th century AD a significant Dead Sea lake level fall occurred[53]. The depiction of the Dead Sea on the Madaba mosaic map dated to either late 6th or 7th century AD represents a period of unusually dry climate, which caused a recession of the lake level and consequently the drying of the southern basin[54].

In Eastern Macedonia (Greece) dates from deposits based on archaeological remains from the Late Roman to the Early Byzantine periods testify to the acceleration of alluviation rates in the basin of Drama from the 6th century BC to the 7th century AD. This acceleration of alluvial aggradation during the Early Byzantine period is attributed to humid climatic conditions[55]. A warm period from AD 520 to 1040 is indicated by speleothem isotopic data from stalagmite profiles of the cave Ceremosjna (Eastern Serbia)[56]. Moreover, increased humidity in Northern Africa was also documented by the increase of the Nile River runoff[57], while the reconstruction of the environmental history of the Tigrean Plateau (northern Ethiopia) based on geomorphological, palynological, archaeological, and historical evidence suggests an environmental deterioration that occurred during the 7th–8th centuries AD, with a famine in the 9th century, most likely as a consequence of soil exhaustion and erosion caused by heavy rains[58].

The findings obtained from our research are clearer for these centuries. The hot episodes for the Mediterranean regions [Csa] AD 500–540 and the periods of higher frequency of dry episodes AD 530–580, 690–720 for the temperate semi-arid regions [BSk], AD 510–560, 600–630, 740–770 for the desert region [BWh] and AD 560–590, 740–790 for the Mediterranean regions [Csa] correspond well

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49 Issar, *op. cit.*

50 A. Frumkin – N. Greenbaum – A. Schick, Paleohydrology of the Northern Negev: Comparative Evaluation of Two Catchments, in: Water, Environment and Society in Times of Climatic Change: Contributions from an International Workshop within the Framework of International Hydrological Program (IHP) UNESCO, held at Ben-Gurion University, eds. A. Issar – N. Brown. Dordrecht 1998, 97–111.

51 Issar, *op. cit.*; S. Rosen, The decline of desert agriculture: a view from the classical period Negev, in: The Archaeology of Drylands: Living at the Margin, eds. G. Barker – D. Gilbertson (*One World Archaeology* 39), London 2000, 45–62; G. Barker, A tale of two deserts: contrasting desertification histories on Rome's desert frontiers. *World Archaeology* 33 (3) (2002) 488–507, p. 503.

52 Schilman [et al.], *op. cit.*

53 Y. Enzel – R. Bookman – D. Sharon – H. Gvirtzman – U. Dayan – B. Ziv – M. Steinc, Late Holocene climates of the Near East deduced from Dead Sea level variations and modern regional winter rainfall. *Quaternary Research* 60 (2003) 263–273; Bookman [et al.], *op. cit.*

54 D. Amiran, The Madada Mosaic Map as a Climate Indicator for the Sixth Century. *Israel Exploration Journal* 47 (1997) 97–99.

55 L. Lespez, Geomorphic responses to long-term land use changes in Eastern Macedonia (Greece). *Catena* 51 (2003) 181–208.

56 Kacanski [et al.], *op. cit.*

57 S. Nicholson, Saharan climates in historic times, in: The Sahara and the Nile, eds. M. Williams – H. Faure. Rotterdam 1980, 173–200.

58 K. Bard – M. Coltorti – M. Di Blasi – F. Dramis – R. Fattovich, The Environmental History of Tigray (Northern Ethiopia) in the Middle and Late Holocene: A Preliminary Outline. *African Archaeological Review* 17 (2) (2000) 65–86, 80–81.

with proxy physical evidence depicting a scenario of unusually dry climate for these centuries (Figure 8 [Pl. 1]).

III. MEDIEVAL WARM PERIOD (800–1300 AD)

The MWP is a period of relatively warm conditions the timing and the geography of which primarily depends on the time resolution and the spatial distribution of the available proxy data[59]. There is strong evidence from early European documentary records that winter temperatures in Western Europe were quite mild during at least part of the period AD 750–1300[60]. Wetter regional conditions probably occurred all over the Middle East region, suggesting that the local SE Mediterranean rainfall increased simultaneously with an enhanced monsoonal activity in North Africa[61].

The period 1380–880 yr BP (620–1120 AD) is characterized by many high magnitude floods on the basis of paleoflood records from the Negev Desert (Israel). A small number of very large floods occurred during the period 880–530 yr BP (1120–1470 AD) suggesting wetter climatic conditions[62]. There is good correlation between this many large floods period and high Dead Sea levels. Between the 1000 and 1200 AD a rise of the Dead Sea level took place[63]. The humid period at about 800 BP (1200 AD) is also indicated by the low $\delta^{18}O$ values of cave deposits in Israel[64]. The MWP also corresponds to high Saharan lake levels, an event which also coincides with a precipitation maximum at the Nile headwaters. Analysis of Nile flooding – which originates with rains in the Ethiopian highlands – reveals minimum flow during the years 930 to 1070 and 1180 to 1350 and maximum Nile floods during 1070 to 1180[65]. According to the pollen analysis of lakes Abant and Yeniçağa (Turkey), there were no dramatic changes in climate or vegetation around AD 977[66]. Limnological and archaeological data from Central Asia and the Caspian region indicate a milder, less continental climate with more precipitation approximately from the 9th through 12th centuries (Solomina – Alverson [note 73]). The speleothem isotopic data the Ceremosjna Cave (Eastern Serbia) indicate a cold period initiating from AD 1040[67].

The findings obtained from this research (Figure 8 [Pl. 1]) correspond to the picture of wetter regional conditions prevailing over the Eastern Mediterranean and the Middle East region during the MWP. The higher frequency of cold decades for the temperate semi-arid regions [BSk] (AD 1030–1090, 1120–1200, 1230–1260) and the Mediterranean regions [Csa] (AD 790–850, 900–950, 990–1020, 1030–1060, 1250–1300) as well as the relatively high total number of wet decades for the temperate semi-arid regions [BSk] (AD 1030–1210), the desert region [BWh] (AD 1160–1200) and the Mediterranean regions [Csa] (AD 960–1000, 1030–1070, 1090–1130) seem to support the scenario of wetter conditions. On the other hand, periods with higher frequency of dry episodes in the temperate semi-arid regions [BSk] (AD 1090–1200), the desert region [BWh] (AD 1040–1070, 1130–1200) and the Mediterranean regions [Csa] (AD 1020–1050, 1070–1110, 1140–1160) are not absent probably suggesting regional variations and converse trends.

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59 Bradley – Hughes – Diaz, *op. cit.*
60 Pfister [et al.], *op. cit.*
61 Schilman [et al.], *op. cit.* (note 31).
62 Greenbaum [et al.], *op. cit.* (note 41).
63 Issar, *op. cit.*; Enzel [et al.], *op. cit.*; Bookman [et al.], *op. cit.*
64 Schilman [et al.], *op. cit.*
65 Hassan, *op. cit.*; W. Quinn, A study of Southern Oscillation-related climatic activity for AD 622–1900 incorporating Nile River flood data, in: El Niño historical and paleoclimatic aspects of the Southern Oscillation, eds. H. Diaz – V. Markgraf. Cambridge 1992, 119–149.
66 Ü. Akkemik – B. Aytuğ – S. Güzel, Archaeobotanical and dendroarchaeological studies in the Ilgarini Cave, Pınarbaşı-Kastamonu, Turkey. *Turkish Journal of Agriculture and Forestry* 28 (1) (2004) 9–17.
67 Kacanski [et al.], *op. cit.*

IV. LITTLE ICE AGE (AFTER 1300 AD)

The LIA has also been a controversial climatic period regarding its temporal and spatial scaling. For Southern Europe the LIA is well attested by proxy evidence. Tree-ring records from the Alps and the Mediterranean for the period 12th–19th centuries indicate relatively warm temperatures before 1335 AD, a period of cooler climate until 1456 AD, and another cooling through the duration of the Little Ice Age until about 1860 AD[68]. But what was the situation in the Eastern Mediterranean and the Middle East? It has been concluded from various proxies that the climatic conditions that induced the LIA glacier advances in the European Alps were also responsible for an increase in flooding frequency and sedimentation rate during the same period in the Mediterranean Europe[69]. An increase in alluvial aggradation in Southern Europe is often attributed to climatic deterioration associated with LIA for the period 15th–19th centuries. In Greece, an increase in flood frequency and alluvial aggradation has been correlated with the hydroclimatic changes of this period[70].

The beginning of the LIA for the Eastern Mediterranean and the Middle East is associated with warm and dry conditions as indicated by a pronounced trend of the isotopes of the Sea of Galilee (Israel) and of Lake Van (Turkey) to become heavier during the period 800–500 BP (1200–1500 AD), while the level of the Dead Sea droped[71]. This period was succeeded by a colder and probably more humid phase ca. 500–100 BP (±1500–1900 AD) in the Mediterranean region, which coincided with the LIA, as indicated by a depletion trend in the $\delta^{18}O$ curves of the Sea of Galilee and Lake Van cores[72]. Cold conditions dominated from the 13th to 19th centuries, though interrupted by a short warm period from the end of the 14th through early 15th century are indicated by limnological and archaeological data from Central Asia and the Caspian region[73].

Colder but drier conditions based on cave deposits have also been suggested for the period (880–60 yr BP= 1120–1940 AD). This period is characterized by low flood frequency as palaeoflood records from the Negev Desert (Israel) indicate and may be linked to a drier climate. The speleothem isotopic data of the Ceremosjna Cave (Eastern Serbia) indicate a cold period spanning from AD 1040 until present time[74]. Major episodes of high Nile floods are recorded for the period 1350 to 1470 AD[75].

The findings obtained from this research for this period are sparse and cannot support generalizations (Figure 8 [Pl. 1]). The cold episodes of the period AD 1230–1260 for the temperate semi-arid regions [BSk] and AD 1320–1400, 1430–1450 for the Mediterranean regions [Csa], as well as the wet period AD 1340–1390 for the Mediterranean regions [Csa] might fit well to the LIA cooling.

6. CONCLUDING REMARKS

In this paper I presented documentary paleoclimatic evidence gathered from Byzantine narrative sources and I explored their contribution to existing climate history reconstructions of the Eastern Mediterranean and the Middle East for the period 4th–15th centuries AD. Descriptive data of historical climatology represents valuable source of information for the study of climatic fluctuations in the past.

[68] F. Serre – Bachet – J. Guiot, Summer temperature changes from tree rings in the Mediterranean area during the last 800 years, in: Abrupt Climatic Change, eds. W. Berger – L. Labeyrie. Dordrecht 1987, 89–97.

[69] J. Grove, The Little Ice Age and its Geomorphological Consequences in Mediterranean Europe. *Climatic Change* 48 (2001) 121–136.

[70] Lespez, *op. cit.*

[71] Issar, *op. cit.*

[72] *Ibid.*

[73] O. Solomina – K. Alverson, High latitude Eurasian paleoenvironments: introduction and synthesis. *Palaeogeography, Palaeoclimatology, Palaeoecology* 209 (2004) 1–18.

[74] Greenbaum [et al.], *op. cit.* (note 41); Schilman [et al.], *op. cit.* (note 31); Kacanski [et al.], *op. cit.*

[75] Hassan, *op. cit.*

Byzantine sources do provide evidence of paleoclimatic interest which include information about spatio-temporal distribution of climate-related phenomena for the Eastern Mediterranean and the Middle East during the medieval period. This data-set expands our knowledge on the occurrence of extreme meteorological events in pre-instrumental period and fills the gap of documentary paleoclimatological knowledge for Southeastern Europe, Anatolia, Middle East and North Africa during the Byzantine period (4th–15th centuries AD). These areas have not been investigated so far with regard to documentary meteorological evidence.

If we examine the collected material from a historical point of view, we realize that Byzantine authors were not concerned about weather and climate. It is also obvious that the Byzantines lacked any awareness of large-scale climatic changes, but, they must have possessed some notion of "weather normality". Byzantine authors reflect in their writings the perception of this "weather normality". Sudden extreme weather events were expected and regarded as inevitable manifestations of God's wrath. From a paleoclimatological point of view I have concluded that documentary evidence on weather and climate derived from Byzantine sources include significant drawbacks. The relevant records often emphasize extreme conditions and/or natural disasters; they are also biased by the selective perceptions of the observers. The structure of the meteorological information is discontinuous and heterogeneous and, consequently, it reduces the statistical analysis to simple techniques.

Despite the wealth of literary tradition for the lands of the Byzantine Empire, documentary climate-related accounts are scanty. The data is scattered within a large geographical area over a period of twelve centuries. This sporadic character of the meteorological text-entries obtained from Byzantine documentary sources had two negative consequences for the data-analysis process: (i) we were obliged to decrease the time resolution of the paleoclimatic reconstruction and (ii) the spatial dimensions of the analysis should be increased. This fact begs the question of interpolation in space and reduces the reliability of the statistical evaluation. Paleoclimatologists cannot reconstruct detailed climatic fluctuations on the basis of this type of documentary meteorological data alone and face difficulties in shaping long-term trends of temperature or precipitation and their links to existing scenarios of climatic change during the period 300–1500 AD. Besides, they must be cautious in their interpretations as the data are characterized by chronological inaccuracy and geographical uncertainty.

These pessimistic conclusions should not drive the researcher to an immediate rejection of the obtained data-series. The handling of the available data by a more general and impressionistic statistical approach was the only way to escape from the above mentioned difficulties so that we could obtain any possible results concerning past climatic fluctuations and anomalies on the basis of literary evidence derived from Byzantine documentary sources during the period 300–1500 AD. The application of a simple statistical approach through the obtaining of decadal frequencies of the meteorological anomalies by converting them into an ordinal scale and by calculating decennial moving averages has shown a considerable higher density of records about phenomena of long and short duration during the 4th, 6th, 11th and 12th centuries AD. This fact leads us to the question whether such a growth of information may be positively affected by the higher number of records preserved in a higher number of sources during these centuries. The answer is that this growth of evidence may have happened not only because of the existence of numerous documentary sources in those centuries, but also because of a possible higher rate of occurrence of meteorological events.

On the basis of the calculation of decennial moving averages for wide-range geographical regions in the Eastern Mediterranean and the Middle East classified by the Köppen-Trewartha climate classification system we obtained a crude paleoclimatic picture for the period 300–1500 AD. For the last centuries of the RCO the dominant climatic element emerging from our evidence is drought, especially for the desert [BWh] and temperate semi-arid [BSk] regions. But this result is of limited value because of the statistical weakness of the data. A relatively dry period is indicated through higher frequency of dry events between 500 and 800 AD – the so-called DACP – for the temperate semi-arid [BSk], the desert [BWh] and the Mediterranean regions [Csa] regions corresponding well with proxy physical evidence depicting a scenario of unusually dry climate for these centuries. The higher frequency of cold decades for the temperate semi-arid [BSk] and the Mediterranean regions [Csa], as well as the relatively high total number of wet decades for the temperate semi-arid [BSk], the desert [BWh] and the Mediterranean [Csa] regions are in a good agreement with the picture of wetter regional conditions prevailing over the Eastern Mediterranean and the Middle East region during the MWP emerging from the study of physical proxy data. There is documentary evidence suggesting that many areas around the Mediterranean experienced drought episodes during the MWP. This fact probably suggests regional variations and converse trends. The cooling during the beginning of the LIA is supported by the occurrence of cold periods for the temperate semi-arid [BSk] and the Mediterranean [Csa] regions. This result is limited because of the statistical weakness of the dataset.

Whether these reconstructed fluctuations are rather an effect of a changing density of records than the product of changing climate parameters is a question that should remain open to discussion. Until a more extensive set of documentary data is available, the absence of evidence should not necessarily imply evidence of absence. Research in historical climatology of the Byzantine Empire has made it possible to obtain a view of some features of climatic fluctuations during the Late Antiquity and the Middle Ages in the Eastern Mediterranean and the Middle East. But the reconstruction of climatic conditions during the RCO, the DACP, the MWP and the beginning of the LIA in the Eastern Mediterranean region suffers from considerable temporal and spatial dispersion of evidence of all types. This situation causes major problems of interpretation and hinders the application of standardized methodological tools. Further systematic historical and paleoclimatic research in all scientific disciplines is an essential means for the improvement of this picture and the filling of the existing gaps of data. This research has surveyed from a paleoclimatological point of view the most informative genres of the Byzantine documentary sources. Further research might be directed to the completion of the existing database by the investigation of unexploited genres of Byzantine documentary sources (e.g. Byzantine oratory and epistolography) and by cross-controlling with expanding physical proxy evidence.

Appendix

A catalogue[76] of meteorological phenomena (AD 300–1500) reported by Byzantine and oriental Christian sources for the Eastern Mediterranean and the adjacent regions follows. The codification of symbols and abbreviations are cited in the *sigla*.

[76] This catalogue is based on material published in I. Telelis, *op. cit.* (introductory note *).

Sigla

Columns

1. = Rf = Reference
the numbers in [ ] refer to data entries in I. Telelis, (*op.cit.* introductory note*).

2. = C= number of Citations in the Byzantine sources

3. = Y= Year of the meteorological event
( ) : year not literally reported in the sources, but inferred from the historical-philological elaboration of the evidence
/ : duration of the described phenomenon for successive years
- - : phenomenon that took place in unspecified time between two year-limits

4. = D = Date / Duration of the meteorological event
I … XII : Latin numbers for the months of the year (starting with January).
digits: Arabic numbers for exact dates.
y: years
m: months
d: days
h: hours

5. = A= Area in which the meteorological event took place

A.S.: Aegean Sea	**Con.**: Constantinople	**Mac.**: Macedonia	**N**: North
Ad.S.: Adriatic Sea	**Cy.**: Cyprus isl.	**Mes.**: Mesopotamia	**E**: East
Af.: Africa	**Eg.**: Egypt	**Pal.**: Palestine	**S**: South
Al.: Albania	**Fr.:** France	**Per.**: Persia	**W**: West
An.: Anatolia (Asia Minor)	**Ger.:** Germany	**Ro.**: Romania	**C**: Central
Ar.: Arabia	**Gr.**: Greece	**Rus.**: Russia	
Arm.: Armenia	**Hu.:** Hungary	**Ser.**: Serbia	
As.C.: Asia Central	**It.:** Italy	**Sp.**: Spain	
Au.: Austria	**I.S.:** Ionian Sea	**Syr.**: Syria	
B.S.: Black Sea	**Leb.:** Lebanon	**Thr.:** Thrace	
Bul.: Bulgaria			

des.= desert	mt.= mountain	tor.= torrent
lak. = lake	riv.= river	isl. = island

In ( ) the geographical location of the climatic event as well as modern place names are included.

6. = R= climatic Region in which the geographical location of the event is classified according to the Köppen-Trewartha classification scheme (cf. Figure 8 and note 27)

BSk = temperate semi-arid, a midlatitude cold steppe climate. This climate owes its origin to locations deep within continental interiors, far from the windward coasts and sources of moist, maritime air. Temperature conditions are extremely variable, with annual means decreasing and annual ranges increasing poleward. In the higher latitudes, winters are severely cold, with meager precipitation (much of it in the form of snow). Summer precipitation is more often convective, arriving in the form of scattered thunderstorm activity brought about by irregular incursions of moist air. It is located peripheral to the true desert, either adjacent to the moister C and D climates.
BShs = semi-arid
BWh = desert. Annual precipitation between 0–38cm in low latitude locations, precipitation occurs (albeit rarely) during high sun season in interior locations, low sun in regions bordering Mediterranean climates. Extremely hot summers warm overall average temperatures (annual above 18 degrees C) large daily temperature range especially during summer, very windy during daylight.
BWk = temperate arid
Cfa = humid subtropical
Cfb = maritime temperate
Csa, Csb = Mediterranean. These climates usually occur on the western sides of continents between the latitudes of 30° and 45°. They are characterised by moderate temperatures and changeable weather. Summers are hot and dry, due to the domination of

the subtropical high pressure systems, except in the immediate coastal areas, where summers are cooler due to the nearby presence of cold ocean currents.

Dfa = hot summer continental

Dfb = warm summer continental or hemiboreal

7. = P= meteorological Phenomenon

: freezing of water (rivers, lakes, sea etc.)
***** : much snow
@ : famine
≈ : turbulent sea
bw : blow of wind/s
N : northern
S : southern
E : eastern
W : western

c : cold harsh
cl. : cloudy sky
d : drought
f : flood
fg. :fog
h : hot (for winds), heatwave
hl. : hailfall
lr : lack of rain

Nf : Nile flood anomaly
p : pestilence
r : rainfall/s
rh : rainfall heavy
rn : rainfall normal
s : rainstorm
sr : summer rainy
th. : thunderbolt

var. : various meteorological phenomena (cited generally)
wh. : whirlwind
wm : winter mild
wr : winter rainy
ws : winter severe (cold)

8. = Cl= Classification of the meteorological observations.

L: Observations about meteorological phenomena of Long duration (which cover time resolutions of weeks, months, seasons or years).

S: Observations about meteorological phenomena of Short duration (which cover time resolutions of minutes, hours or days).

F1: Observations about Floods of unspecified cause.

F2: Observations about Nile river Flood anomalies.

9. = T/i= Thermal index

-1: cold excess / +1: hot excess

10. =W/i= Wetness index

-1: dry excess / +1: wet excess

Catalogue of Meteorological Phenomena (AD 300–1500)

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[1]	1	(300- -311)		**Eg.** (Thebais des.)	BWh	**h**	S		
[2]	1	(300- -311)		**Eg.** (Lycos riv.)	BWh	**f**	F1		
[3]	1	(300- -399)		**Thr.** (Marmara Ereglisi)	Csa	**lr/d**	L		-1
[4]	1	(303)		**An. SE** (Scirtus riv. Edessa (Urfa), Harran)	Csa	**f**	F1		
[5]	1	(304- -330)		**An.** ?	BSk	**var.**	L		
[6]	2	(305)		**Cy.**	Csa	**lr/d/@**	L		-1
[6]	2	(306)		**Cy.**	Csa	**lr/d/@**	L		-1
[6]	2	(307)		**Cy.**	Csa	**lr/d/@**	L		-1
[6]	2	(308)		**Cy.**	Csa	**lr/d/@**	L		-1
[6]	2	(309)		**Cy.**	Csa	**lr/d/@**	L		-1
[6]	2	(310)		**Cy.**	Csa	**lr/d/@**	L		-1
[6]	2	(311)		**Cy.**	Csa	**lr/d/@**	L		-1
[8]	6	(311)		**An. E**	BSk	**lr/d/@/p**	L		-1
[8]	6	(311)		**Pal.**	BWh	**lr/d/@/p**	L		-1
[8]	6	(311)		**Eg.**	BWh	**lr/d/@/p**	L		-1
[6]	2	(312)		**Cy.**	Csa	**lr/d**	L		-1
[9]	2	(313)	**I-II**	**(Eg.)**	Csa	**lr/d**	L		-1
[6]	2	(313)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(314)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(315)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(316)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(317)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(318)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(319)		**Cy.**	Csa	**lr/d**	L		-1
[10]	1	(319)		**An. N** (Euchaita, Amasia)	Csa	**hl.**	S		
[6]	2	(320)		**Cy.**	Csa	**lr/d**	L		-1
[11]	1	(320±)	**XII-II**	**An. N** (Euchaita, Amasia)	Csa	**c**	S		
[12]	1	(320±)	**III**	**An. N** (Euchaita, Amasia)	Csa	**rh**	S		
[6]	2	(321)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(322)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(323)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(324)		**Cy.**	Csa	**lr/d**	L		-1
[13]	1	(324)	**VII/5**	**A.S. NW** (Seddülbahir)	Csa	**bw/≈**	S		
[6]	2	(325)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(326)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(327)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(328)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(329)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(330)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(331)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(332)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(333)		**Cy.**	Csa	**lr/d**	L		-1
[14]	4	333		**Syr.**	BWh	**(d)/@/p**	L		-1
[6]	2	(334)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(335)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(336)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(337)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(338)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(339)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(340)		**Cy.**	Csa	**lr/d**	L		-1
[6]	2	(341)		**Cy.**	Csa	**lr/d**	L		-1
[16]	1	(341)		**Cy.** (Trimythos)	Csa	**rh**	S		

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[17]	2	350		**Mes.** (Nisibis)	BSk	**s**	S		
[18]	2	(350- -357)		**Pal.** (Jerusalem)	BWh	**lr/d**	L		-1
[19]	1	354	**III…V**	**Fr.** (Aquitania)	Cfb	**rh**	L		+1
[20]	1	354	**XII…V** ?	**Syr.** (Antioch)	Csa	**lr (?)/@**	L		-1
[21]	1	357/358	**XII-I** 40 d	**Ger.** (Mosa riv.)	Cfb	**ws/#**	L	-1	
[22]	1	358	**IV**	**Ser.** (Danube riv.)	Dfa	**f**	F1		
[23]	1	358	**VIII/24**	**An. NW** (Izmit)	Csa	**s**	S		
[24]	1	359	**III…V**	**Mes.** (Euphrates riv.)	BSk	**f**	F1		
[25]	1	359	**III…V**	**Hu.** (Danube riv.)	Dfa	**c/#**	L	-1	
[26]	1	(359- -362)	**XI…II**	**Syr.** (Kyrros)	Csa	*****	S		
[27]	1	360		**An. C** (Egerdir)	BSk	**d/p**	L		-1
[29]	2	(361- -363)		**An.** ?	BSk	**(d)/@/p**	L		-1
[28]	1	(361)	**VI**	**Au.** (Danube riv.)	Cfa	**bw**	S		
[30]	1	(361/362)	**XI…II**	**Syr.** (Antioch)**, Leb.**	Csa	**d**	L		-1
[31]	1	(362)		**Leb.** (Phenice)	Csa	**d**	L		-1
[33]	1	(362)	**XI…II**	**B.S. N** (Dnieper riv.)	BSk	**c/#**	L	-1	
[34]	6	(363)		**Pal.** (Jerusalem)	BWh	**bw**	S		
[35]	1	363	**III…V**	**Mes.** (Euphrates riv.)	BSk	**wh.**	S		
[36]	1	363	**III…V**	**Mes.** (Euphrates riv.)	BSk	**f**	F1		
[37]	2	363	**VI/26**	**Mes.** (Ctesiphon)	BSk	**bw**	S		
[38]	2	364	**XI…II**	**Syr.** (Antioch)	Csa	**ws**	L	-1	
[39]	2	364	**II/17**	**An. C** (Ankara)	BSk	**c**	S		
[40]	1	365		**Fr.** (Châlons-sur Marne)	Cfb	**c**	S		
[41]	9	367	**VII/2**	**Con.**	Csa	**hl.**	S		
[42]	1	368	**IX…XI**	**Bul.** (Danube riv.)	Csa	**f**	F1		
[43]	6	368/369	**XI…II**	**An. C** (Phrygia, Cappadocia)	BSk	**(d)/@**	L		-1
[44]	1	370	**VII** ?	**An. NW** (Isnik gölü lake)	Csa	**f**	F1		
[45]	3	372		**An. SE** (Edessa (Urfa))	Csa	**(d)/@**	L		-1
[45]	3	372		**(Pal.)**	Csa	**(d)/@**	L		-1
[46]	1	374		**It.** (Tiber riv.)	Csa	**rh/f**	L		+1
[47]	1	374	**III**	**Ger.** (Hüningen)	Cfb	**c/#**	L	-1	
[48]	1	375	**XI-II**	**Ger. C**	Cfb	**ws**	L	-1	
[49]	2	375	**XI/17**	**Ser.** (Mitrovica)	Dfa	**th.**	S		
[50]	1	(375- -380?)		**(Af. N)**	BWh	**rh**	S		
[51]	1	377- -378		**(An.)**	BSk	**lr/d**	L		-1
[52]	1	378	**II**	**Fr.** (Rhine riv.)	Cfb	**#**	L	-1	
[53]	2	(388- -392)	**XI…II**	**Ro.** (Danube riv.)	Dfa	**c/#**	L	-1	
[54]	4	392		**Eg.** (Nile riv.)	BWh	**Nf (delay)**	F2		
[56]	1	(394±)	**I/6-8**	**Eg.** (Bahra Maryut lake)	BWh	**rh/c**	S		
[57]	6	394	**IX/6**	**It.** (Aquillia)	Csa	**bw N**	S		
[58]	2	(394- -395)	**XI…II**	**Bul.** (Danube riv.)	Csa	**c/#**	L	-1	
[59]	5	(395- -408)		**Thr.**	Csa	**s**	S		
[61]	1	395	**IX…XI**	**Pal.** (Gaza)	BWh	**lr**	L		-1
[61]	1	396	**XI…II**	**Pal.** (Gaza)	BWh	**lr**	L		-1
[62]	1	396	**I/3-5**	**Pal.** (Gaza)	BWh	**rh**	S		
[63]	1	397- -404		**Syr.** (Tigris riv. Daskart Abiso)	BSk	**lr**	L		-1
[64]	1	399	**IX…X**	**An. W** (Sardis - Izmir)	Csa	**rh**	S		
[66]	1	(400- -402)		**An. N** (Cilicia)	Csa	*****	S		
[68]	4	401	**I** ? 20-30 d	**B.S., Thr.**	Csa	**ws/#**	L	-1	
[69]	1	402	**IV/27**	**An. S.**	Csa	**bw/≈**	S		
[70]	6	404	**IX/30**	**Con.**	Csa	**hl.**	S		
[72]	3	407	**IV**	**Con.**	Csa	**rh**	S		
[73]	1	408	**VII/5**	**Con.**	Csa	**rh**	S		
[74]	2	408	**XI**	**It.** (Narnia)	Csa	**th.**	S		
[75]	4	409		**Eg.** (Nile riv.)	BWh	**Nf (delay)**	F2		

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[76]	1	413	**IV**	**An. SE** (Scirtus riv., Edessa (Urfa))	Csa	**f**	F1		
[77]	2	418	**IX…XI**	**(Con.)**	Csa	**d**	L		-1
[79]	2	(422)		**Mes.** (Theodosioupolis (Ra's al-Ayn))	BSk	**rh, f**	S		
[80]	1	423	**XI…II**	**(Con.)**	Csa	**ws/***	L	-1	+1
[82]	1	(429- -440)		**An. SE** (Cilicia)	Csa	**lr/d**	L		-1
[82]	1	(429- -440)		**Syr.** (Telanissos (Telneshin))	Csa	**lr/d/@/p**	L		-1
[84]	1	(431+)		**Pal.** (Jerusalem)	BWh	**h**	L	+1	
[85]	1	(431- -451)		**Pal.** (Jerusalem)	BWh	**lr/d**	L		-1
[86]	1	(435- -446)	**IX…XI**	**An. NW** (Olympos mt. (Ulu dag))	Csa	**rh**	S		
[87]	1	437	**XI…II**	**An. C** (Cappadocia, Galatia)	BSk	**ws**	L	-1	
[88]	1	443	**I-III**	**(Con.)**	Csa	**(ws)/c/*/#**	L	-1	+1
[89]	1	444		**An. NW** (Bithynia)	Csa	**rh/f**	L		+1
[91]	1	447	**IX**	**Thr.**	Csa	**hl.**	S		
[92]	1	(449)		**Hu.** (Temes & Theiss riv.)	Dfa	**s/wh./th.**	S		
[93]	1	(450- -457)		**An. NW** Chalcedon (Kadiköy))	Csa	**s**	S		
[94]	2	(453- -457)		**An. C** (Phrygia, Galatia, Cappa-docia, Cilicia)	BSk	**lr/d/@/p**	L		-1
[94]	2	(453- -457)		**Pal.** (Jerusalem)	BWh	**lr/d/@/p**	L		-1
[94]	2	(453- -457)		**Af. N** ?	BWh	**lr/d/@/p**	L		-1
[95]	1	(461)	**IX…XI**	**Con.**	Csa	**rh/hl.**	S		
[96]	1	(461- -466)	**XI…II**	**Con.**	Csa	**ws (?)/bw/c/rh**	L	-1	
[97]	1	(462- -466)	**XI…II**	**Con.**	Csa	**ws (?)/bw/c**	L	-1	
[98]	2	463	**XI…II**	**Eg.** (Nile riv.)	BWh	**Nf (no flood)**	F2		
[99]	7	467	40 d	**Con.**	Csa	**cl.**	S		
[100]	3	(467+)	4 d	**Con. An. NW** (Nicomedia (Izmit), Boane lake (Sapanca Göl))	Csa	**rh/f**	L		+1
[102]	1	(475)		**Con.**	Csa	**s**	S		
[104]	1	(483)		**Pal.**	BWh	**lr/d**	L		-1
[105]	1	(488)		**An. S** (Cilicia, Tarsus)	Csa	**s**	S		
[106]	1	(492)		**Pal.** des.	BWh	**h**	S		
[107]	1	(492- -580)	**XI…II**	**Pal.** (Jerusalem, Mar-Saba)	BWh	**c**	S		
[108]	1	499	**X/23**	**Mes.** (Euphrates riv.)	BSk	**f**	F1		
[109]	2	500	**XII**	**An. SE** (Edessa (Urfa))	Csa	**c**	L	-1	
[110]	2	501	Θ: 7-8	**An. SE** (Edessa (Urfa))	Csa	**bw/h**	L	+1	
[111]	2	501/502	**X-IV**	**An. SE** (Edessa (Urfa))	Csa	**wr**	L		+1
[112]	2	502	**V** 3 d	**An. SE** (Edessa (Urfa))	Csa	**bw/h**	L	+1	
[113]	2	503	**I/10**	**An. SE** (Amida (Diyarbakir))	BSk	**c/rh**	S		
[114]	2	504	**XI…II**	**An. SE** (Amida (Diyarbakir), (Batman-sû riv.))	BSk	**f**	F1		
[115]	2	505	**XI…II**	**An. SE** (Amida (Diyarbakir))	BSk	**c**	L	-1	
[116]	1	(511)		**Ser.** (Tisza riv.)	Dfa	**cl.**	S		
[118]	5	(516)	5 y	**Pal.** (Jerusalem, Siluho, Sapsas, Chorat tor.)	BWh	**lr/d/p**	L		-1
[118]	5	(517)	5 y	**Pal.** (Jerusalem, Siluho, Sapsas, Chorat tor.)	BWh	**lr/d/p**	L		-1
[118]	5	(518)	5 y	**Pal.** (Jerusalem, Siluho, Sapsas, Chorat tor.)	BWh	**lr/d/p**	L		-1
[119]	1	(518)		**Syr.** (Antioch)	Csa	**bw**	S		
[120]	1	(518;)		**Arm.** (Petra)	BSk	**h**	L	+1	
[121]	1	(518)		**Con.**	Csa	**th.**	S		
[118]	5	(519)	5 y	**Pal.** (Jerusalem, Siluho,Sapsas, Chorat tor.)	BWh	**lr/d/p**	L		-1
[118]	5	(520)	5 y	**Pal.** (Jerusalem, Siluho,Sapsas, Chorat tor.)	BWh	**lr/d/p**	L		-1
[122]	1	(520)	**VI/8**	**Pal.**	BWh	**rh**	S		

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[123]	2	(521)	**IX/4**	**Pal.** (Jerusalem)	BWh	**rh**	S		
[124]	1	522	**II/15**	**Pal.** (Bitylion (Shaykh Zuwayd?)	BWh	**rh**	S		
[125]	1	(523- -525)		**Ar. S** (Red Sea)	BWh	**bw/≈**	S		
[126]	2	523	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[126]	2	524	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[126]	2	525	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[128]	19	525	**IV/22**	**An. SE** (Edessa (Urfa) Skirtos riv.)	Csa	**rh/f**	S		
[129]	2	525		**Syr.** ?	BSk	**(ws)/***	L	-1	+1
[126]	2	526	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[130]	2	526		**Syr.** ?	BSk	**lr/d**	L		-1
[126]	2	527	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[131]	1	(527- -528)		**Syr.** (Antioch)	Csa	**s/th./bw/hl.**	S		
[132]	1	(527- -528)	**XII**	**An. C** (Ankara)	BSk	**lr**	L		-1
[134]	1	(527- -562)		**An. NW** (Elenopolis (Hersek), Drakon riv. (Kurtköy Dere))	Csa	**rh/f**	S		
[135]	1	(527- -562)	**XI…II**	**An. NW** (Bithynia)	Csa	**rh/***	L	-1	+1
[136]	1	(527- -562)		**An. C** (Galatia, Siveris riv. (Aladag Çay))	BSk	**f**	F1		
[137]	1	(527- -613)		**Pal.** (Jerusalem)	BWh	**lr/d**	L		-1
[138]	1	(527- -613)	**IX…XI**	**An. W** (Pergamos)	Csa	**hl.**	S		
[139]	1	(527- -613)	**IX…XI**	**An. C** (Anakara)	BSk	**rh**	S		
[140]	1	(527- -613)		**An. C.** (Ankara, Pesinus (Sivrihisar))	BSk	**lr/d**	L		-1
[126]	2	528	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[141]	5	528/529	**XI…II**	**Syr.** (Antioch)	Csa	**ws**	L	-1	
[126]	2	529	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[126]	2	530	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[142]	1	530		**Con.** ?	Csa	**lr/d**	L		-1
[143]	1	530/531	**XI…II**	**Mes.** (Martyropolis (Maypharkath))	BSk	**rh/c**	S		
[126]	2	531	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[126]	2	532	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[144]	1	(533)	**VI…VIII**	**An. NW** (Hellespont (Abydos, Sigeion))	Csa	**bw/≈**	S		
[126]	2	533	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[126]	2	(534)	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[145]	1	(534)	**XII**	**It.** (Tyrrhenian Sea)	Csa	**s**	S		
[126]	2	535	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[126]	2	536	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[146]	1	536		**Mes.**	BSk	**lr/d**	L		-1
[146]	1	536		**Per.**	BWh	**lr/d**	L		-1
[147]	1	(536)	**III/23**	**Af. N** (Membrasa)	BShs	**bw**	S		
[148]	2	536/537	**XI…II**	**Syr.** ?	BSk	**ws/***	L	-1	+1
[126]	2	537	15 y	**Pal.** (Jerusalem, Siluho)	BWh	**lr/d**	L		-1
[149]	1	537		**An. S.** (Tarsus, Cydnus riv. (Tarsus-Irmak))	Csa	**f**	F1		
[150]	1	(541;)	**V**	**Eg.** (Nile riv. delta)	BWh	**s/th./bw/≈**	S		
[151]	1	(541;)		**A.S. SE** (Rhodos isl.)	Csa	**bw W/≈**	S		
[152]	1	(541)	**VI…VIII**	**Mes.**	BSk	**h/p**	S		
[154]	1	(542)	**XI…II**	**It.** (Napoli)	Csa	**bw/≈**	S		
[155]	1	(544)		**Pal.** (Jerusalem)	BWh	**wr**	L		+1
[155]	1	544		**Pal.** (Jerusalem)	BWh	**wr**	L		+1
[156]	10	545	**XI…II**	**Con.**	Csa	**(ws)/@**	L	-1	
[157]	1	(545- -546)	**XI…II**	**Syr.** (Antioch)	Csa	**c**	S		
[158]	1	(547;)		**An. N** (Paphlagonia)	Csa	**s/th./rh**	S		
[160]	2	(547- -548)		**Eg.** (Nile riv.)	BWh	**Nf (prolonged flood)**	F2		

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[159]	2	547- -548		**Con.**	Csa	**rh**	L		+1
[161]	6	548	**VI**	**Con.**	Csa	**th.**	S		
[162]	1	(548- -549)	**XI…II**	**Mes.**	BSk	**ws/c/***	L	-1	+1
[163]	1	(548- -556)	**VII**	**Pal.**	BWh	**r**	S		
[164]	6	550	**III**	**An. S** (Taurus mt.)	Csa	**bw S/**	S		
[165]	1	551	**III…V**	**It.** (Adrian Sea, Calabria)	Csa	**s/bw/≈**	S		
[166]	1	(551)	**IX…XI**	**Con.** ?	Csa	**bw S/d**	L		-1
[167]	1	(551- -552)	**XI…II**	**Syr.** (Antioch)	Csa	**rh**	S		
[168]	1	(551- -553)	**XII**	**Syr.** (Antioch)	Csa	**ws**	L	-1	
[169]	1	(551- -592)		**Syr.** (Antioch)	Csa	**rh**	S		
[170]	5	552	8 y	**An.** (Amida (Diyarbakir), Amasea, Con.)	BSk	**lr/d**	L		-1
[170]	5	553	8 y	**An.** (Amida (Diyarbakir), Amasea, Con.)	BSk	**lr/d**	L		-1
[171]	1	(553- -554)		**Mes.** (Daras, Cordis riv.)	BSk	**rh/f**	S		
[170]	5	554	8 y	**An.** (Amida (Diyarbakir), Amasea, Con.)	BSk	**lr/d**	L		-1
[170]	5	555	8 y	**An.** (Amida (Diyarbakir), Amasea, Con.)	BSk	**lr/d**	L		-1
[172]	2	555	**VII/19**	**Con.**	Csa	**bw/th.**	S		
[173]	1	(555)		**Pal.** (Jerusalem)	BWh	**rh/f**	S		
[170]	5	556	8 y	**An.** (Amida (Diyarbakir), Amasea, Con.)	BSk	**lr/d**	L		-1
[174]	3	556	**VII/13**	**Con.**	Csa	**rh/th.**	S		
[170]	5	557	8 y	**An.** (Amida (Diyarbakir), Amasea, Con.)	BSk	**lr/d**	L		-1
[175]	1	(558)	**IV**	**An. C** (Sykeon)	BSk	**h**	L	+1	
[170]	5	558	8 y	**An.** (Amida (Diyarbakir), Amasea, Con.)	BSk	**lr/d**	L		-1
[170]	5	559	8 y	**An.** (Amida (Diyarbakir), Amasea, Con.)	BSk	**lr/d**	L		-1
[176]	1	(559)		**Ser.** (Danube riv.)	Dfa	**c/#**	L	-1	
[177]	1	560	**IX/9**	**Con.**	Csa	**rh**	S		
[178]	2	562	**IX…XI**	**Con.**	Csa	**bw N**	S		
[179]	3	562	**XI**	**Con.**	Csa	**lr/d**	L		-1
[180]	1	563	**IX…XI**	**Con.**	Csa	**d**	L		-1
[181]	1	568	**XI…II**	**Syr.** ?	BSk	**d**	L		-1
[182]	1	568	**XI…II**	**Syr.** ?	BSk	**wm**	L	+1	+1
[183]	1	(571- -577)	**II-III**	**Con.**	Csa	**c/#**	L	-1	
[184]	1	573	**XI**	**Mes.** (Daras)	BSk	**c**	S		
[186]	1	(578- -582)		**An. SE** (Scopas riv.)	Csa	**f**	F1		
[187]	1	(578- -582)		**Syr.** (Antioch)	Csa	**lr/d**	L		-1
[188]	1	(578- -582)		**An. S** (Pamphylia)	Csa	**bw/≈**	S		
[189]	1	580	**VI…VIII**	**Syr.** ?	BSk	**sr**	L		+1
[191]	1	582- -602		**An. S.** (Tarsus, Cydnus riv. (Tarsus-Irmak))	Csa	**f**	F1		
[191]	1	582- -602		**Mes.** (Rîf, Esna, Euphrates riv.)	BSk	**f**	F1		
[192]	1	(582- -602)		**An. C** (Ankara, Scourdis)	BSk	**s/rh/hl./f**	S		
[193]	1	(582- -602)	**IX**	**An. C** (Ankara, Apokoumis)	BSk	**hl.**	S		
[194]	1	(582- -602)	**IX**	**An. C** (Ankara, Apokoumis, Alion)	BSk	**hl.**	S		
[195]	2	(582- -602)		**As.C.** (Scythia, Himalaya mt.)	BWk	**d**	L		-1
[196]	3	583	**IV**	**Con.**	Csa	**bw**	S		
[197]	1	(584±)	**IV**	**Thr.** (Hadrianopolis (Edirne))	Csa	**ws/***	L	-1	+1
[198]	2	588	**IV**	**Thr.** (Heracleia (Erekli))	Csa	**bw/≈**	S		
[199]	1	(588)	**XI…II**	**Syr.** ?	BSk	**ws**	L	-1	
[200]	2	590	**X/3**	**Con.**	Csa	**bw S**	S		

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[201]	1	595- -596	**XI…II**	**Mes.** ?	BSk	**h**	L	+1	
[202]	1	597- -598	**XI…II**	**Mes.** ?	BSk	**rh/f**	L		+1
[203]	2	599	**XI…II**	**Bul. C** (Osum Trojan)	Csa	**c**	S		
[204]	1	(600- -601)		**Syr.**	BWh	**lr/bw/h/d**	L		-1
[204]	1	600		**Pal.**	BWh	**lr/bw/h/d**	L		-1
[205]	2	602	**XI…II**	**Con.**	Csa	**s (?)/@**	L		+1
[206]	3	602		**Ser.** (Securisca (Nikopol))	Dfa	**c/rh**	S		
[207]	1	602	**XI/22**	**An. NW** (Prenetos (Karamürsel))	Csa	**s/bw S**	S		
[208]	1	(602- -607)		**Pal.** (Jerusalem) ?	BWh	**rh**	S		
[209]	1	(603- -642)		**Pal.**	BWh	**lr/d**	L		-1
[210]	1	(604- -614)	**VI…VIII**	**Pal.** (Jerusalem) ?	BWh	**h**	S		
[211]	14	609/610	**XI…II**	**Con.**	Csa	**ws**	L	-1	
[211]	14	609	**XI…II**	**An. C**	BSk	**ws**	L	-1	
[211]	14	609	**XI…II**	**Mes.** (Euphrates riv.)	BSk	**ws/*/#**	L	-1	+1
[212]	2	610		**Con.** ?	Csa	**lr/d**	L		-1
[214]	1	(610- -619)		**Eg.** (Nile riv.)	BWh	**Nf (delay)**	F2		
[216]	1	(619)		**A.S. SE** (Rhodos isl. - Alexandria)	Csa	**bw/≈**	S		
[217]	1	623	**VI/21**	**Per.** (Gazacum)	BWh	**bw**	S		
[218]	1	623	**I**	**Arm.** (Caucasus mt.)	BSk	**c**	S		
[219]	2	626	**VI**	**Mes.** (Euphrates riv.)	BSk	**hl.**	S		
[220]	1	628	**III**	**An. C** (Sebastia (Sivas) Zara mt.)	BSk	*****	L	-1	+1
[221]	3	635	**VIII/23**	**Syr.** (Emesa (Höms))	Csa	**bw S**	S		
[222]	1	(635- -645)		**Mes.** (Basra, Cascar)	BSk	**lr/d**	L		-1
[224]	8	647- -648		**Con.**	Csa	**bw**	S		
[226]	1	(650;)		**Cy.** (Trimythos)	Csa	**rh**	S		
[227]	1	658		**Syr.** (Damascus, Orontes riv. Euphrates riv.)	Csa	**lr/d**	L		-1
[228]	2	659	**IV/13**	**Syr.** ?	BSk	**c/#**	L	-1	
[229]	1	664	**XI…II**	**Syr.** ?	BSk	**ws (?)/c/***	L	-1	+1
[230]	4	667	**XI…II**	**An. SE** (Edessa (Urfa), Scirtus riv.)	Csa	**rh (?)/f**	L		+1
[230]	4	667	**XI…II**	**Mes.** (Euphrates riv.)	BSk	**rh (?)/f**	L		+1
[230]	4	667	**XI…II**	**Eg.** (Nile riv.)	BWh	**f**	F1		
[231]	2	667- -668	**XI…II**	**Mes.** (Amorion (Samarra))	BSk	*****	S		
[232]	4	669/670	**XI…II**	**Syr.**	BWh	**ws**	L	-1	
[232]	4	669/670	**XI…II**	**Mes.**	BSk	**ws**	L	-1	
[235]	3	678		**A.S. NE** (Syllaion (Assar Kioi))	Csa	**bw/≈**	S		
[236]	2	683/684	**XI…II**	**Mes.** (Euphrates riv.)	BSk	**ws/#**	L	-1	
[239]	1	694- -695		**Syr.** ?	BSk	**lr/d**	L		-1
[239]	1	694- -695		**Mes.** ?	BSk	**lr/d**	L		-1
[240]	1	698- -699		**Arm.** ?	BSk	**ws/#**	L	-1	
[241]	1	699- -700		**Mes.** (Makkab)	BSk	**f**	F1		
[243]	1	707	**IV**	**Syr.** ?	BSk	**#**	L	-1	
[244]	1	(711)		**Af. N**	BWh	**lr/d/@**	L		-1
[245]	1	(712- -740)		**A.S. S** (Crete isl.)	Csa	**lr/p**	L		-1
[246]	1	714	**V**	**Syr.** ?	BSk	**bw**	S		
[247]	1	715	**IV**	**Syr.** ?	BSk	**c/#**	S		
[249]	5	717/718	**XI…II** 100 d	**Thr.**	Csa	**ws/***	L	-1	+1
[250]	1	(717- -740)		**Con.** ?	Csa	**var.**	S		
[251]	5	718		**An. NW** (Propontis)	Csa	**bw**	S		
[252]	1	719		**Syr.** ?	BSk	**lr/d**	L		-1
[253]	2	721- -722		**Syr.** ?	BSk	**lr/d**	L		-1
[254]	2	725		**An. SE** (Edessa (Urfa), Scirtus riv.)	Csa	**f**	F1		
[255]	1	725		**A.S.** (Lesbos isl.)	Csa	**s/th./rh**	S		
[256]	3	740	**III** (24 h)	**An. SE** (Edessa (Urfa), Scirtus riv.)	Csa	**rh/ f**	S		
[257]	6	742- -743		**An. SE**	Csa	**lr/d**	L		-1

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[257]	6	742- -743		**Syr.** (Bostra, Harran)	Csa	**lr/d**	L		-1
[258]	1	744- -767	3 y	**Eg.**	BWh	**lr/d**	L		-1
[259]	1	744- -767		**Eg.** (Nile riv.)	BWh	**Nf (no flood)**	F2		
[260]	1	744- -767	2 y	**Eg.** (Alexandria)	BWh	**lr/d**	L		-1
[261]	1	744- -767	**IX** 3 d	**Eg.** (Alexandria)	BWh	**rh**	S		
[262]	1	744- -767	**XII**	**Eg.** (Alexandria)	BWh	**c**	L	-1	
[263]	1	744- -767		**Eg.** (Nile riv.)	BWh	**Nf (delay)**	F2		
[264]	1	744- -767		**Eg.** (Nile riv.)	BWh	**Nf (delay)**	F2		
[265]	2	746	**XI…II**	**Syr.** ?	BSk	**ws/#**	L	-1	
[266]	2	746- -747		**Syr.** ?	BSk	**lr/d/@/p**	L		-1
[267]	1	(750;--753)		**Sp.**	Csb	**lr/d/@**	L		-1
[268]	1	761		**A.S.** (Lesbos isl.)	Csa	**s**	S		
[269]	1	761- -762		**Syr.** ?	BSk	**hl.**	S		
[270]	1	761- -762		**Syr.** ?	BSk	**(d)@/p**	L		-1
[271]	10	763/764	**X-III**	**B.S.**	Dfa	**ws/*/#**	L	-1	+1
[271]	10	764	**X-III**	**Con.**	Csa	**ws/*/#**	L	-1	+1
[272]	5	764	**III…V**	**Con.** ?	Csa	**lr/d**	L		-1
[273]	1	764	**XI/28**	**Con.**	Csa	**hl.**	S		
[274]	2	766	**VI/21**	**Bul. E** (Aghialos)	Csa	**bw N**	S		
[275]	2	767		**Con.**	Csa	**lr/d**	L		-1
[276]	1	773		**Arm.** ?	BSk	**ws**	L	-1	
[278]	1	774		**Thr.** (Mesembria)	Csa	**bw N/≈**	S		
[280]	1	781- -782		**Mes.** (Baghdad)	BSk	*****	S		
[281]	1	(784- -806)		**An. NW** (Bithynia)	Csa	**lr/d**	L		-1
[282]	2	793	**I**	**An. N** (Samsun)	Csa	**ws/*/c**	L	-1	+1
[283]	1	(793- -837)		**An. N** (Bithynia, Apollonias lak.)	Csa	**c/#**	L	-1	
[284]	1	(794- -805)		**Con.**	Csa	**bw/≈**	S		
[285]	1	(794- -805)		**An. C** (Alis riv., Dorylaeon (Eski Sehir))	BSk	**f**	F1		
[286]	4	797	**VIII/19-IX/6**	**Con.**	Csa	**s (?)**	S		
[287]	1	802	**IX…XI**	**Con.**	Csa	**cl./c**	S		
[288]	1	802	**X/31**	**Con.**	Csa	**s (?)/bw/≈**	S		
[289]	1	(803- -811)		**An. W.** (Meander / Xanthos riv.)	Csa	**rh/*/f**	L		+1
[290]	1	(806+)		**An. N** (Amastris (Amasra))	Csa	**rh/f**	L		+1
[291]	2	807		**An. SW** (Lykia, Myra (Demre))	Csa	**s/bw/th./≈**	S		
[293]	1	810/811	**XII-1/10**	**Mes.**	BSk	**wm/rn**	L	+1	+1
[294]	1	811	**I/11-19**	**Mes.**	BSk	**bw N**	L	-1	
[295]	1	813		**An. NW** (Bithynia)	Csa	**s/bw/≈**	S		
[296]	1	813	**V/5-9**	**An. NW** (Chalke)	Csa	**bw S**	S		
[297]	1	813	**VI/22**	**Thr.** (Hadrianopolis (Edirne))	Csa	**h**	S		
[298]	2	813	**XII** 8 d	**Thr.** (Ergene riv.)	Csa	**rh/f**	L		+1
[299]	7	(814)		**An.** ?	BSk	**var./d**	L		
[300]	1	(816- -820)		**An. W** (Lydia, Temnos mt.)	Csa	**rh**	S		
[301]	1	(816- -820)		**An. W** (Lydia, Temnos mt.)	Csa	**s/th.**	S		
[302]	3	820	**XII/25**	**Con.**	Csa	**c**	S		
[303]	1	(820- -821)		**Mes.** ?	BSk	**lr/d**	L		-1
[304]	3	(821- -823)		**Con.** ?	Csa	**var./d**	S		
[305]	1	(821- -823)		**An. N** ?	Csa	**s/bw/≈**	S		
[306]	1	(821- -897)		**Con.**	Csa	**lr/d**	L		-1
[307]	2	822	**XII**	**Con.**	Csa	**s/bw/≈**	S		
[308]	1	822	**XII**	**Thr.**	Csa	**ws**	L	-1	
[310]	1	(823±)	**XII…II** 2 d	**A.S.** (Lesbos isl.)	Csa	**s/th.**	S		
[311]	1	824		**Con.** ?	Csa	**var.**	S		
[312]	6	(829- -842)		**Con.** ?	Csa	**var./ws**	L	-1	
[313]	1	(830- -831)		**Syr.** ?	BSk	**f**	S		

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[314]	1	(831- -842)		**It.** (Napoli)	Csa	**s/bw/≈**	S		
[315]	2	832/833	**XI…II**	**Mes.** (Euphrates riv.)	BSk	**ws/#**	L	-1	
[315]	2	832/833	**XI…II**	**Eg.** (Nile riv.)	BWh	**ws/#**	L	-1	
[317]	1	(833- -836)	**XI…II**	**Thr. E** (Catesia)	Csa	**c**	S		
[318]	1	(833- -836)		**Con.**	Csa	**rh**	S		
[319]	2	(835- -836)		**An. E** (Zubatra)	BSk	**f**	F1		
[319]	2	(835- -836)		**Mes.** (Tigris riv.)	BSk	**f**	F1		
[320]	1	(835- -836)		**An. NW** (Bithynia, Kalonoros)	Csa	**rh**	S		
[321]	1	836		**An. NW** (Appolonias lac. (Sabandja dag))	Csa	**rh (?)/f**	F1		
[322]	1	(836)	**X**	**B.S. N** (Cherson (Sevastopol)	Dfa	**bw/≈**	S		
[323]	2	838	**VIII**	**Mes.** (Amorion (Samarra))	BSk	**rh**	S		
[324]	2	839		**Mac.** (Salonica)	Csa	**(lr/d)**	L		-1
[325]	2	841	**IV/10**	**An. SE** (Harran)	Csa	**rh/f**	S		
[326]	1	841	**XII**	**Mes.** (Samarra, Tigris riv.)	BSk	**rh/f**	S		
[327]	1	842/843	**XII-III**	**Syr.** ?	BSk	**lr/*/c/#/@/p**	L	-1	-1
[328]	1	(843- -868)		**Mac.** (Salonica)	Csa	**rh**	S		
[329]	1	843	**IV**	**An. E** (Djezireh)	BSk	**rh**	L		+1
[330]	1	843	**IV**	**Mes.** (Djezireh)	BWh	**bw**	S		
[332]	1	846		**Sp.**	Csb	**d**	L		-1
[333]	1	850	**II**	**Sp.** (Seville, Tajo riv.)	Csb	**f**	F1		
[334]	1	851/852	**XI…II**	**Arm.** (Taron)	BSk	**ws/c/***	L	-1	+1
[336]	2	855	**VI…VIII**	**An. C** (Phrygia, Honaz)	Csa	**h**	S		
[335]	1	(852/853)	**XI…II**	**Mac.** (Salonica)	Csa	**ws/#**	L	-1	
[337]	3	860	**VI**	**Con.**	Csa	**bw/≈**	S		
[340]	1	867		**Con.**	Csa	**bw**	S		
[341]	1	867- -886		**An. S.** (Attaleia (Antalya))	Csa	**f ποτ.**	F1		
[342]	1	867- -886	**XI…II**	**An. NW** (Pythion (Yalova))	Csa	**bw/s/≈**	S		
[343]	1	867- -886		**An. NW**	Csa	**bw S**	S		
[344]	1	867- -886	**VI…VIII**	**An. NW** (Bithynia)	Csa	**rh**	S		
[345]	1	867- -886		**An. NW** (Bithynia)	Csa	**rh**	S		
[346]	1	867- -886		**An. NW** (Bithynia)	Csa	**(rh)/f**	F1		
[347]	1	(868)		**Con.**	Csa	**rh**	S		
[349]	2	873	**VI…VIII**	**An. E** (Malatya, Euphrates riv.)	BSk	**f**	F1		
[350]	1	877		**Con.**	Csa	**bw S/≈**	S		
[352]	2	880	**III…V** ?	**Syr.** (Adata ((Hadath))	Csa	**c**	S		
[353]	5	887	**X//27**	**Con.**	Csa	**s/bw/th.**	S		
[354]	1	890		**Eg.** (Nile riv.)	BWh	**Nf (no flood)**	F2		
[355]	1	(893)	**XI/10**	**Con.**	Csa	**h**	S		
[356]	2	897	**II** 1 y	**Eg.**	BWh	**d**	L		-1
[357]	1	898		**Mes.** (Kufah, ’Ukâmtâ, Bâsrâ)	BSk	**rh/bw/th./hl.**	L		+1
[358]	1	(900- -955)	**XI/13**	**An. W** (Latmos mt.)	Csa	**th.**	S		
[359]	1	(900- -955)	**VI…VIII**	**An. W** (Latmos mt.)	Csa	**h**	S		
[360]	1	(900- -955)	**XI/25**	**An. W** (Latmos mt.)	Csa	**rh**	S		
[361]	1	902	**VII**	**Syr.** (Emesa (Hims))	Csa	**bw N/c/#**	L	-1	
[363]	1	(904- -905)		**Mes.** (Tigris riv.)	BSk	**f**	F1		
[364]	2	908	**II**	**Con.**	Csa	*****	L	-1	+1
[365]	5	908	**VI**	**Con.**	Csa	**bw S/rh**	S		
[366]	1	908- -909		**Mes.** (Baghdad)	BSk	*****	S		
[367]	1	918- -919		**Mes.** (Tigris riv., Euphrates riv.)	BSk	**ws/#**	L	-1	
[368]	1	921	**XI…II**	**Gr. S** (Peloponnese)	Csa	**ws/c**	L	-1	
[369]	1	922	**X**	**A.S.** (Kythera isl.)	Csa	**c**	S		
[370]	1	923- -924		**Syr.** ?	BSk	**lr/d**	L		-1
[371]	1	(926±)		**Gr. S** (Peloponnese)	Csa	**rh**	S		
[373]	10	927/928	**XII-III** 120 d	**Con.**	Csa	**ws/bw N/*/#**	L	-1	+1

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[373]	10	927/928	**XII-III** 120 d	**Mes.** (Baghdad)	BSk	**ws/bw N/*/#**	L	-1	+1
[374]	1	(927- -956)		**Con.** ?	Csa	**bw**	S		
[375]	1	(927- -956)	**VI…VIII**	**Con.** ?	Csa	**h**	S		
[376]	1	931	**XI…II**	**An. E** (Malatya)	BSk	*****	S		
[377]	1	(933/934)	**XII-III** 120 d	**An. W**	Csa	**ws/#**	L	-1	
[378]	1	935	**VI**	**Syr.** ?	BSk	**c/rh**	L		+1
[379]	1	(935- -940±)		**An. NW** Chalcedon (Kadiköy))	Csa	**s/fg./rh/th.**	S		
[380]	1	940- -941		**Mes.** (Tigris riv.)	BSk	**f**	F1		
[382]	1	(940- -979)		**An. NW** Chalcedon (Kadiköy))	Csa	**bw/≈**	S		
[383]	5	943	**XII**	**Con.**	Csa	**bw**	S		
[386]	1	(950±)		**It. S** (Rossano)	Csa	**rh/f**	S		
[387]	1	952	**VI…VIII**	**Eg.** (Nile riv.)	BWh	**Nf (no flood)**	F2		
[389]	1	(952/953)	**XI…II**	**Gr.** (Phokis, Steirion)	Csa	**ws**	L	-1	
[390]	1	954	**III…V** ?	**It.** (Panormos (Palermo))	Csa	**s/bw/≈**	S		
[391]	1	(956)		**An. N** (Parthenios riv. (Bartin Su/ Koca Irmak))	Csa	**f**	F1		
[392]	1	957/958	**XI…II**	**Mes.** ?	BSk	**rh**	L		+1
[393]	1	960	**XII…II** ?	**Ar.** (Makkah, tor.)	BWh	**f**	F1		
[394]	2	(960)	**X**	**Eg.** (Nile riv.)	BWh	**Nf (delay)**	F2		
[395]	2	(960/961)	**XI…II**	**A.S. S** (Crete isl.)	Csa	**wr**	L		+1
[396]	1	961	**II**	**Mes.** (Baghdad)	BSk	**f**	S		
[397]	1	962- -963		**Mes.** (Bataih)	BSk	**f**	S		
[399]	2	963		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[399]	2	964		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[400]	1	965		**Mes.** (Baghdad)	BSk	**hl.**	S		
[399]	2	965		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[401]	2	966	**XII**	**Syr.** (Antioch)	Csa	**rh**	L		+1
[399]	2	966		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[402]	1	967	**VI/6**	**Con.** (tor.)	Csa	**rh/f**	S		
[399]	2	967		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[403]	1	968	**VI/4**	**Con.**	Csa	**rh**	S		
[406]	5	969	**V**	**An. NW**	Csa	**bw h**	L	+1	
[407]	1	(969- -1004)	**XI…II**	**Mac.** (Athos mt.)	Csa	**ws**	L	-1	
[408]	1	(969- -1004)		**Mac.** (Athos mt.)	Csa	**bw/≈**	S		
[409]	1	971	**III…VIII**	**Ser.** (Dristra (Silistria))	Dfa	**s/hl./rh/th.**	S		
[410]	2	971	**VI/8**	**Ser.** (Dristra (Silistria))	Dfa	**bw N**	S		
[411]	1	(976- -992)		**Con.** ?	Csa	**var.**	S		
[412]	1	977- 978		**Mes.** (Baghdad, Tigris riv.)	BSk	**f**	F1		
[413]	1	(979)		**Con.** (Bosporus)	Csa	**bw/≈**	S		
[414]	1	982	**VI-IX**	**Eg.** (Nile riv.)	BWh	**Nf (no flood)**	F2		
[416]	1	989	**VII-VIII** 2 m	**Mes.** (Baghdad)	BSk	**bw S/h**	L	+1	
[417]	1	(992- -1019)		**Mes.** (Euphrates riv.)	BSk	**rh/f**	S		
[418]	2	(996)		**Gr.** (Thessaly, Spercheios riv.)	Csa	**rh/f**	S		
[419]	1	(997)	**VI…VIII**	**Gr.** (Peloponnese, Nikli)	Csa	**h**	S		
[420]	1	997	**VI…VIII**	**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[421]	1	999		**Mes.** (Baghdad)	BSk	**c/#**	L	-1	
[423]	1	(1005- -1019)		**Mac.** (Athos mt.)	Csa	**lr/d**	L		-1
[424]	1	1005	**VIII**	**Eg.** (Nile riv.)	BWh	**Nf (delay)**	F2		
[425]	1	1006	**X/3**	**Eg.** (Cairo)	BWh	**s/hl.**	S		

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[426]	1	1006	**X/3**	**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[428]	1	1007	**XI…II** 7 d	**Mes.** (Baghdad, Senar, Basra, Mahruban)	BSk	**(ws)/***	L	-1	+1
[428]	1	1007	**XI…II** 7 d	**Af. E**	BShs	**ws**	L	-1	
[427]	2	1007		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[429]	1	1008		**Mes.** (Tagrith, Dakûkâh)	BSk	**bw**	S		
[430]	1	1008	**III/14**	**Eg.** (Cairo, tor.)	BWh	**rh/hl./f**	S		
[431]	1	1008		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[432]	2	1010/1011	**XI…II**	**Con.** ?	Csa	**ws/#**	L	-1	
[433]	1	1021	**IX…XI**	**Arm.** (Vaspurakan)	BSk	**s/bw/rh/***	S		
[434]	1	1022	**VIII**	**An. E** (Malatya)	BSk	**bw**	S		
[437]	2	1025		**Con.** ?	Csa	**lr/d**	L		-1
[437]	2	1026		**Con.** ?	Csa	**lr/d**	L		-1
[438]	1	1026	**IV**	**Mes.** (Baghdad)	BSk	**hl.**	S		
[439]	1	1027	**XI…II**	**Mes.** (Baghdad)	BSk	**ws/c/#**	L	-1	
[437]	2	1027		**Con.** ?	Csa	**lr/d**	L		-1
[437]	2	1028		**Con.** ?	Csa	**lr/d**	L		-1
[440]	1	1029		**Con.** ?	Csa	**wm/rn**	L	+1	+1
[441]	2	1029/1030		**Con.** ?	Csa	**wr/rh/f**	L		+1
[442]	1	(1030- -1042)		**An. N** (Heraklea (Eregli))	Csa	**s/th/bw/≈**	S		
[443]	5	1031/1032	**XI…II**	**Mes.** (Baghdad)	BSk	**ws/c/#**	L	-1	
[444]	1	1031-1032	**XI…II**	**Mes.**	BSk	**d**	L		-1
[445]	1	1033	**XII**	**Mes.** (Nisibis)	BSk	**bw**	S		
[446]	1	1033	**XII**	**Mes.** (Nisibis)	BSk	**rh/hl.**	S		
[448]	2	1034	**IV/14**	**Con.**	Csa	**hl.**	S		
[449]	1	1034		**Mes.** (Persian gulf)	BSk	**bw/≈**	S		
[450]	1	1034		**(Mes.)**	Csa	**rh/f**	L		+1
[451]	2	(1035)	**XII-II**	**An. NE** (Trabzon)	Csa	**ws/c/*/s**	L	-1	+1
[451]	2	(1035)	**XII-II**	**Bul.** (Danube riv.)	Csa	**ws/#**	L	-1	
[452]	1	(1035- -1051)		**Thr.** (Philea)	Csa	**s/th.**	S		
[454]	2	1037	**III-VIII**	**Con.** ?	Csa	**lr/d**	L		-1
[455]	2	1037	**IX**	**Con.**	Csa	**hl.**	S		
[456]	1	1037	**XII** 6 d	**Mes.** (Baghdad)	BSk	**(ws)/c/*/#**	L	-1	+1
[457]	1	1038- -1039		**Con.** ?	Csa	**rh**	L		+1
[458]	2	1040		**Con.** ?	Csa	**var.**	S		
[459]	1	(1040)		**Con.**	Csa	**d**	L		-1
[460]	1	1040	3 y	**Af. N**	BWh	**lr**	L		-1
[460]	1	1041	3 y	**Af. N**	BWh	**lr**	L		-1
[460]	1	1042	3 y	**Af. N**	BWh	**lr**	L		-1
[461]	1	1042		**Mes.** (Baghdad)	BSk	**f**	S		
[462]	2	1043	**VI**	**Con.**	Csa	**cl./bw/≈**	S		
[463]	1	1043	**IX**	**Con.** ?	Csa	**bw**	S		
[464]	2	1045- -1046		**Arm.** (Ezangai)	BSk	**f**	F1		
[465]	1	1046- -1047		**Arm.** (Tevin)	BSk	**c/rh**	L		+1
[467]	4	1048	**XII**	**Bul.** (Danube riv.)	Csa	**(ws)/bw N/#**	L	-1	
[468]	1	(1051)		**An. W.** (Ephesos, Galesion mt.)	Csa	**rh/f tor.**	S		
[469]	1	1052		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[471]	1	(1054)	**I/5**	**Arm.** (Arsanias riv.)	BSk	**c/#**	L	-1	
[472]	2	1054	**VII**	**Con.**	Csa	**hl.**	S		
[473]	1	(1054)	**XI**	**An. W.** (Ephesos, Galesion mt.)	Csa	**rh/bw N**	S		
[474]	1	(1054- -1055)	**I/5**	**Arm.** (Awkawmi)	BSk	**c/#**	L	-1	

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[475]	1	1055		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[476]	2	1055/1056	**XII-V** ?	**An.** ?	BSk	**rn**	L		+1
[478]	1	1058/1059	**XI…II**	**An. E** (Malatya)	BSk	*****	L	-1	+1
[479]	6	1059	**IX/24**	**Bul.** (Lovec)	Csa	**rh/*/c/f**	S		
[480]	1	1059		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[480]	1	1060		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[480]	1	1061		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[480]	1	1062		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[480]	1	1063		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[481]	1	1063	**XI-XII**	**Mes.** (Baghdad)	BSk	**h**	L	+1	
[482]	1	1064	**I**	**Mes.** (Tigris riv.)	BSk	**ws/c/*/#**	L	-1	+1
[480]	1	1064		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[480]	1	1065		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[483]	1	1066- -1067	**III**	**Rus.** (Nemiga)	Dfb	*****	L	-1	+1
[485]	2	1068	**XII**	**An. S** (Alexandretta)	Csa	**c**	S		
[486]	1	1068- -1069	**XI…II**	**Arm.** ?	BSk	**lr/***	L		-1
[489]	1	1071	**XI…II**	**Mac.**	Csa	*****	S		
[490]	1	(1072)	**XII**	**Mac.** (Scopje)	Csa	*****	S		
[491]	1	1073/1074	**XI-II**	**Mes.** (Baghdad)	BSk	**wr/rh/f**	L		+1
[492]	3	1079	**X**	**Con.**	Csa	**th.**	S		
[493]	1	(1081)	**VI…VIII**	**Gr.** (Epirus, Acheron riv.)	Csa	**lr/d**	L		-1
[494]	1	(1081)	**VII/17**	**I.S.** (Corfu isl.)	Csa	**bw/≈**	S		
[495]	3	(1081)	**VII/30** 24 h	**Con.**	Csa	**rh/f**	S		
[496]	1	(1085)		**Ad.S.**	Csa	**bw/≈**	S		
[497]	1	1085	**IX/27**	**Mes.** (Baghdad)	BSk	**bw**	S		
[498]	1	(1085±)		**Gr. C** (Thebes)	Csa	**lr/d**	L		-1
[500]	1	(1087)	**III…V**	**Bul.** (Skenderlii)	Csa	**bw**	S		
[502]	1	(1091)	**II-III**	**(Con.)**	Csa	**ws/***	L	-1	+1
[505]	1	(1091- -1105)		**Gr. C** (Thebes)	Csa	**ws/c/***	L	-1	+1
[506]	1	1092		**Rus.** (Kiev, Polock)	Dfb	**d**	L		-1
[507]	1	(1095)		**Bul.** (Skenderlii)	Csa	**s**	S		
[508]	1	1095	**II**	**Mes.** (Nisibis)	BSk	**lr/d**	L		-1
[509]	1	(1095- -1096)		**Ar.** (Makkah)	BWh	**s/rh/f**	S		
[510]	1	(1096)	**XII/6**	**Al.** (Durazzo)	Csa	**no bw**	S		
[513]	1	(1098)		**Syr.** (Antioch)	Csa	**bw**	S		
[514]	3	1099/1100	1 y	**An. SE** (Edessa (Urfa))	Csa	**lr/d**	L		-1
[514]	3	1099/1100	1y	**Mes.**	BSk	**lr/d**	L		-1
[515]	1	(1101)	**III/15** ?	**Pal.** (Haifa, Yafo)	BWh	**s/≈**	S		
[516]	1	1103	**III**	**An. SE** (Scirtus riv., Edessa (Urfa))	Csa	**rh/hl./f**	S		
[517]	1	1106	**III**	**Mes.** (Baghdad, Tigris riv.)	BSk	**f**	F1		
[518]	3	1106	**IV/5**	**Con.**	Csa	**bw**	S		
[519]	1	1107	**IV/17**	**Mes.** (Euphrates riv.)	BSk	**f**	F1		
[520]	1	(1108- -1109)	**XI…II**	**Leb.** (Archas)	Csa	**rh/***	S		
[521]	1	1115- -1116		**An. SE** (Edessa (Urfa))	Csa	**s**	S		
[522]	1	1115- -1116		**An. SE** (Edessa (Urfa))	Csa	**f**	F1		
[523]	1	(1115- -1223)		**An. E** (Siran)	BSk	**bw h/d**	L		-1
[524]	1	(1115- -1223)		**B.S. N**	Dfa	**bw/≈**	S		
[525]	1	(1115- -1223)		**An. SE** (Basean)	BSk	**ws/rh/***	L	-1	+1

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[526]	1	(1116)	**VI…VIII**	**An. NW** (Lopadion (Ulubad))	Csa	**h/d**	L	+1	-1
[528]	1	(1120- -1121)		**Mes.** (Mardin)	BSk	**hl.**	S		
[529]	1	(1120- -1121)	**XI…II**	**Mes.** (Euphrates riv.)	BSk	**ws/#**	L	-1	
[530]	1	1122/1123	**XI-II**	**Syr.** ?	BSk	**lr/d**	L		-1
[531]	2	1124/1125	**XII-II**	**Syr.** (Aleppo, Damascus)	Csa	**lr/d**	L		-1
[531]	2	1124/1125	**XII-II**	**Mes.** (al Rahba, al Qala, Mosul)	BSk	**lr/d**	L		-1
[532]	1	1126/1127	**XI…II**	**Syr.** ?	BSk	**ws**	L	-1	
[533]	1	1129- -1130		**Mes.** (Mosul)	BSk	**cl./s/rh/th.**	S		
[534]	1	(1134;)	**II/17**	**Con.**	Csa	***/c**	S		
[535]	1	(1134)	**IX…XI**	**An. SE** (Edessa (Urfa))	Csa	**cl./hl./th.**	S		
[536]	1	(1134)	**XI…II**	**Syr.**	BWh	**lr/d/@**	L		-1
[536]	1	(1134)	**XI…II**	**Cy.**	Csa	**lr/d/@**	L		-1
[537]	2	(1134/1135)	**XI…II**	**An. E** (Malatya)	BSk	**ws/***	L	-1	+1
[536]	1	(1135)		**Syr.**	BWh	**lr/d/@**	L		-1
[536]	1	(1135)		**Cy.**	Csa	**lr/d/@**	L		-1
[538]	1	1135	**IX**	**Mes.** (Symnada (Şuhut))	BSk	**rh/th.**	S		
[539]	1	1135	**XI-XII**	**An. E** ?	BSk	**wm**	L	+1	+1
[540]	2	1135/1136	**I/26-**	**An. SE** (Amida (Diyarbakir))	BSk	**ws/#**	L	-1	
[541]	1	1136	**V/24**	**Syr.** (Damascus)	Csa	**bw**	S		
[542]	1	1136	**V/24**	**An. SE** (Harran)	Csa	**rh/hl./f**	S		
[543]	1	1138/1139	**XII-II**	**Mes.** (Euphrates riv.)	BSk	**ws/***	L	-1	+1
[544]	2	1139	**I-V**	**Mes.** ?	BSk	**lr**	L		-1
[545]	3	(1139)	**XII**	**An. N** (Cappadocia, Neocaesarea (Niksar))	Csa	**ws**	L	-1	
[546]	1	1141	**V**	**Syr.** (Hanazit, Hesna Ziad)	Csa	**hl./th.**	S		
[547]	1	1141	**VI**	**An. E** (Malatya)	BSk	**bw**	S		
[548]	1	1141- -1142		**Syr.** (Camha)	Csa	**hl.**	S		
[549]	2	(1142)		**An. C** (Baysehir golu)	BSk	**bw/≈**	S		
[551]	2	1143	**IV/5**	**An. S** (Cilicia)	Csa	**rh/f**	S		
[552]	3	1147	**IX/7**	**Thr. E** (Bahsajys, Melas riv.)	Csa	**rh/f**	S		
[553]	2	1147- -1148		**Syr.** ?	BSk	**lr/d**	L		-1
[554]	1	1148	**V/12**	**A.S.** (Paros isl.)	Csa	**hl.**	S		
[555]	1	1148	**XI-XII**	**Syr.** ?	BSk	**lr/ d**	L		-1
[556]	1	1149	**I-II**	**Syr.** ?	BSk	**wr**	L	+1	+1
[557]	1	1149	**III…V**	**I.S.** (Corfu isl.)	Csa	**s/bw/≈**	S		
[558]	1	1149	**VI…VIII**	**It.** (Sicilia)	Csa	**s/th./bw/≈**	S		
[559]	1	1149/1150	**XI…II**	**Thr.** ?	Csa	**ws/c**	L	-1	
[560]	1	(1150)	**IV**	**Pal.** (Awaj riv.)	BWh	**rh**	L		+1
[561]	2	1150	**IV**	**Mes.** (Hesna Ziad)	BSk	**rh/f**	L		+1
[562]	1	(1150;)		**An. E.** (Malatya, Tarshanâ)	BSk	**rh/f**	L		+1
[563]	1	1150/1151	**XI…II**	**An. E.** (Malatya)	BSk	**ws/***	L	-1	+1
[564]	2	1151		**Syr.** (Damascus)	Csa	**rh/f**	L		+1
[565]	1	1151	**X**	**Syr.** (Euphrates riv., Hesna Ziad, Camha)	Csa	**rh/f**	S		
[566]	1	(1154- -1160)		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[568]	1	1157	**V/12**	**Mac.** (Pelagonia)	Csa	**th.**	S		
[569]	1	1158	**III…V**	**An. E** (Phrygia, Sandikli)	Csa	*****	S		
[570]	1	(1159)	**IV**	**Mes.** (Baghdad, Tigris riv.)	BSk	**f**	F1		
[572]	2	1167	**XI…II**	**An. E** (Alemdagi)	BSk	**c**	L	-1	
[573]	1	1169	**XII**	**Eg.** (Damietta)	BWh	**s/bw/≈**	S		
[574]	4	1172/1173	**XI…II**	**Eg.**	BWh	**ws/*/rh/#**	L	-1	+1
[574]	4	1172/1173	**XI…II**	**Pal.**	BWh	**ws/*/rh/#**	L	-1	+1
[574]	4	1172/1173	**XI…II**	**Syr.**	BWh	**ws/*/rh/#**	L	-1	+1
[574]	4	1172/1173	**XI…II**	**Mes.**	BSk	**ws/*/rh/#**	L	-1	+1

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[574]	4	1172/1173	**XI…II**	**Arm.**	BSk	**ws/*/rh/#**	L	-1	+1
[574]	4	1172/1173	**XI…II**	**Per.**	BWh	**ws/*/rh/#**	L	-1	+1
[575]	1	1172- -1173		**Mes.** (Baghdad)	BSk	**rh/f**	L		+1
[576]	1	(1174)	4 y	**Pal.**	BWh	**(d)/@**	L		-1
[576]	1	(1174)	4 y	**Syr.**	BWh	**(d)/@**	L		-1
[576]	1	(1174)	4 y	**Arm.**	BSk	**(d)/@**	L		-1
[576]	1	(1175)	4 y	**Pal.**	BWh	**(d)/@**	L		-1
[576]	1	(1175)	4 y	**Syr.**	BWh	**(d)/@**	L		-1
[576]	1	(1175)	4 y	**Arm.**	BSk	**(d)/@**	L		-1
[577]	2	1176	**III-V**	**Pal.** (Jerusalem)	BWh	**lr/ d**	L		-1
[577]	2	1176	**III-V**	**Mes.** (Nisibis)	BSk	**lr/ d**	L		-1
[577]	2	1176	**III-V**	**Mes.** (Mosul)	BSk	**lr/ d**	L		-1
[578]	2	1176	**IX/17**	**An. C** (Myriokephalon (Denizli))	BSk	**bw**	S		
[576]	1	(1177)	4 y	**Pal.**	BWh	**(d)/@**	L		-1
[576]	1	(1177)	4 y	**Syr.**	BWh	**(d)/@**	L		-1
[576]	1	(1177)	4 y	**Arm.**	BSk	**(d)/@**	L		-1
[579]	1	1177/1178	**XII…II** ?	**Pal.**	BWh	**lr/ d/@**	L		-1
[579]	1	1177/1178	**XII…II** ?	**Syr.**	BWh	**lr/ d/@**	L		-1
[579]	1	1177/1178	**XII…II** ?	**Mes.**	BSk	**lr/ d/@**	L		-1
[579]	1	1177/1178	**XII…II** ?	**Arm.**	BSk	**lr/ d/@**	L		-1
[580]	1	1178	**IV**	**Syr.** ?	BSk	**rn**	L		+1
[581]	1	1178	**V**	**Syr.** (Antioch)	Csa	**rh/f**	S		
[583]	1	(1178/1179)	**XI…II**	**Syr.** (Antioch)	Csa	**wm**	L	+1	+1
[585]	1	(1179)	**XI…II**	**An. NW** (Nicomedea (Izmit))	Csa	**rh/f**	S		
[586]	1	(1184- -1223)	**V**	**An. NE** (Paipert)	Csa	**f**	F1		
[587]	1	(1184- -1223)		**An. NE** (Trabzon)	Csa	**s/rh/hl./th.**	S		
[589]	1	(1185)	**XI**	**An. NW** (Hellespont)	Csa	**bw/≈**	S		
[590]	1	(1187)	**IX/4**	**Con.** ?	Csa	**bw**	S		
[591]	1	(1187/1188)	**XI…II**	**Bul.** (Philippopolis (Plovdiv))	Csa	**ws/c/*/#**	L	-1	+1
[593]	1	(1199)	**VII**	**Mac.** (Prosakos)	Csa	**h**	L	+1	
[596]	2	1200		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[595]	1	1200	**III**	**Eg.** (Cairo)	BWh	**bw**	S		
[597]	1	1200	3 y	**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[598]	1	(1201)		**An. NW** (Propontis)	Csa	**s/bw/≈**	S		
[597]	1	1201	3 y	**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[597]	1	1202	3 y	**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[599]	1	(1205)	**IX…XI**	**Thr.** (Evros riv.)	Csa	**rh/f**	S		
[600]	1	(1231)	**VII**	**Mes.** (Khâtâyê)	BSk	**rh/*/#**	L		+1
[601]	1	1235/1236	**XI…II**	**An. E**	BSk	**ws/#**	L	-1	
[601]	1	1235/1236	**XI…II**	**Mes.** (Euphrates riv.)	BSk	**ws/#**	L	-1	
[602]	1	1238- -1239		**Mes.** (Baghdad, Tigris riv.)	BSk	**f**	F1		
[603]	2	(1242)	**XII**	**An. W** (Pigai)	Csa	**(ws)/c/***	L	-1	+1
[605]	1	(1245- -1246)		**An. S** (Tarsus)	Csa	**rh**	S		
[606]	2	(1256)	**XI…II**	**Thr.** (Hadrianopolis (Edirne))	Csa	**c/***	L	-1	+1
[607]	1	(1256)	**XI…II**	**Mac.** (Rhodope mt.)	Csa	**c**	L	-1	
[608]	2	(1256)	**IX…XI**	**Mac.** (Makrolivada)	Csa	**ws/c/bw N**	L	-1	
[609]	2	(1256)	**IX…XI**	**Mac.** (Tzepaena)	Csa	**c/#**	L	-1	
[611]	1	(1265)	**V**	**Con.**	Csa	**s/rh/hl./th.**	S		
[612]	1	1273	**I/5**	**An. S** (Cilicia)	Csa	*****	L	-1	+1
[613]	1	1276	**II/17**	**Mes.** (Mosul, Arbil)	BSk	**bw**	S		
[614]	1	(1276)		**Mes.** (Bîrâh)	BSk	**c/***	S		

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[615]	1	(1277- -1288)	**XI…II**	**Thr.** (Hadrianopolis (Edirne))	Csa	**c/#**	L	-1	
[616]	1	(1282/1283)	**XII-II**	**Mes.** (Mosul)	BSk	**ws**	L	-1	
[616]	1	1282/1283	**XII-II**	**Per.** (Senar)	BWh	**ws**	L	-1	
[618]	1	1295		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[619]	1	1295- -1296		**Mes.** (Kûngûr Aûlân)	BSk	**s/rh/th./bw**	S		
[620]	1	1296		**Eg.** (Alexandria)	BWh	**bw**	S		
[620]	1	1296		**Pal.**	BWh	**bw**	S		
[620]	1	1296		**Syr.**	BWh	**bw**	S		
[621]	2	1296		**Eg.** (Cairo)	BWh	**d/@**	L		-1
[621]	2	1296		**Pal.** (Jerusalem)	BWh	**d/@**	L		-1
[621]	2	1296		**Syr.** (Aleppo)	Csa	**d/@**	L		-1
[621]	2	1296		**Ar.** (Makkah)	BWh	**d/@**	L		-1
[622]	1	(1297)	**VIII/29**	**Con.**	Csa	**rh/f**	S		
[623]	1	1297		**Af. N** (Barqa)	BWh	**lr/ d**	L		-1
[623]	1	1297		**Eg.**	BWh	**lr/ d**	L		-1
[623]	1	1297		**Syr.**	BWh	**lr/ d**	L		-1
[623]	1	1297		**Pal.** (Jerusalem)	BWh	**lr/ d**	L		-1
[624]	1	(1298/1299)	**XI…II**	**Con.**	Csa	**ws/*/#**	L	-1	+1
[625]	1	(1301)	**III-V**	**An.** ?	BSk	**lr/ d**	L		-1
[626]	1	(1302)	**VII**	**An. C.** (Sagaris riv.)	BSk	**rh/f**	S		
[628]	1	1316- -1317		**Leb.** (Baalbek)	Csa	**f**	F1		
[630]	1	1317		**Con.**	Csa	**bw N**	S		
[631]	1	(1321)	**XII**	**Thr.** (Tzouroulos (Corlu))	Csa	**c**	L	-1	
[632]	2	(1322)	**XII**	**Con.**	Csa	**bw N/c/rh/***	L	-1	
[633]	1	(1325- -1328)	**XI…II** 6 d	**Con.**	Csa	**ws/#**	L	-1	
[634]	1	(1325- -1328)		**Con.**	Csa	**ws**	L	-1	
[635]	2	1330	**XI**	**Cy.** (Nicosia)	Csa	**rh/f tor.**	S		
[636]	1	1332	**II/12**	**Con.**	Csa	**bw S**	S		
[637]	1	(1333)	**XII**	**Gr.** (Thessaly)	Csa	***/c**	L	-1	+1
[639]		(1341)	**XI/23**	**Con.**	Csa	*****	L	-1	+1
[640]	2	(1341)	**XII**	**Thr.** (Hadrianopolis (Edirne))	Csa	**ws**	L	-1	
[641]	1	(1341)	**XI…II**	**Thr.** (Orestias, Evros riv.)	Csa	**rh/f**	S		
[642]	1	(1341)	**XI…II**	**Thr.** (Hadrianopolis (Edirne))	Csa	**rh/***	L	-1	+1
[643]	1	(1341)	**XII** 12 d	**Thr.** (Evros riv.)	Csa	**(ws)/bw N/c/#**	L	-1	
[644]	1	(1341/1342)	**XI…II**	**Thr.** (Didymoteicho)	Csa	**ws**	L	-1	
[645]	1	(1342)	**III-V**	**Mac.** (Axios riv.)	Csa	**rh/f**	L		+1
[646]	2	(1342/1343)	**XI…II**	**Thr.** (Didymoteicho)	Csa	**ws/c/***	L	-1	+1
[647]	1	(1343)	**V**	**Mac.** (Axios riv.)	Csa	**rh/f**	L		+1
[648]	1	(1343)		**Con.** ?	Csa	**hl.**	S		
[649]	1	(1344)		**Con.** ?	Csa	**hl.**	S		
[650]	1	(1346/1347)	**XII-IV**	**Con.**	Csa	**(ws)/c/#/***	L	-1	+1
[651]	1	(1346- -1353)	**XI…II**	**Mac.** (Athos mt.)	Csa	*****	L	-1	+1
[653]	1	(1349)	**III**	**Con.**	Csa	**fg.**	S		
[654]	1	(1349)	**III**	**Con.**	Csa	**bw/≈**	S		
[655]	1	(1349)	**XI**	**Mac.** (Serbia)	Csa	**rh**	S		
[656]	1	(1350)	**I**	**Mac.** (Berroia)	Csa	**c**	L	-1	
[657]	1	(1350±)	**IX**	**Mac.** (Athos mt.)	Csa	**s/bw/rh/th./hl.**	S		
[658]	1	(1351)	**IX**	**An. N** (Heraklea (Eregli))	Csa	**bw/≈**	S		
[659]	1	(1352)	**II**	**An. NW** (Marmara sea, Princes' Islands (Adalar))	Csa	**c**	L	-1	
[660]	1	(1352)	**II/13**	**An. NW** (Marmara sea, Princes' Islands (Adalar))	Csa	**bw N/≈**	S		
[661]	1	(1352)	**III…V**	**Con.**	Csa	**s/c**	L	-1	+1
[662]	1	(1352)	**V**	**Con.**	Csa	**bw/≈**	S		

1	2	3	4	5	6	7	8	9	10
Rf	**C**	**Y**	**D**	**A**	**R**	**P**	**Cl**	**T/i**	**R/i**
[663]	1	(1354)	**III/1-2**	**Thr.** (Callipolis (Gelibolu))	Csa	**rh/*/c**	L	-1	+1
[664]	1	(1358/1359)	**XI…II**	**An. W** (Phocaia (Foca))	Csa	**ws/***	L	-1	+1
[665]	1	(1359)	**VI…VIII**	**Con.** ?	Csa	**h/d**	L	+1	-1
[666]	1	(1360)	**VI…VIII**	**Ser.**	Dfa	**bw W**	S		
[667]	1	1373	**I/13**	**An. NE** (Trabzon)	Csa	**c/***	L	-1	+1
[669]	1	1374	2 y	**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[669]	1	1375	2 y	**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[670]	1	(1384;)		**Mac.** (Athos mt.)	Csa	**c/*/#**	L	-1	+1
[671]	1	1384		**Syr.** (Damascus)	Csa	**c**	L	-1	
[672]		1391	**I**	**Syr.** (Aleppo)	Csa	**c**	S		
[674]	1	1394		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[675]	1	1395	**IV-V**	**Syr.** ?	BSk	**lr/ d**	L		-1
[677]	2	1397		**Syr.** (Damascus, Guta)	Csa	**lr/ d**	L		-1
[678]	1	1397	**III**	**Syr.** (al Zabadani, Gabal al Tag, Harran)	Csa	**rh/***	L		+1
[679]	1	1397	**IV/2**	**Syr. N**	BSk	**c/#**	L	-1	
[680]	1	1397	**V/4-6**	**Syr. N** (Barza)	BSk	**f**	F1		
[681]	1	1402	**VI…VIII**	**An. NE**	Csa	**bw**	S		
[682]	1	(1403)	**XI…II**	**An. W** (Miletus)	Csa	**ws/c**	L	-1	
[684]	1	1403		**Eg.** (Nile riv.)	BWh	**Nf (low level flood)**	F2		
[685]	1	1403/1404	**XI…II**	**Eg.**	BWh	**c**	L	-1	
[686]	1	1419	**IX-XII**	**Mac.** (Salonica)	Csa	**lr/ d**	L		-1
[686]	1	1420	**I-VIII**	**Mac.** (Salonica)	Csa	**lr/ d**	L		-1
[687]	1	1420	**XII/17**	**Gr.** (Nafplion)	Csa	**rh/th.**	S		
[688]	1	(1435)	**VIII/29**	**Gr.** (Chalkis)	Csa	**c**	L	-1	
[689]	1	(1436)	**I-II**	**Al.** (Depas)	Csa	**ws**	L	-1	
[690]	1	(1436- -1438)		**An. N** (Heraklea (Eregli))	Csa	**bw N/≈**	S		
[691]	1	(1438- -1439)		**It.** (Ferrara)	Csa	**s**	S		
[692]	1	1440	**VI/1**	**Con.**	Csa	**s**	S		
[693]	1	(1444)	**VIII**	**An. NW** (Hieron)	Csa	**bw/≈**	S		
[694]	1	1445	**VII/17**	**Con.** ?	Csa	**h**	S		
[695]	1	(1451)		**Con.** ?	Csa	**var.**	S		
[696]	1	(1453)	**III…V**	**Con.** ?	Csa	**var.**	S		
[697]	1	(1453)	**IV/18**	**Con.**	Csa	**rh/hl./f**	S		
[698]	1	1453	**VI…VIII** 8 d	**Con.**	Csa	**var.**	S		
[699]	1	(1454- -1455)		**A.S.** (Lesbos isl.)	Csa	**s/rh/bw/≈**	S		
[701]	1	(1456)	**I-II**	**Con.**	Csa	**ws**	L	-1	
[702]	1	(1460)		**Gr.** (Corinth)	Csa	**s**	S		
[703]	1	(1463;)		**Al.** (Klitie)	Csa	**h**	S		
[705]	1	1470	**XI…II**	**I.S.** (Corfu isl.)	Csa	**ws**	L	-1	
[706]	1	1470	**XI/5**	**Cy.** (Nicosia, Ammochostos)	Csa	**rh/f**	S		