Different Times? Archaeological and Environmental Data from Intra-Site and Off-Site Sequences

Proceedings of the XVIII UISPP World Congress
(4-9 June 2018, Paris, France)
Volume 4
Session II-8

Edited by

Zoï Tsirtsoni, Catherine Kuzucuoğlu,
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Archaeopress Archaeology

Archaeopress Publishing Ltd
Summertown Pavilion
18-24 Middle Way
Summertown
Oxford OX2 7LG

www.archaeopress.com

ISBN 978-1-78969-651-6
ISBN 978-1-78969-652-3 (e-Pdf)

Cover: Firewood and woodland management at Naachtun (Guatemala), based on charcoal analysis, by Lydie Dussol.

Printed in England by Severn. Gloucester

This book is available direct from Archaeopress or from our website www.archaeopress.com

UISPP PROCEEDINGS SERIES VOLUME 4 – Different Times? Archaeological and Environmental Data from Intra-Site and Off-Site Sequences

UISPP XVIII World Congress 2018

(4-9 Juin 2018, Paris)

Session II-8

VOLUME EDITORS: Zoï Tsirtsoni, Catherine Kuzucuoğlu, Philippe Nondédéo, Olivier Weller

SERIES EDITOR: The board of UISPP

SERIES PROPERTY: UISPP – International Union of Prehistoric and Protohistoric Sciences

KEY-WORDS IN THIS VOLUME: Chronology relative-absolute, archaeology, physical geography, settlement, paleoenvironment, man-environment interaction, spatial dynamics

UISPP PROCEEDINGS SERIES is a printed on demand and an open access publication, edited by UISPP through Archaeopress

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UISPP has a structure of more than thirty scientific commissions which form a very representative network of worldwide specialists in prehistory and protohistory. The commissions cover all archaeological specialisms: historiography; archaeological methods and theory; material culture by period (Palaeolithic, Neolithic, Bronze Age, Iron Age) and by continents (Europe, Asia, Africa, Pacific, America); palaeoenvironment and palaeoclimatology; archaeology in specific environments (mountain, desert, steppe, tropical); archaeometry; art and culture; technology and economy; biological anthropology; funerary archaeology; archaeology and society.

The UISPP XVIII World Congress of 2018 was hosted in Paris by the University Paris 1 Panthéon-Sorbonne with the strong support of all French institutions related to archaeology. It featured 122 sessions, and over 1800 papers were delivered by scientists from almost 60 countries and from all continents.

The proceedings published in this series, but also in issues of specialised scientific journals, will remain as the most important legacy of the congress.

L'UISPP a une longue histoire, à partir de 1865, avec le Congrès International d'Anthropologie et d'Archéologie Préhistorique (C.I.A.A.P.), jusqu'en 1931, date de la Fondation à Berne de l'UISPP. En 1955, l'UISPP est devenu membre du Conseil International de philosophie et de Sciences humaines, associée à l'UNESCO. L'UISPP repose sur plus de trente commissions scientifiques qui représentent un réseau représentatif des spécialistes mondiaux de la préhistoire et de la protohistoire, couvrant toutes les spécialités de l'archéologie : historiographie, théorie et méthodes de l'archéologie ; Culture matérielle par période (Paléolithique, néolithique, âge du bronze, âge du fer) et par continents (Europe, Asie, Afrique, Pacifique, Amérique), paléoenvironnement et paléoclimatologie ; Archéologie dans des environnements spécifiques (montagne, désert, steppes, zone tropicale), archéométrie ; Art et culture ; Technologie et économie ; anthropologie biologique ; archéologie funéraire ; archéologie et sociétés.

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Les actes du congrès, édités par l'UISPP comme dans des numéros spéciaux de revues scientifiques spécialisées, constitueront un des résultats les plus importants du Congrès.

Marta Arzarello

Secretary-General / Secrétaire général UISPP

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Introduction

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The present volume brings together some of the papers presented in a session organized in the 18th World Congress of the UISPP, under the title 'Different Times? Archaeological and Environmental Data from Intra-Site and Off-Site Sequences'.

A common characteristic of these papers, besides their theme broadly speaking, is their connexion with the activities of the Working Group 'Environmental and Social changes in the Past' (*Changements environnementaux et sociétés dans le passé*), animated in the frame of the Cluster of Excellence 'Dynamite' (*Territorial and Spatial Dynamics*) of the University Paris 1-Panthéon-Sorbonne. This Cluster of Excellence, funded by the French State (ANR-11-LABX-0046, *Programme d'Investissements d'Avenir*), was created in 2012 as part of a public policy aiming at favouring interaction between researchers and disciplines that do not usually work together –or not enough. 'DynamiTe' (http://labex-dynamite.com/fr/) was conceived as a consortium of laboratories representing different disciplines –geography mainly, but also anthropology, history, sociology, archaeology– susceptible to investigate issues around the key-concept of Territory, in the present, past and future. The Group 'Environmental and Social changes in the Past' focuses on evidenced landscape changes that affected human societies and the perception of these changes by the same societies. Its members are mostly archaeologists and physical geographers, many of them being further specialized in analytical techniques deriving from natural sciences (zoology, paleobotany, palynology, geology, sedimentology, malacology, anthracology). This small community –ca. 65 active members at the time of the Congress– handles and/or produces every day substantial quantities of data in relation with past events in the four corners of the earth (see also Giligny and Tsirtsoni 2015). And like most of their colleagues around the world, they give particular attention to the recording of time scales and interpretation of time records.

Time is indeed an essential parameter to be taken into account in any research dealing with the past, since all our hypotheses lay on that. If the reading of time is not right, if an event that we place at a time A happened actually at a time B, several years, decades or centuries after the presumed time A, all the narratives that we may build are wrong. Anyone who ever read a detective novel is aware of how important this factor is for the solution of the mystery and the arrest of the guilty! The gravity of the mistake becomes bigger as we pile up narratives or we try to combine evidence in order to *explain* things. Thus, if we presume causality between an environmental change and a societal event, either positive (e.g. emergence of a new way of living) or negative (e.g. shrinkage or abandonment of a settlement or settlements in a region), we have to make sure at least that

the environmental change took place before or roughly simultaneously with the societal event itself. Of course this is still not a proof of causality, but it is a minimum prerequisite, the first step of the demonstration (see Coombes and Barber 2005; Maher *et al.* 2011; van der Plicht *et al.* 2011; Middleton 2012; Bonsall *et al.* 2015; Kuzucuoğlu and Tsirtsoni 2015; Contreras 2017; Beach *et al.* in press). If the chronology of events is reversed, the whole scenario collapses.

Attention is needed when we talk about environmental change. In many works, even recent ones, there is confusion between 'environmental changes' and 'climate changes' or 'climatic events'. These are not synonyms though, and the difference between the two is a difference of scale, spatial and temporal. Climate changes do not have the same impact everywhere, nor synchronously, especially if we talk in terms of human time. This fact is usually dissimulated behind the long time scales used by paleoclimatologists. Even those that are described as 'global' do not affect equally the various parts of the globe, and although the main symptoms are the same (e.g. a substantial cooling or warming of the atmosphere over an entire hemisphere), the local impacts can be of varying intensity and even of different nature (Curtis *et al.* 1996; Miller-Rosen 1997; Wilkinson 1997; Andrews *et al.* 2000; Gill Richardson 2000; Allen 2003; Haug *et al.* 2003; Calaway 2005; Kuzucuoğlu 2009; Berger *et al.* 2016; Oster *et al.* 2019). Societies, on the other hand, do not respond to climate changes in general, but to changes in their immediate environment or in more distant environments on which they depend (e.g. for pastures or agriculture, for raw materials or, in more developed societies, for trade purposes).

Environmental changes can also be induced by geological phenomena, e.g. earthquakes or volcano eruptions, which have a priori nothing to do with climate –although some of them can actually have an impact on climate (Sicre *et al.* 2011; Cooper and Sheets 2012; Dunning and Houston 2011). In this case, the time scale of the geological event is rather short (even if repeated eruptive episodes can sometimes stretch over several decades), but the distances at which its effects will be visible can vary considerably and not necessarily in a straightforward way.

And of course, environmental changes can also be provoked by human action. Small-scale actions may include intensive farming or forest exploitation in a limited area, deviation of small watercourses, etc. But the same actions developed over larger or more critical areas (from an ecological point of view) can have heavier impacts (Redman *et al.* 2004; Aimers 2007; Kuzucuoğlu 2007, 2009; Fleury *et al.* 2014).

Whatever its origin, some time passes before people actually *feel* the impact of a given change on their natural or economic environment, and even more time passes before they *react* to this impact, first by adapting (whatever mechanisms this implies: see Wossink 2009 with previous bibliography, and also Smyth *et al.* 2017), then eventually by moving to some other place.

Therefore, when we discuss regional phenomena and try to correlate behaviours here and there (e.g. massive abandonments of settlements as a response, presumably, to environmental changes generated by climate changes), we have to: first, make sure that we record time correctly at each individual spot, and second, consider properly the timespan needed to move from one spot to the other taking into account the distances, the nature of changes seen in the environment, and also the nature of the behaviour presumably involved (e.g. interruption of agricultural practices favouring reforestation, water control etc., or conversely, turn to husbandry favouring erosion).

What is true for regions is also true for sites. The same events recorded in a primary archaeological context (e.g. a house destruction layer, or an undisturbed grave) and in a secondary depositional context (e.g. a fill, a colluvium, or a secondary burial), do not have the same historical meaning, and do not provide the same information in terms of temporal framing. Before making any correlation, we have then to make sure that the sedimentary/deposition processes are understood correctly and that the time delay between the two points (primary-secondary) is taken into account. The

interpretation procedures –and the risks– are the same also for contexts far from settlements. An undisturbed silt deposit and a reworked colluvium, even if they provide the same dates, do not actually refer to the same 'events'; to say it crudely: they are not contemporaneous, and any narrative that would consider them as such would be false.

Last but not least, changes –environmental as well as social– are not always rapid or dramatic. Smooth changes also exist, which derive from long-duration processes and well-established practices. Correlations between phases of stability in the human and environmental record are also of interest for archaeologists and natural scientists, and are also subjected to the limitations described above.

The higher the resolution of the available data, the better we can examine the different combinations seen in the environmental and human record, and try to deduce meaningful patterns between the two (Lespez *et al.* 2016; and several papers in Carcaud and Arnaud-Fassetta 2014). Natural sciences –physics mainly– have made great progress in the past decades, providing us with dating methods capable to reach a previously unsuspected precision. To take only the example of radiocarbon, in the last fifty years raw measurements passed from an average precision of 150-250 years BP to a precision of 30-50 years BP; combined to the improvement of calibration method, this gives us today calendar dates spanning less than two centuries for the biggest part of Holocene (including those affected by 'plateaux', i.e. rapid variations in the calibration curve), reaching sometimes less than 80 years (see Evin and Oberlin 2005; Reimer *et al.* 2004; Reimer *et al.* 2009; Taylor and Bar-Yosef 2014). This is however not always sufficient for resolving chronological issues in periods where cultural change is too rapid and/or historical evidence contradictory (see Bietak and Czerny 2007; Manning 2006-2007), but one can hope that this will soon be the case.

But the resolution is not just a question of density or precision of measurements. It is also a question of reliability of the samples: phenomena like the so-called 'old-wood effect', the marine or freshwater 'reservoir effect', or the various suspected problems around the carbon content of burnt bones (Schiffer 1986; Facorellis *et al.* 1998; Bonsall *et al.* 2004; Van Strydonck 2016) or endocarps of wild fruits (Quade *et al*. 2014), can produce more-or-less significant deviations from the real age of dated samples. It is also, more importantly, a question of *adequacy* of the measured samples with the actual events that they are supposed to represent. A charcoal in a house destruction layer and another in a colluvium that reworked this same layer do not provide the same information in terms of temporal framing –and this, independent of the short- or long-lived character of the charred plant species. If the sample does not correspond to the layer we think it does, or if we misinterprete the nature of the dated deposit (primary, secondary, mixed), the physical quality of the sample and the precision of the date will be of little use in interpreting things (see Ashmore 1999; Demoule *et al.* 2009: 211; Tsirtsoni 2016: 41). Being aware of the discrepancies generated by such contextual differences is essential for our understanding of the succession or amplitude of past events (see case studies in Berger *et al.* 2014; Borić *et al.* 2015). This is why we prefer here to speak of 'time reading' rather than 'time measurement': making inferences about past chronologies is not a mechanistic juxtaposition of numbers but the outcome of a complex analysis, quantitative as well as qualitative.

Our Group defends also the necessity of a closer dialogue between specialists that would overcome the separation between intra-site and off-site records, the former being considered as the 'ground' of archaeologists, the latter as that of geomorphologists and natural scientists. Although convenient in practical terms and justified to a certain point by differences in the theoretical backgrounds and skills, this separation minimizes the interaction between the two spaces –whose definitions are in themselves far from evident– over the short, middle and long terms, and neglects the similarities in the approaches or the methodological tools used here and there (Dincauze 1987; Demoule *et al.* 2009: 174-175). Ultimately, comparisons between intra-site (i.e. basically anthropogenic) sequences and neighbouring off-site (i.e. basically environmental) sequences must to take into account, in

addition to distance distortion, the effects of time delay observed, or estimated, in the recording of mutual impacts. Only then can we propose a common narrative, a convincing joint reconstruction of past events. The papers gathered here exemplify the difficulties met in this exercise and propose some 'good practices' to follow.

The papers are presented in a rough geographical movement from metropolitan France to the Eastern Mediterranean –Old World first–, then to the Americas –New World. Incidentally, the movement is also chronological, although not in a perfect order, going from the early protohistoric contexts (Neolithic and Bronze Age, 9th to 2nd mill. BC) to the late Historic ones (1st and 2nd millennium AD). This movement in time and space shows without ambiguity that: a) the methodological problems are essentially the same everywhere; b) similarities are sometimes dissimulated by changes in the vocabulary and the academic traditions.

The contribution of Granai *et al.* points to the crucial issue of our understanding of human presence in a given area, depending on the precise nature of the sites studied and the intensity and overall duration of occupation. The main proxy used here consists of terrestrial and freshwater molluscs. The paper confronts results of analyses from one Neolithic site in Northern France (Passel 'Le Vivier') with the picture retrieved from previous analysis of data on coeval sites over a radius of c. 100 km, observing some differences that seem troubling at first sight given the geographical proximity and the similarities in the landscape originally surrounding the sites. The explanation may be lying in the nature of this particular site (an enclosure), which, although more monumental in aspect than the others, is ultimately less marked by human activities, as it was occupied only for a short period and involved little or no cultivation of the fields around. The key for all comparisons –between the built 'intra-site' space and the more or less natural 'close off-site' sequence, as well as between Passel and the other sites in the area– is, of course, chronology, based on a series of high-precision AMS dates from shell and charcoal fragments. The dates are few and not always consistent with their stratigraphic position. For this reason, the authors search for additional support in correlations with malacological assemblages collected in other features, and in logical arguments about the stratification of material over the entire sequence. This shows how important it is to consider evidence not only from the particular 'slice of time' that interests us more, but also from the years/centuries before and after, in order to evaluate things correctly.

The contribution of Lemer *et al.* also concerns comparisons between individual sites and regional patterns in Northern France, related to the Neolithic. The authors aim to precise the interactions between environmental changes recorded by palynological studies and development of agricultural practices in the Plain of Caen (Normandy). Based on the results of a new high-resolution palynological study in the Vey valley at Cairon, close to a Neolithic settlement, they highlight environmental dynamics in the area and propose detailed correlations between anthropogenic indicators and the three occupation phases of the archaeological site (c. 4400-3500 BC). Although the paper presents only the pollen proxy, this case study demonstrates the importance of high-resolution analyses and accurate chronological framework for the understanding of environmental evolutions.

With the paper by Kuzucuoğlu *et al.* we change environment completely. This is again about Neolithic, but of much earlier date and in very different topographical and climatic conditions. The discussion here is about one of the earliest sedentary settlements of the Near East, established in a river valley on the Central Anatolian plateau and prospering continuously for almost 1000 years. The authors first present separately the evidence from intra-site (archaeological) and from close and more distant off-site (geomorphological) investigation. Confronting their respective results, they propose a joint scenario for the conditions under which the first inhabitants settled at this spot and progressively expanded in a changing environment. Besides being highly pedagogical, this kind of presentation allows measuring: a) the difficulties met by each discipline in 'reading' the various lines of evidence, including time (e.g. inversions or inconsistencies of ^{14}C dates), b) the importance of a thorough, multi-parameter analysis in each field of research (architecture, fauna,

etc. for archaeology; diverse sediment analyses for geomorphology), and c) the benefits obtained from a close and long-term collaboration. For space and time are indeed quality parameters also in the present: inter-disciplinary research is still, unfortunately, too often understood as different specialists working separately from each other and/or over short periods only –physical geographers and natural scientists being more or less considered as temporary 'service providers' for the pluri-annual archaeological projects. The same is true for radiocarbon scientists and specialists of other dating methods, who, although constantly solicited, are rarely implicated in the selection of samples and the reasoning behind the requested measurements. The results of such a cooperation are limited in accuracy and ambition despite the precision of individual data. By contrast, a truly integrated approach requires proximity of the different specialists in the field (i.e. working together, scrutinizing together the same features, sections, records, etc.) and time for maturation of ideas and interaction. In the case of Aşıklı Höyük the results are convincing: the inhabitants benefited from the specific site location as much and as long as possible, and departed when the local conditions –and not the climate– made their maintenance there less interesting from a socio-economic perspective.

The paper by Pomadère *et al.* about the area around the Bronze Age palace and town of Malia, in Crete, is a good example of the limitations imposed to ambitious joint archaeological-environmental projects by the paucity or ambiguity of data themselves. The authors are confident that this situation may change with the processing of additional lines of evidence (i.e. proxies that are not yet thoroughly exploited). It appears then, once again, that good interdisciplinary research needs time... Until reaching final results, the authors make a number of interesting hypotheses about human activities in the area, in connection –or not– with changes in the local environment (e.g. expansion/shrinkage of the nearby coastal marsh) but also in connection with major regional phenomena, like the eruption of the Santorini volcano. The confrontation of the local chronological data, obtained from both intra-site excavations and off-site cores, with the complex and largely contradictory evidence about the date of the eruption itself, is an opportunity to discuss a series of crucial methodological issues.

The next three papers take us to the other side of the Atlantic Ocean: first at the coastal desert of Peru, with a contribution by Villa *et al.* about two neighbouring micro-regions whose evolution is tracked over the last two millennia; then in Guatemala, with papers by Nondédéo *et al.* and by Dussol, who discuss, on different time and space scales as well as from different perspectives, the connection of the Maya city of Naachtun with its surrounding environment.

The region investigated by Villa *et al.* in South America is very different from all other areas presented in the volume. It concerns a hyper-arid desert on the north Peruvian coast. The authors are conscious of the importance, for the human societies in the past, of possible climatic variations during the Holocene (and especially the early Holocene), that may have caused occurrences of (i) environmental conditions less constrained by humidity depletion than the present one, and (ii) extreme rainfall linked to the El Niño Southern Oscillation (ENSO) events. In this context, the authors compare intra-site data from two sites of contrasted dimensions and time lengths of occupation: (1) a fishermen site occupied for c. 300 years during the 5th to 8th centuries AD, and (2) a mound occupied more-or-less continuously for more than 1000 years, from the 5th to the 15th century AD. In parallel, off-site data are provided by sedimentary archives studied in coastal humid environments (*playas* and intra-dune wetlands). Results allow the authors to evidence:

- the succession of contrasting climatic phases during the last two millennia, with the identification, in particular, of two humid phases separated by a more arid one at the onset of the 8th century AD.
- the variety of responses of populations who adapted their subsistence economies to the substantial environmental fluctuations, before and after the 8th century AD. It is indeed evidenced that, in the coastal area facing the sea along the Sechura desert, the first centuries

of our era saw short-term opportunistic occupations focusing on the exploitation of temporary marine and wetland resources. On the wider scale of the regional territory between the coast and its hinterland, populations could address a higher variety of resources. This richness allowed permanent occupation and adaptation, even when the resources changed over time. This trend continued until the installation of hyper-aridity during the second half of the 15th century AD (i.e. a date known in the northern hemisphere as the end of the 'Medieval Optimum').

The following paper, by Nondédéo *et al.*, confronts two sequences: a cultural one (intra-site), recording also the archaeo-environmental context of a very large Maya city (Naachtun) mainly occupied during the Classic period, and a palaeoenvironmental sequence composed of several cores and observations made on a much wider scale around (off-site), in a forest and wetland context. The confrontation of these sequences leads to a quite new image on different time scales: a 'short' scale (c. 800 years) during the construction and main lifetime of the Maya city; a long scale, during a few millennia preceding the building of the Maya city. The results show also the interest of working on different space scales: the scale of the city vs. that of resource exploitation in closer or more distant 'natural environments'. In particular, off-site palaeoenvironmental investigations evidence a very early occupation of the area by human societies practicing agriculture on a wide scale around the city (which is not yet born), thus adding new light and time depth to the history of Naachtun. This evidence of human presence before the Classic times was unknown until now in the area, and confirms similar results obtained in other Maya sites. The authors underline however that, while intra-site archaeological chronology is well constrained, off-site chronology of palaeoenvironmental records does not provide a similar resolution, mainly because of a lack of control on the origin of the dated material and on possible time-lags produced by sedimentation processes.

Finally, the paper by Dussol concentrates on the different perceptions of human presence in a given area with respect to the nature of the investigated sites and to the material used for analysis. The question –and to a larger degree, the results– recall strongly those exposed in the paper by Granai *et al.* (*supra*). The environmental proxy used here is different (charcoal) and the comparisons are not between the big city of Naachtun and the broader region, but between the setting around Naachtun before, during and after the city itself. The overall conclusion is however the same: not all activities are equally visible in all types of sites, and it is not necessarily the most monumental among the latter (i.e. the most visible archaeologically) that provide the most accurate or the most reliable evidence about demography on the long-term. The last point is a useful reminder to all those who try to map out past demographical trends over vast geographical zones and chronological periods by compiling and modeling the available radiocarbon data. 'Available' is indeed not synonym of 'representative'; much more efforts like those exposed here are needed to equilibrate the relation between past realities and archaeological record.

Acknowledgements

The research projects whose results are presented here are only some of those who received financial support in the last six years from the LabEx 'DynamiTe' (ANR-11-LABX-0046, *Investissements d'Avenir* program, University Paris 1 Panthéon-Sorbonne). The LabEx has also financially supported the session 'Different Times?' at the 18th UISPP Congress, by covering the registration fees of the organisers and all the participants members of the Working Group 'Environmental and Social changes in the Past'. The editors extend their gratitude to the LabEx for accepting to undertake the printing expenses of the present volume.

We further wish to thank the seven renowned scholars who accepted to revise the papers as members of an experts committees: Nicholas Dunning (University of Cincinnati, USA), Catherine Dupont (CNRS, UMR 6566-CReAAH, France), Eric Fouache (Paris-Sorbonne University Abu

Dhabi, UAE) , Gerald Islebe (ECOSUR, Mexico), Neil Roberts (University of Plymouth, UK), Daniel Sandweiss (University of Maine, USA) and Pierre Stephan (CNRS, UMR 6554 LETG-Brest, France). With their comments and suggestions they have greatly helped to improve the final contributions and enhance the quality of the book as a whole.

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