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Mediterranean Holocene climate, environment and human societies

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ABSTRACT

This paper introduces the reader to a special issue of articles that explores links and processes behind societal change, climate change and environmental change in a Holocene perspective in the Mediterranean region. All papers are, by purpose, co-authored by scientists representing different disciplines. The cross-cutting theme has been to reach beyond simple explanations of potential climate-society relationships and advance our understanding on how to improve research methods and theories in the field. The thirteen papers in this issue address these questions in three different ways, by i) conceptual/methodological approaches; ii) review papers; and iii) case studies.

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Can we learn about life on Future Earth by looking into the past? Can we gain any understanding of importance from the past for the development of environmental, economic and social sustainability strategies on local to global levels in times of rapid social and climate change? As historians, archaeologists, paleo-environmentalists and paleo-climatologists we often claim so, but how can we realistically contribute? Strong and long-lasting traditions to work within a single discipline have often resulted in conclusions about simple causal relationships between climate/environmental changes and human societies which are not

scientifically robust. With increased understanding about the difficult problems the world is facing today, among which is included the human induced climate change, interdisciplinary research has received higher appreciation. It is now generally acknowledged that interdisciplinary research approaches are necessary to reach beyond deterministic relationships between climate, the environment and the society in order to advance our understanding of the complex causes behind societal vulnerability and sustainability respectively (e.g. Brown et al., 2015; Ledford, 2015). To include a historical perspective on these issues is perceived as important, not least in order to formulate a balanced view on the scales and underlying processes of changes that we observe today (Caseldine and Turney, 2010; Guildi and Armitage, 2014; Haldon et al., 2014; Crumley et al., 2015). The challenge is to move beyond mere statements of the importance of interdisciplinary research in order to realize actual interdisciplinary results!

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How can we work to succeed in a true integration of physical and social data and theory, analysed in a historical perspective? This was one major question for a workshop held at the Navarino Environmental Observatory (NEO), Costa Navarino, Greece, in April 2014. Sixty-one participants from 16 countries attended, representing a range of disciplines, such as: history, archeology, paleoclimatology, palynology, geomorphology, hydrology and modeling (Holmgren et al., 2014). The spatial focus of the workshop was the Mediterranean region and the temporal frame the Holocene. Stimulating discussions during the workshop led to several new initiatives, for example i) the proposal of a new PAGES working group on Society and Climate; ii) the planning of a common interdisciplinary field campaign in the Maghreb region in 2016/2017 within the Mistral/PaleoMex program and; iii) a workshop and the formation of an interdisciplinary research network, PELOPS, focusing on Paleoclimate, Environment and Landscapes of the Peloponnesian Societies in Greece.

The first decisive move by the workshop participants to engage in a better integration is, however, this special issue of Quaternary Science Reviews. The 13 papers include conceptual/methodological papers, review papers and case studies (Table 1). All of them are co-authored by scientists representing different disciplines.

Izdebski et al. (2015a) analyse in detail the conceptual barriers hindering cross-disciplinary research and outline a number of methods to break these, while Arikian et al. (this issue) highlight the potential of interdisciplinary modelling experiments as a promising tool to approach complex and non-linear human-environment relationships. The paper by Xoplaki et al. (2015) demonstrates a holistic approach to improve our understanding of processes and drivers behind climate and climate-society systems by bridging the knowledge and evidence from climatology, palaeoclimatology, climate modelling, history and archaeology. All of the review papers and most of the case studies concern the Eastern Mediterranean/Middle East/Near East regions, while the central/western Mediterranean is represented by three studies (Fig. 1). Together the papers cover the full Holocene but with an emphasis on the late Holocene (Fig. 1). It is interesting to note that while most of the lead authors of the conceptual and the review papers are scholars from the humanities, all case studies are headed by natural science scholars. As a corroboration of the conceptual differences highlighted by Izdebski et al. (2015a), it can further be noted that – although all papers emphasize that societal development occurs both during “bad and good” climates – there is a tendency for papers with lead authors from natural sciences (i.e. the case studies) to emphasize the role of climate and the papers led by scholars from the humanities (i.e. the review papers) to highlight societal factors.

Several papers show that favorable climate generally is a plausible contributing factor to community expansions, while harsh climate does not necessarily lead to the opposite (e.g. Izdebski et al. 2015, Xoplaki et al., 2015). A changing climate may, however, lead to changing societal strategies (e.g. Cremashi et al., this issue, Gogou et al., this issue, Izdebski et al., 2015b, Mazzini et al., this issue) where different societies respond in different ways to the same specific change in climate (Weiberg et al., this issue). Other studies demonstrate how the same society seems resilient to climate change at one point in time but not at another (Sadori et al., 2015). Rapid climate events observed several times during the Holocene are discussed by Berger et al. (this issue), Clarke et al. (in press), Flohr et al. (2015) and Weiberg et al. (this issue). They all show that even though a negative impact on human societies cannot always be excluded, we are far from a conclusion that rapid climate change always leads to societal catastrophes or even to transformations. Flohr et al. (2015) identified no societal response at all in SW Asia during the rapid climate changes in the Early Holocene and they suggest that small-scale, non-specialised, societies are more sustainable than complex ones. However, more recent societies with more complex organisation have also survived and thrived despite observed rapid climate changes, as shown by several papers in this issue (e.g. Izdebski et al., 2015b, Weiberg et al., this issue, Xoplaki et al., 2015).

Human societies have always been living with and adapting to a variable climate and environment. It is clear from the latest decades of research that climate has varied at amplitudes and duration of importance for human societies even before the recent anthropogenic global impact on the climate system. The Mediterranean region is richly endowed with information on human and environmental history, which makes it suitable for exploring interactions between climate, environment and humans over a variety of time scales. The papers in this special issue demonstrate the need for local case studies to better understand the social dynamics and underlying mechanisms behind inferred climate-society interrelations. The majority of papers emphasizes the need for more highly resolved paleoenvironmental and paleoclimate records and for an improved precision in the dating of climatological and archeological-historical events and processes. Several papers stress the need to also consider other physical processes that can affect societies, particularly in the Mediterranean region where seismic activity is an important forcing of environmental changes and influences erosion base and sedimentation patterns (e.g. Morellon Marteles et al., this issue, Weiberg et al., this issue).

These points make evident that many challenges remain and they connect to some further, and perhaps even more complex, questions for forthcoming research to tackle:

Table 1
Basic information about the papers in this special issue.

Reference	Type of paper	Geographical focus	Time period covered		Labelled in Fig. 1
			ca years BC/AD	ca years BP	
Izdebski et al. (2015a)	Conceptual	n.a.	n.a.	n.a.	n.a.
Flohr et al. (2015)	Review	SW Asia	7500-5500 BC	9500-7500 BP	12
Weiberg et al. (this issue)	Review	SW Greece	7000 BC-AD 2000	9000-0 BP	6
Berger et al. (this issue)	Case study	SE France	6500-5000 BC	8500-7000 BP	1
Mazzini et al. (this issue)	Case study	N Albania	glacial; 6000 BC-AD 2000	glacial, ++8000-0 BP	4
Clarke et al. (in press)	Review	E Med-Near East	4500-3000 BC	6500-5000 BP	9
Arikian et al. (this issue)	Methodological/Case study	C Turkey	3000-1000 BC	5000-3000 BP	11
Morellon Marteles et al. (this issue)	Case study	S Albania	2450 BC-AD 2000	4400-0 BP	5
Cremashi et al. (this issue)	Case study	N Italy	1550-1170 BC	3500-3120 BP	2
Sadiri et al. (2015)	Review/Case study	S Italy	AD 1–1950	2000-0 BP	3
Izdebski et al. (2015b)	Review	Eastern Mediterranean	AD 200–800	1750-1150 BP	10
Gogou et al. (this issue)	Case study	N Aegean	AD 500–2000	1500-0 BP	7
Xoplaki et al. (2015)	Methodological/Review	Eastern Mediterranean	AD 850–1300	1100-650 BP	8

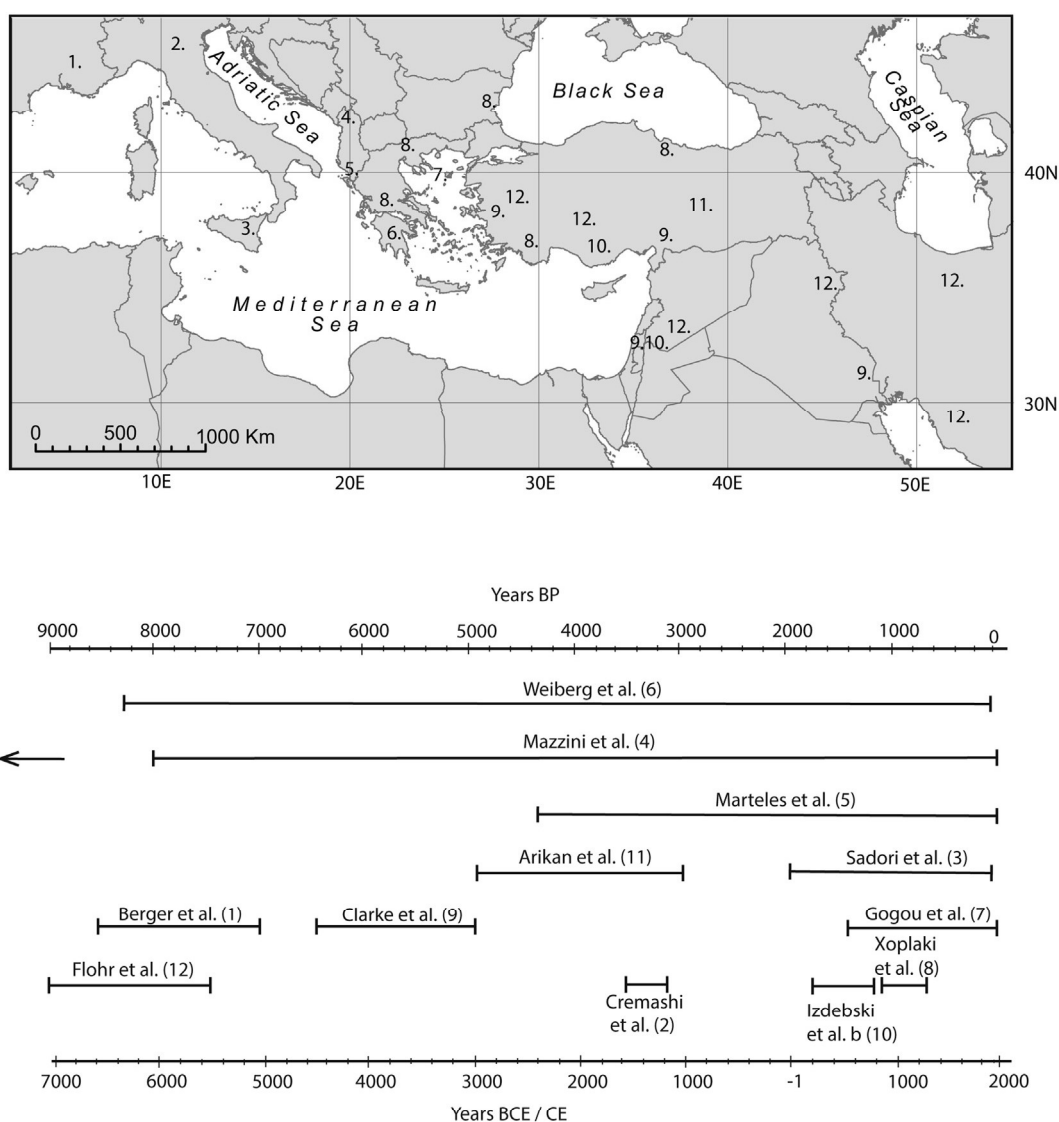


Fig. 1. Top: Map of the Mediterranean region indicating the geographical locations of the studies presented in this issue of Quaternary Science Reviews. Bottom: Time line indicating periods covered by the papers in this issue. Every number (top, bottom) refers to a certain paper in this issue, see Table 1.

- Are there any general socio-economic-political patterns and strategies behind what makes a society resilient or vulnerable? How can we improve the understanding of these processes in the context of societies that declined and those that maintained their complexity during the same climate conditions?
- Can we up-scale the understanding of socio-ecological dynamics reached through local historical case studies to explanatory theories that apply to larger spatial scales?
- Can such regional explanatory theories be used for predictions into the future or are there in fact no such general strategies to help us learn from the past to prepare for the future?
- It is often proposed that “less sophisticated” societies were less vulnerable to climate change than “complex” societies. Is this correct and will this assumption hold in the future?

These are open questions that the papers in this special issue address to come closer to the holistic and transdisciplinary approaches required for the study of climate and environmental changes and their impacts on societies required, to realistically contribute to Future Earth (e.g. Costanza et al., 2007; Butzer, 2015;

Crumley et al., 2015). In order to both forecast and adapt to future conditions we need to advance our understanding of interactions between processes operating at different scales in time and space. The future should not be viewed as a catastrophe in the making, but instead our knowledge on climate and environmental variability and the mechanisms behind state formations, transformations and societal adaptation capacities should be utilised and applied in areas of rural, coastal and urban planning and management. Hopefully, this would provide important links in the chain that can build sustainable development at local, regional and global levels.

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This special issue of QSR emerged as a result of a workshop at Costa Navarino and the Navarino Environmental Observatory (NEO), Greece in April 2014, addressing Mediterranean Holocene climate and human societies. NEO is a partnership between Stockholm University, Academy of Athens and the Greek ecotourism company TEMES SA, dedicated to research and education on climate and environmental changes in the Mediterranean

region. The workshop was co-sponsored by PAGES, NEO, the MIS-TRALS/PaleoMex program, the Labex OT-Med, the Bolin Centre for Climate Research at Stockholm University, and the Institute of Oceanography at the Hellenic Centre for Marine Research.

References

- Arikan, B., Balossi Restelli, F., Masi, A., The Bronze Age Comparative Modeling of the Surface Processes and Land Use in the Malatya Plain (Turkey). *Quaternary Science Reviews*, in this issue.
- Berger, J.-F., Delhon, C., Magnin, F., Bonté, S., Thiébaud, S., Guilbert-Berger, R., Beeching, A., A fluvial record of the Mid-Holocene Rapid Climatic Changes in the Middle Rhone Valley (Espeluche-Lalo, France) and of their impact on Late Mesolithic and Early Neolithic populations. *Quaternary Science Reviews*, in this issue.
- Brown, R.R., Deletic, A., Wong, T.H.F., 2015. How to catalyse collaboration. *Nature* 525, 315–317.
- Butzer, K., 2015. Anthropocene as an evolving paradigm. *Holocene* 25, 1539–1541.
- Caseldine, C.J., Turney, C., 2010. The bigger picture: towards integrating palaeoclimate and environmental data with a history of societal change. *J. Quat. Sci.* 25, 88–93.
- Clarke J., et al., in press Climatic changes and social transformations in the Near East and North Africa during the 'long' 4th millennium BC: a comparative study of environmental and archaeological evidence. *Quat. Sci. Rev.*, 1–26 <http://dx.doi.org/10.1016/j.quascirev.2015.10.003>
- Costanza, R., Graumlich, L., Steffen, W., et al., 2007. Sustainability or to Collapse: what Can We Learn from Integrating the History of Humans and the Rest of Nature?, 36. *Ambio*, pp. 522–527.
- Cremashi, M., Mercuri, A.M., Torri, P., Florenzano, A., Pizzi, C., Marchesini, M., Zerbini, A., Climate change versus land management in the Po Plain (Northern Italy) during the Bronze Age: new insights from the VP/VG sequence of the Terramara Santa Rosa di Poviglio. *Quaternary Science Reviews*, in this issue.
- Crumley, C., Laparidou, S., Ramsey, M., Rosen, A.M., 2015. A view from the past to the future: concluding remarks on the “The anthropocene in the longue durée”. *Holocene* 25, 1721–1723.
- Flohr, P., Fleitmann, D., Matthews, R., Matthews, W., Black, S., 2015. Evidence of resilience to past climate change in southwest Asia: early farming communities and the 9.2 and 8.2 ka events. *Quat. Sci. Rev.* 1–17. <http://dx.doi.org/10.1016/j.quascirev.2015.06.022>.
- Gogou A., Triantaphyllou, M., Xoplaki, E., Izdebski, A., Parinos C., Dimiza, M., Bou-loubassi, I., Luterbacher, J., Kouli, K., Martrat, B., Fleitmann, D., Rousakis, G., Kaberi, H., Athanasiou, M., Lykousis, V. Climate variability and socio-environmental changes in the northern Aegean Sea during the last 1500 years. *Quaternary Science Reviews*, this issue.
- Guildi, J., Armitage, D., 2014. *The History Manifesto*. Cambridge University Press, Cambridge.
- Haldon, J., Roberts, N., Izdebski, A., Fleitmann, D., McCormick, M., Cassis, M., Doonan, O., Eastwood, W., Elton, H., Ladstätter, S., Manning, S., Newhard, J., Nichol, K., Telelis, I., Xoplaki, E., 2014. The climate and environment of Byzantine Anatolia: integrating science, history and archaeology. *J. Interdiscip. Hist.* 45 (2), 113–161. http://dx.doi.org/10.1162/JINH_a_00682.
- Holmgren, K., Sicre, M.-A., Gogou, A., Xoplaki, E., Luterbacher, J., 2014. Mediterranean holocene climate and human societies. *Past. Glob. Chang. Mag.* 22 (2), 54.
- Izdebski, A., Holmgren, K., Weiberg, E., Stocker, S., et al. 2015a Realising consilience: how better communication between archaeologists, historians and natural scientists can transform the study of past climate change in the Mediterranean. *Quaternary Science Reviews*, 1–18. <http://dx.doi.org/10.1016/j.quascirev.2015.10.038>
- Izdebski, A., Pickett, J., Roberts, N., Waliszewski, T., 2015b. The environmental, archaeological and historical evidence for regional climatic changes and their societal impacts in the eastern mediterranean in late Antiquity. *Quat. Sci. Rev.* 1–20. <http://dx.doi.org/10.1016/>
- Ledford, H., 2015. Team science. *Nature* 525, 308–311.
- Morellon Marteles, M., Anselmetti, F.S., Ariztegui, D., Brushulli, B., Sinopoli, G., Wagner, B., Sadori, L., Gilli, A., Pambuku, A., Human - climate interactions in the central Mediterranean region during the last millennia: The laminated record of Lake Butrint (Albania). *Quaternary Science Reviews*, this issue.
- Mazzini, I., Gliozzi, E., Galaty, M., Bejko, L., Sadori, L., Soulié-Marsche, I., Kochi, R., Van Welden, A., Bushati, S., Holocene evolution of Lake Shkodra: multidisciplinary evidence for diachronic landscape change in northern Albania. *Quaternary Science Reviews*, this issue.
- Sadori, L., Giraudi, C., Masi, A., Magny, M., Ortu, E., Zanchetta, G., Izdebski, A., 2015. Climate, environment and society in Southern Italy during the last 2000 years. A review of the environmental, historical and archaeological evidence. *Quat. Sci. Rev.* 1–16. <http://dx.doi.org/10.1016/j.quascirev.2015.09.020> this issue.
- Weiberg, E., Kouli, K., Unkel, I., Holmgren, K., et al. The socio-environmental history of the Peloponnese during the Holocene: towards an integrated understanding of the past. *Quaternary Science Reviews*, this issue.
- Xoplaki, E., Fleitmann, D., Luterbacher, J., Wagner, S., Haldon, J.F., Zorita, E., Telelis, I., Toreti, A., Izdebski, A., 2015. The medieval climate anomaly and Byzantium: a review of the evidence on climatic fluctuations, economic performance and societal change. *Quat. Sci. Rev.* 1–24. <http://dx.doi.org/10.1016/j.quascirev.2015.10.004>.