

References

- BBC News.** 2006. High Tide Washes away Beach Huts, *BBC News Online*, Tuesday 24 October 2006, <http://news.bbc.co.uk/1/hi/england/devon/6081994.stm> (accessed 3 June 2013).
- Bowyer PJ, MacAfee AW.** 2005. The theory of trapped-fetch waves with tropical cyclones – an operational perspective. *Weather Forecast.* **20**: 229–244.
- Draper L, Bownass TM.** 1982. Unusual waves on European Coasts, February 1979. *Proceedings 18th Coastal Engineering Conference, Cape Town*. American Society of Civil Engineers: Reston, VA; pp. 270–281.
- Draper L, Bownass TM.** 1983. Wave devastation behind Chesil Beach. *Weather* **38**: 346–352.
- East Devon District Council.** 2008. *Strategic Flood Risk Assessment, Level 1, SFRA*. Volume 1, Main Report. East Devon District Council/Halcrow Group Ltd: Exeter, UK, September.

- Gibbs P.** 1982. Observations of short term profile changes on Chesil Beach. *Proc. Dorset Nat. Hist. Archeol. Soc.* **102** (for 1980): 77–82.
- Haigh I, Nicholls R, Wells N.** 2011. Rising sea levels in the English Channel 1900 to 2100. *Marit. Eng.* **164**(MA2): 81–92.
- Lamb H, Frydendahl K.** 1991. *Historic Storms of the North Sea, British Isles and Northwest Europe*. Cambridge University Press: Cambridge, UK: 204 pp. (Paperback Re-issue – 2005, ISBN 0-521-61931-9 paperback).
- Lapworth A.** 2011. Wind against tide. *Weather* **66**: 100–102.
- Nicholls RJ, Webber NB.** 1988. Characteristics of shingle beaches with reference to Christchurch Bay, *Proceedings 21st International Coastal Engineering Conference, Torremolinos, Spain*. Volume 3. American Society of Civil Engineers: Reston, VA; pp 1922–1936.
- Turton J, Fenna P.** 2008. Observations of extreme wave conditions in the northeast

Atlantic during December 2007. *Weather* **63**: 352–355.

West IM. 2012 *Chesil Beach: Storms and Floods. Geology of the Wessex Coast of Southern England*. School of Ocean and Earth Science, Southampton University, Version: 19th June 2012. <http://www.southampton.ac.uk/~imw/chestorm.htm> (accessed 3 June 2013).

Correspondence to: Andrew Sibley
andrew.sibley@metoffice.gov.uk

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Ancient Greek drama as an eyewitness of a specific meteorological phenomenon: indication of stability of the Halcyon days

Christina Chronopoulou¹
A. Mavrakis²

¹*Theatre on Education, Educational Department of Primary Education, National and Kapodestrian University of Athens, Athens, Greece*

²*Department of Economic and Regional Development, Institute of Urban Environment and Human Resources, Panteion University, Athens, Greece*

Introduction

The aim of this paper is to investigate the weather conditions and circumstances under which the audience of the open theatre of Dionysus in Athens would have watched drama in the middle of winter during the Attic month of Gamelion (15 January to 15 February). Since antiquity, during that period of the year there were some days

called Halcyon days, characterised by clear, sunny weather conditions.

This paper concerns the indications of stable weather conditions for the performance of dramatic festivals during Gamelion, in Athens in the fifth and in fourth centuries BC by studying the ancient Greek drama. We suggest that the dramas of classical years can be used as credible sources of information useful for the study of the climate in Attica during the classical era, as well as with other palaeoclimatological studies.

Ancient manuscripts can provide valuable meteorological information to help modern scientists reconstruct the climate of the past. This paper analyses the writings of the dramas of Aeschylus, Sophocles, Euripides and the comedies of Aristophanes during the Golden Age, an era of artistic and literary achievements in Athens from the fifth to fourth century BC. These theatrical texts provide descriptions of clear and stable

weather conditions, as seen through the eyes of a simple observer. The lack of sudden weather phenomena and the stability in the appearance of the Halcyon days allowed the dramatic festivities of Lenaia to be performed, during winter time, in an open space: the theatre of Dionysus being located in the southern foothills of the Acropolis in Athens.

Reconstructing climate from trees, ice cores and coral provides evidence of past weather, but from human sources scientists are limited by the historical information available. McCormick *et al.* (2012) have reconstructed climate-change indications during and after the Roman Empire using a combination of scientific and historical data. Also, Domínguez-Castro *et al.* (2012) analyse the writings of scholars, historians and diarists in Iraq during the Islamic Golden Age between AD 816 and 1009 for evidence of abnormal weather patterns. In addition,

Zerefos *et al.* (2007) have reconstructed the aerosol optical depth before, during and after major volcanic eruptions by studying the colouration of the atmosphere in paintings that portrayed sunsets in the period AD 1500–1900.

The climate of Greece in most recent, and previous, climate classifications is characterised as a mild Mediterranean climate with long, hot, dry summers: Csa class according to the Köppen–Geiger classification (Philandras *et al.*, 1999; Peel *et al.*, 2007; Douvis, 2009). The Köppen–Geiger climate classification system is based on the concept that native vegetation is the best expression of the climate. Thus, climate-zone boundaries have been selected with vegetation distribution in mind. It combines average annual and monthly temperatures and precipitation, and the seasonality of precipitation (Peel *et al.*, 2007).

Apparently, periods of stable and clear weather conditions would be less expected, therefore more noticeable, during the cold-rainy period of the year. Halcyon days are such atypical winter-time weather periods characterised by sunny and calm conditions, during which the halcyon birds were supposed to lay their eggs (HNMS, 2013). They occur in Greece, especially in Attica, and in southeastern Europe between 15 December and 15 February, but more frequently during 15–31 January. These cold yet calm and sunny conditions are the result of a stagnant high-pressure system dominating the entire area during this time of year (Ziakopoulos, 2008; HNMS, 2013).

The Halcyon days, a phenomenon also observed nowadays, has its origins in an ancient myth. According to one version, the goddess Halcyon, daughter of Aeolus, the ruler of the winds, insults Zeus and Hera. So, the father of gods transformed her into a bird and condemned her to lay her eggs only in the mid-winter. Consequently, the little birds were hardly able to survive. Crying and praying endlessly, Halcyon managed to make Zeus feel pity for her and so he decided to give her 14 days of good and calm weather in mid-January in order to lay her eggs in security. The Halcyon days were named after this Greek myth, and in Aristotle's *Histories about animals* (p. 5.8; 350 BC) he writes *The halcyon breeds at the season of the winter solstice. Accordingly, when this season is marked with calm weather, the name of "halcyon days" is given to the seven days preceding and to as many following the solstice* (Wentworth Tompson, 2007).

Data and methodology

The data sources are the classical dramas of Aeschylus, Sophocles, Euripides and Aristophanes, classical theatre of fifth and fourth centuries BC, which provide us with earlier information about historical weather

than the geographers of the third century BC, and they act as 'eyewitness' accounts.

In those 43 plays – 7 by Aeschylus, 7 by Sophocles, 18 by Euripides and 11 by Aristophanes (Lesky, 1988) – we notice seven references with information about the weather in Athens from 458 BC until 401 BC, providing direct and indirect indications related to clear weather and the beneficial Halcyon days in mid-winter. The chronological order of the dramas studied is as follows: Aeschylus in *Agamemnon* 458 BC, Euripides in *Medea* 431 BC, Aristophanes in *Acharnians* 425 BC, Aristophanes in *Birds* 414 BC, Aristophanes in *Frogs* 405 BC, Sophocles in *Oedipus in Colonus* 401 BC. In the following we present fragments of Greek drama not in chronological order, but according to the volume of information provided.

Results

The ancient Greeks used to forecast by looking for the signs of diosimies, which are phenomena caused by Zeus. Meteorological calendars called 'Parapigmata' were being circulated in the ancient Agora (a place of gathering and a market) since the fifth century (McCormick *et al.*, 2012). Philosophers were observing weather phenomena from mountains such as Mithimna, Idi and Lycabettus (Theophrastus, third to fourth century BC), and by combining astronomy with their empirical knowledge of the local meteorology they composed the Parapigmata, a kind of empirical forecast report. In *Agamemnon*, (pp. 4–7; 458 BC), Aeschylus writes (Figure 1):

φρουρᾶς ἐτείας μῆκος, ἦν κοιμῶμενος
 στέγαις Ἀτρεϊδῶν ἄγκαθεν
 κυνός δίκεν
 ἄστρον κάτοῖδα νυκτέρων ὀμήγυριν
 καὶ τοὺς φέροντας χεῖμα καὶ θέρος βροτοῖς
 λαμπροῦς δυνάστας
 ἐμπρέποντας αἰθέρι
 ἀστέρας, ὅταν φθίνωσιν, ἀνατολάς τε τῶν

Figure 1. Aeschylus in *Agamemnon*, 458 BC.

I've spent my nights on the Atrides roof resting on my elbows like a dog, and come to know thoroughly the throng of stars of the night, and also those bright potentates, conspicuous in the sky, which bring winter and summer to mortals [observing] them as some set and others rise (Sommerstein, 2008).

Dramatic festivals were being organised in Lenaia in winter, specifically on the twelfth day of Gamelion (26 January). Furthermore, this particular month was the month of the holy marriage of Zeus and Hera and thus the ideal month for the

mortals to marry under the full moon of Gamelion. Aristophanes in *Birds* (pp. 1737–1743; 414 BC) writes (Figure 2):

Ὁ δ' ἀμφιθαλῆς Ἔρος
 χρυσόπτερος ἠνίας
 ἠῦθυνε παλιντόνους
 Ζηνός
 πάροχος γάμων
 τῆς τ' εὐδαίμονος Ἥρας
 Ὑμῆν ὦ, Ὑμέναι' ὦ
 Ὑμῆν ὦ, Ὑμέναι' ὦ!

Figure 2. Aristophanes in *Birds*, 414 BC.

And blooming young Eros of the golden wings guided the tautened reins as groomsman at the wedding of Zeus and the blessed Hera. Hymen O, Hymenaeus O! Hymen O, Hymenaeus O! (Sommerstein, 1987).

Because the Attic weddings lasted for three days and the ceremony was usually performed in an open area in order for the newly weds to harmonise their life with nature, we conclude that in those particular days of Gamelion suitable weather conditions pertained (Michailidou, 2011). Aristophanes refers to the beneficial Halcyon days for the couple who had been married in Gamelion (*Birds*, p. 1591):

Enjoy Halcyon days the whole time.

The ancient Greeks used to observe the stability of the presence of summery days in winter, so they decided to include dramatic festivals in Lenaia, one of the four celebrations in order to honour Dionysus – which was one of the most famous deities, not only in Attica but in many other places in Greece. Three of the four celebrations were combined with dramatic festivals: City Dionysian, Rural Dionysian and Lenaia, which related to the maenads 'ληναίαι' and 'ληναίζω', meaning *I participate in Bacchus dance* (Papahatzis, 1972). The festivals were accompanied by dramatic contests, probably since 440 BC (Pickard-Cambridge, 1988), in which many poets participated. We cannot be sure when the Lenaia celebrations first began, but the fact that the dramatic contests were included many years after the beginning of these celebrations indicates that the winter month Gamelion offered security in weather conditions, which allowed people to watch theatre performances somewhere in the ancient Agora and then at the theatre that Lycurgus had built on the southern slope of the Acropolis in the fourth century BC. According to American excavations, there is no evidence for the existence of any kind of covered place in the Agora where dramas could have been performed (Pickard-Cambridge, 1988). In addition, we have no serious evidence during that era about any kind of shelter close to the theatre of Dionysus in case of sudden rain. The stoa of Eumenus on the southern

side of the theatre was built around the second century BC. Therefore, we can assume that weather did not trouble the people who used to organise dramatic contests in Lenaia in the earlier years.

Lenaia was less highly regarded than the City Dionysian, because no foreigners attended, only Athenians and resident allies, due to the December to February halt in sailing (Pickard-Cambridge, 1988). Specifically, Aristophanes in the Lenaian play *Acharnians* (pp. 501–507; 425 BC) writes:

And what I say will be shocking, but right. This time Cleon will not accuse me of defaming the city in the presence of foreigners; for we are by ourselves; it's the Lenean competition, and no foreigners are here yet; neither tribute nor troops have arrived from the allied cities. This time we are by ourselves. Clean hulled for I count the resident foreigners as the bran of our populace (Henderson, 1998).

Despite the above, the contests during Lenaia were important because they were organised under the Archon Basileus, the supreme religious officer of the city, and so the rich citizens as well as the resident allies were 'khoroi': they sponsored these dramas, and they certainly did not want their offerings to lose their glamour due to postponement or cancellation. The competitive spirit was very important for them in order to achieve prestige and glory (Baldry, 1971). Evidence that makes Lenaia a festival of great significance is provided by excavations in the southern part of the Acropolis, where marble slabs with engraved names of the winners of the dramatic contests in Gamelion were found (Pickard-Cambridge, 1988). Lenaia seemed to be the second most popular celebration after the City Dionysian festival. Famous plays, especially the following comedies by Aristophanes, won the first or second prize in the dramatic contests in Lenaia: *Acharnians* (425 BC) won first prize, *Knights* (425 BC) first prize, *Wasps* (422 BC) second prize and *Frogs* (405 BC) first prize, but there is no information about *Lysistrata* (411 BC) winning a prize.

The weather therefore must have been mild and stable enough to allow these performances to be presented in mid-winter. Even though weather-related references might be favourably influenced by dramaturgical needs, they would still contain fragments of truth. Euripides in *Medea* (pp. 824–833; 431 BC) talks about the clear, pleasant and harmonious climate:

From ancient times the sons of Erichtheus have been favoured; they are children of the blessed gods sprung from a holy land never pillaged the enemy. They feed on wisdom most glorious, always stepping gracefully through the bright air, where once, it is said, the nine Pierian Muses gave

birth to fair-haired Harmonia. Men celebrate in song how Aphrodite, filling her pail at the streams of the fair flowing Cephisus, blew down upon the land temperate and sweet breezes (Kovacs, 1994).

Aristophanes implies that he is particularly grateful for the presence of the Halcyon days because his comedies, especially those that criticise the Athenian democracy, were mainly presented in Lenaia and that is the reason why he invokes their appearance in his comedy *Frogs* (pp. 1309–1310; 405 BC; Figure 3):

Ἀλκυόνες, αἱ παρ' ἀενάοις θαλάσσης κύμασι
κύμασι στωμύλλετε

Figure 3. Aristophanes in *Frogs*, 405 BC.

You halcyons, who chatter by the ever flowing waves of the sea (Henderson, 2002).

Moreover, there are indications of low rainfall in Attica. Rainfalls could be predicted by observing the small Hymettus (a mountain of Athens). Small Hymettus used to be called 'Ανυδρο' – dry Hymettus.

Theophrastus in *On the signs of Waters, Winds and Storms* (p. 20) Hort (1926) observed that if the lesser Mount Hymettos, which is called the Dry Hill, has clouds in its hollows, it is a sign of rain. Athens seemed to have mild weather and it was *the best place on earth that never met heavy winter* as the tragic poet Sophocles writes in *Oedipus at Colonus* (pp. 668–678; 410 BC):

Noble the breed of horses here in white Colonus, the land of our birth. The loveliest land in all the earth. A distant music, pure and clear. Rises from green, secluded vales. The constant trill of the nightingales deep in their haunts of tangled vine, of sacred ivy, dark as wine, thick is the god's inviolate wood, rich in berries and rich in fruit. The sun is curtained; the wind is mute in winter (Banks, 1956).

Additional information mentioned by Aristophanes' heroes in *Birds* (pp. 1505 and 1550; 414 BC) is the reference to 'skiadeion', a kind of umbrella used solely to protect people from the sunlight rather than rain, which provides another indirect indication that during the Lenaia the weather was clear and sunny.

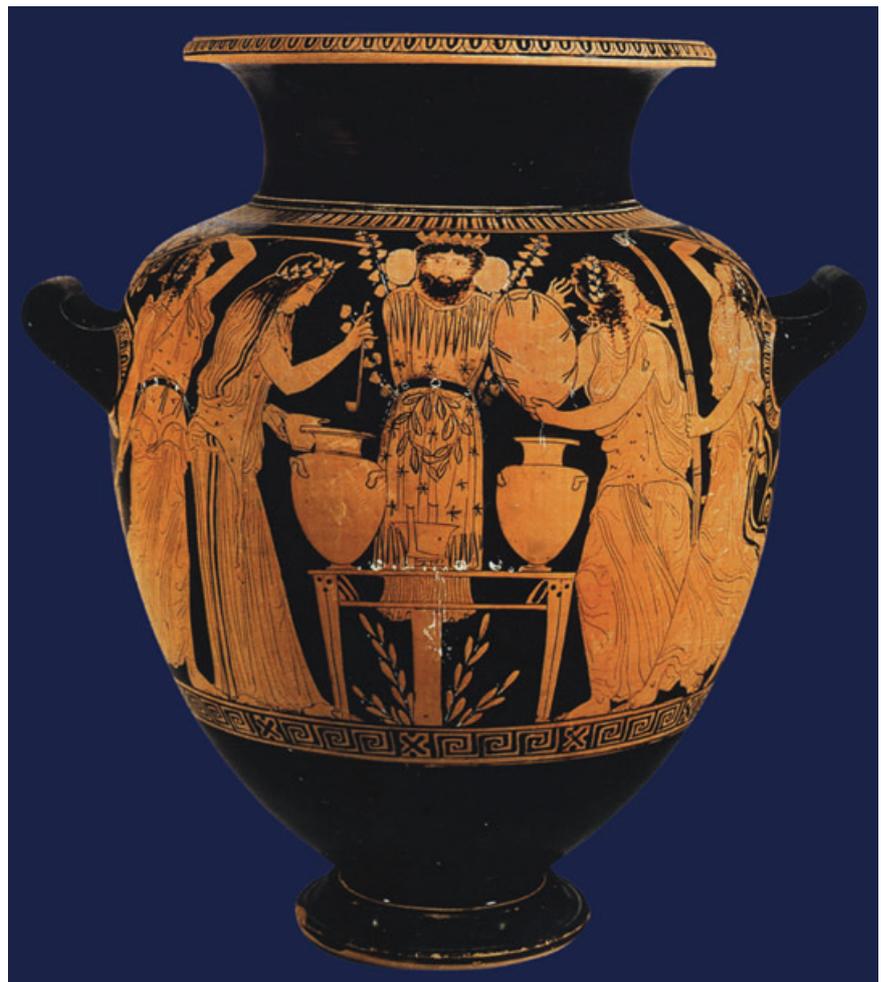


Figure 4. Lenaia celebration: Maenads in ecstasy are dancing around a simulacrum of Dionysus. (Reproduced from Tiverios (1996). The picture comes from a vase currently at the Naples National Archaeological Museum, Italy.)

Scrutiny of works of art can provide us with information about how actors dressed in Lenaia and in wedding ceremonies during the Gamelion month, thus providing more indirect indications about the weather during the month of Gamelion. In our search for climatic evidence from what actors and musicians wore we found that they used to wear long tunics. The piper, especially, according to drawings on vessels, used to wear a tunic with sleeves in order to protect himself from the cold of winter in Lenaia. Paintings of human figures on vessels (Figure 4) show that the married couples, as well as the relatives and friends, were not wearing anything to protect their heads from the rain, despite the fact that the wedding ceremonies used to be performed in mid-winter. Pekridou Gorecki (1989), Blanck (2004) and Konstantakos (2013) provide additional data as well as figures of costumes, masks and ancient technology.

An additional argument in favour of the prevalence of fair weather conditions in the winter month of Gamelion is that in Lenaia, Aristophanes presented some of his more significant comic satiric plays in which he did not attempt to hide the flaws of Athenian democracy. If the presentation of his comic plays was arranged on an unfavourable occasion he would consider it as a purposeful act intended to silence him, and he would have made a point out of it.

Conclusions

In this work we attempted to extract information about the stability of the weather in Athens during the classical years by studying the fully surviving theatrical plays of the three tragic poets Aeschylus, Sophocles and Euripides, and the comedy writer Aristophanes, particularly about the weather stability during the Halcyon days.

The comedies of Aristophanes, especially those presented in Lenaia, often invoke the presence of the Halcyon days. Combining the fact that dramatic contests were held in mid-winter without any indication of postponement, and references from the dramas about the clear weather and mild winters in Attica, we can assume that those particular days of almost every January were summery in the fifth and maybe in the fourth centuries BC. Information is also drawn from the paintings on vessels showing that the clothes worn in Lenaia and in the wedding ceremonies were not designed for rainy weather. All these references concern indications for the fifth century BC. We found no weather indications in the fourth century BC dramas, but dramatic contests continued to take place during that century, because Aristotle's references to Lenaia were in the fourth century BC.

In addition it should be mentioned that the classical period, which the indications

of meteorological weather stability concern, coincides with a time of significant cultural and philosophical development.

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References

- Baldry HC.** 1971. *The Tragic Theatre in Greece*. Christodoulou G., Chatzikosta, L. (trans, 1992), Kardamitsas Editions. Athens, Greece (in Greek).
- Banks TH.** (trans.) 1956. *Sophocles: Three Theban Plays, Antigone, Oedipus the King, Oedipus at Colonus*. Oxford University Press: New York, NY.
- Blanck H.** 2004. *Introduction to Private Life of the Ancient Greeks and Romans*. MIET: Athens.
- Chronopoulou C, Mavrakis A.** 2012. Indications of stability of occurrence of Halkyon Days in the ancient Greek drama, in *Advances in Meteorology, Climatology and Atmospheric Physics – COMECAP 2012*. Springer Atmospheric Sciences, Volume I. Helmis CG, Nastos PT (eds). Springer-Verlag: Berlin, Heidelberg, Germany, pp 403–408. doi:10.1007/978-3-642-29172-2_57.
- Domínguez-Castro F, Vaquero JM, Marín M et al.** 2012. How useful could Arabic documentary sources be for reconstructing past climate? *Weather* **67**(3): 76–82. doi:10.1002/wea.835
- Douvis K.** 2009. Study of the extreme climatic events in Greece using down-scaling methods. Thesis. National and Kapodestrian University of Athens <http://phdtheses.ekt.gr/eadd/handle/10442/22726> (accessed February 2013).
- Hellenic National Meteorological Service (HNMS).** 2013. Introduction in meteorology from ancient Greece to today. http://www.hnms.gr/hnms/greek/meteorology/full_story_html?&dr_url=%2Fdocs%2Fmisc%2FArxaia (accessed February 2013).
- Henderson J** (ed. trans.) 1998. *Aristophanes* (Loeb Classical Library) *The Acharnians*. Harvard University Press: London.
- Henderson J.** (ed. trans.) 2002. *Aristophanes: Frogs* (Loeb Classical Library), *Assemblywoman, Wealth*. Harvard University Press: Cambridge, MA and London.
- Hort FA** (trans.) 1926. *Theophrastus: De signis Vol. II in the Enquire into Plants* (Loeb Classical Library). Harvard University Press: London.
- Konstantakos I.** 2013 Introduction in ancient tragedy: costumes and masks. http://www.academia.edu/1740055/Introduction_to_Greek_tragedy_in_Modern_Greek.
- Kovacs D.** (ed. trans.) 1994. *Euripides: Cyclops, Alcestis, Medea* (Loeb Classical Library). Harvard University Press: Cambridge, MA and London.
- Lesky A.** 1988. *History of Ancient Greek Literature*, 5th Edition Tsopanakis, A. (trans.). Kyriakidis bros (Original edition in 1975): Thessaloniki, Greece (in Greek).
- McCormick M, Büntgen U, Cane MA, Cook ER, Harper K, Huybers P, Litt T, Manning SW, Mayewski PA, More AFM, Nicolussi K, Tegel W.** 2012. Climate change during and after the Roman Empire: reconstructing the past from scientific and historical evidence. *J. Interdiscip. Hist.* **XLIII**(2): 169–220.
- Michailidou E.** 2011. Marital ceremonies according to ancient Greek customs. *Diipetes* **42** (in Greek). http://www.diipetes.gr/htm11dx_25.htm (accessed January 2012).
- Papahatzis N.** 1972. *History of Greek Nation: Lenaia*. Volume C2. Ekdotiki Athinon: Athens. pp 256–257 (in Greek).
- Peel MC, Finlayson BL, McMahon TA.** 2007. Updated world map of the Köppen–Geiger climate classification. *Hydrol. Earth. Syst. Sci.* **11**: 1633–1644.
- Pekridou Gorecki A.** 1989. *Mode im Antiken Griechenland: Textile Fertigung und Kleidung*. C.H. Beck: Berlin.
- Philandras CM, Metaxas DA, Nastos PTH.** 1999. Climate variability and urbanization in Athens. *Theor. Appl. Climatol.* **63**: 65–72.
- Pickard–Cambridge A.** 1988. *The Dramatic Festivals of Athens* 2nd Edition revised by J. Gould and DM Lewis. Oxford University Press: Oxford, UK.
- Sommerstein AH.** (ed. trans.) 1987. *The Comedies of Aristophanes*. Volume 6: Birds. Aris and Phillips Ltd., Harvard University Press: London.
- Sommerstein AH.** (ed. trans.) 2008. *Aeschylus: Oresteia, Agamemnon, Libation – Bearers, Eumenides*. Harvard University Press: Cambridge, MA and London.
- Tiverios M.** 1996. *Greek Art, Ancient Vase*. Ekdotiki Athinon: Athens, Greece, pp 327–328.
- Wentworth Tompson A.** 2007. The history of animals by Aristotle. <http://books.adelaide.edu.au/a/aristotle/history> (accessed November 2011).
- Zerefos CS, Gerogiannis VT, Balis D, Zerefos SC, Kazantzidis A.** 2007. Atmospheric effects of volcanic eruptions as seen by famous artists and depicted in their paintings. *Atmos. Chem. Phys.* **7**: 4027–4042.
- Ziakopoulos D.** 2008. *Weather the Son of Earth and Sun*. Volume 2. Private Edition: Athens.

Correspondence to: C. Chronopoulou
chris_chron@yahoo.com

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