

Conference report: **Climate Science & Ancient History. Decoding «Natural» and «Human» Archives**, Basel 27.–28.11.2018

Organized by: Prof. Dr. Sabine R. Huebner/Basel Climate Science & Ancient History Lab

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Connecting the historical to the natural sciences is an as of yet novel approach to reconstructing the past, which has gained traction in the past few years, often stopping short of complete interdisciplinarity due to the structural and methodological gap between the sciences. Attempting to bridge this disciplinary gap by assembling leading experts of their respective fields in Basel, the international conference “Climate Science & Ancient History. Decoding «Natural» and «Human» Archives” (27.–28.11.2018) featured 15 contributions by ancient historians, classicists, theologians, climate scientists, environmental historians, and paleoclimatologists. Issues discussed were wide-ranging, from reconstructing the climate in ancient regions via climatological findings and literary sources, to analyzing ice cores and lake sediments to retrace events taking place across the ancient world.

ADAM W. SCHNEIDER (Boulder) commenced Day 1 focusing on the region of Ancient Greece, with the debate whether Athens had experienced an extreme drought in the late 8th to early 7th century BCE. Some have argued with contradictory archaeological evidence (e.g. a significant increase vs. decrease in votive offerings) and reached diverging conclusions as to the existence and cause of such a drought. A lack of proxy evidence within mainland Greece has caused scientists to look further east. Examining the Aegean region, there appears to have been a trend towards increased aridity; further, the Southern Aegean may have experienced a climatic shift before the North, accounting for differing evidence. The development of Greek colonialism has been seen by some as a consequence of climatic disturbances; in the very least, Athens may have felt indirect effects of a drought due to trade partners in the Aegean being affected.

RUBEN POST (Pennsylvania) offered a textual analysis of written evidence, indicating an awareness of climatic change in Antiquity, the most explicit descriptions of natural phenomena found in Aristotle (*Meteorologika*), Theophrastes (*On Winds*), and Columella (*On Agri-*

culture). With the rise of the poleis began the codification of weather as well as the creation of climate-related inscriptions (*parapegmata*). The Greeks appear to have had an understanding of ‘normal’ weather patterns, as discrepancies from these patterns were considered unusual and inexplicable. These potential extreme events are recorded in the form of public oracle inquiries. An issue discussed after the contribution was whether individuals at the time were capable of differentiating between climatic cycles, weather phenomena and irregular climatic change.

During the later Hellenistic and Roman period, Greek literary sources mention declining population and abandoned settlements. **ANTON BONNIER** (Uppsala) considered climatic causes for such a decline in domesticated landscapes on the Peloponnese. Speleothems formed in the Mavri Trypa, Alepotrypa, and Kapsia caves have proven most indicative climate proxies. Findings have recorded environmental shifts in the form of soil degradation and erosion, with the Eastern Peloponnese being much drier than the West, lacking the moist air transport from the Mediterranean. Dry farming is highly dependent on regular precipitation — years of insufficient rainfall would be detrimental to the agricultural landscape, causing a shift in land-use strategies. These results do not, however, provide a universal pattern for the peninsula; rather, micro-regional perspectives are significant.

JOANA SEGUIN (Kiel) focused on the socio-environmental interactions of humans with their surroundings by utilizing limnic archives (paleoenvironmental reconstructions via the analysis of lakes). Lake Stymphalia, located on the NE-Peloponnese, is the last remaining perennial lake on the peninsula, situated in a karst polje, and characterized by a subsurface water flow to and from the lake. Thus innately connected to its larger surrounding territory, it is also located in high proximity to significant archaeological sites (Corinth, Mycenae, and Tiryns), allowing for a comparison and evaluation of regional results. The construction of an aqueduct under Emperor Hadrian (130 CE), for example, blocked water flow to the lake, and this anthropogenic impact is visible in the age-depth model for the past 8000 years.

Concluding the afternoon with an all-encompassing look at the Mediterranean, **PAUL ERDKAMP** (Brussels) evaluated the impact of climate change on agricultural production. Measuring climate change impact by analyzing the links between climatic change and wheat yields, Erdkamp considered case studies in Apulia and Algeria, while questioning the “tipping point” argument popularized in recent years by scholars such as Kyle Harper. Determining that the

shifts in temperature and precipitation between the “Roman Climate Optimum” and the Later Roman Empire were not equivalent to, and certainly not as severe as the global warming we are experiencing in the 21st century, the contribution stressed that climatic change does not necessarily have to be dramatic to be considered as such. The discussion afterwards considered reworking or even abandoning the “Roman Climate Optimum” (RCO) as a term, while also emphasizing the risks of attributing specific causes to climate change seen in Antiquity.

Rounding out the Graeco-Roman geographical focus of the first day, Keynote speaker **JÜRIG LUTERBACHER** (Giessen) delved into the challenges of climate reconstructions, and not least the linking of documentary evidence to natural archives found on-site. Paleoclimatic proxies (e.g. speleothems, plankton, pollen, tree-rings and sedimentary flood records), the ‘involuntary’ evidence of the past, can be made quantifiable, allowing for the conception of climate models, ideally to then be analyzed complementary to written documents. Luterbacher challenged concepts such as the Late Antique Little Ice Age (LALIA), as they do not indicate a significant drop or high when analyzed within a longer timescale; he also stressed the difficulty of extrapolating regional interpretations spatially to the entire Mediterranean.

Areas not immediately within the Mediterranean sphere, such as Egypt, the Black Sea, Byzantium, the Arabian peninsula and not least Greenland, were discussed on Day 2. **JOSEPH MANNING** (Yale) commenced the morning’s focus on Egypt, arguably one of Antiquity’s most exhaustive regions for both natural and human archives. With the territory featuring a density of historical records, as well as depending on a single water input from East Africa (the Nile), Manning outlined the possibility of recording tele-connections to volcanic outbursts elsewhere in the world. Egyptian literary sources at times mention low and insufficient water flow, and nilometer records have historically not been well used, though they are an important documentary source for the region.¹

SABINE R. HUEBNER & MARKUS STOFFEL (Basel & Geneva) presented their interdisciplinary research combining the fields of ancient history and dendroclimatology, a reconstruction of Egyptian climate year-by-year between the 1st to 4th centuries CE. The construction of nilometers was of political importance for evaluating the Nile’s flood levels, and historians (e.g. D. Bonneau, *Le fisc et le Nil*, 1971) have attempted to reconstruct floods using

¹ Manning is currently heading a collaborative project focusing on Ptolemaic Egypt (305–30 BCE), the “[Yale Nile Initiative](#)” (2018–2023), with a long-term aim in the field being the capability to model clusters of volcanic eruptions, tracking the response in the atmosphere.

these documentary sources. Huebner and Stoffel, however, propose the use of tree-rings as a reliable proxy instead, focusing on local species (sycamore fig and tamarisk) for the analysis by dendrochronology. Further, mummy labels were made from this ‘low-level’ local wood, of which there are roughly 2500 specimen worldwide, often dated within the label text.

Approaching Egypt’s climatic history from an economic viewpoint, **PAUL KELLY** (London) constructed a family model, monitoring the effects climatic changes would have on three (not always distinct) groups in the agrarian sector: landlords, smallholders, and private tenants. This theoretical case study focused on a newlywed couple in the Oxyrhynchite nome over the span of 15 years, on the assumption that they would be expending all of their savings on land. The climate was determined to have an impact on yields, grain spoilage, and the likelihood of a Nile flood, all leading to potential ruin for the landowners. Kelly reached the conclusion that the frequency of Nile floods had less of an impact whenever the population had access to secure granaries, a provision in the case of a flood failure.

Concluding the morning’s focus on Egypt, **IRENE SOTO MARÍN** (Basel) illustrated life in Egypt’s oases (Amheida, Dakhla, and Kharga), fertile areas very much isolated from their desert surroundings, while remaining highly connected to larger cities. The production of goods such as olive oil, wine and cotton took its toll: Amheida showed signs of erosion after a long period of use (from the Old Kingdom until the Late Roman Period), and Kharga experienced increasing flash floods. Whether these occurred randomly or were signs of a more humid period remains unanswered. The desertification of previously fertile land indicates that excessive agriculture caused irreversible damage to the oases’ soil. Soto Marín took a similar approach to Seguin, shifting more agency to humans, examining the (at times irreversible) effect of humans on their environment, rather than merely the impact of climatic change on humans.

Following these contributions rich in interdisciplinary approaches, the difference in status quo between historical and scientific publications was mentioned as a source of concern when choosing how to present research to an audience: historical journals favor articles with comprehensive citations, while succinct contributions with conclusion-based titles are common to the natural sciences.

JOSEPH R. MCCONNELL (Nevada) presented the possibilities of sampling natural archives with ice cores, in order to reconstruct global events. Lead traces in Greenland allow

scientists to infer aspects of ancient economy, as lead silver ores were a common material in coinage. The provenance of this pollution is uncertain, with emission sites located in Europe (e.g. the Rio Tinto mines in Spain) or China. Long-range transport caused tiny fractions of the metal to be blown to Greenland; since it is located far from most activity in Antiquity, only traces of large-scale events over longer periods remain. The chronology retraced by the ice cores shows links to recorded historical events: the Antonine Plague, for example, shows a drop in emissions, prompting the conclusion that social changes correlate to emission fluctuations.

Detailing another instance of climate history filling the gaps in documented history was the contribution by **JONATHAN P. STANFILL** (Portland) on the Gothic attempt to migrate (376 CE). Arguably one of Rome's most important 'barbarian' neighbors, historical records remain limited, with no literary sources composed by the Goths. Viewing this people only through the Roman lens, their migration patterns remain somewhat elusive. Traditionally, Hunnic pressure from the East explained the Goths' wishes to migrate, but a new multi-causal approach offers a more varied picture. Considering the years before the 2nd Gothic War, which featured both a first war against Rome and a civil war, the consequences of these conflicts seem to have coincided with measurable climatic change in the shape of severe and consecutive floods of the Danube river.

Remaining in the Eastern part of the Roman Empire, **ADAM IZDEBSKI & GEORGIOS LIAKOPOULOS** (Jena) scrutinized Byzantine resistance to its natural challenges, by analysis of lake sediment proxies. Outlining changing trends in the Mediterranean, from Sicily becoming Europe's 'bread basket' after 640s CE, to the region experiencing an aridification trend from ca. 720 CE onwards, followed by a period of intense agriculture under the Umayyads, they outlined how most landscape change could be explained by societal dynamics, such as decreasing human influence leading to natural biological succession.²

MATTHEW JACOBSON (Reading) moved further South-East with his contribution on Ḥimyar, a kingdom located in SW-Arabia (Oman). Lasting from 110 BCE to roughly the 6th century CE, the Ḥimyarite Kingdom was among the first to unite Arabian peoples, enjoying a period of prosperity 250–450 CE, weakening after the 480s–520s, followed by a rapid con-

² Izdebski and Liakopoulos are currently leading the project "[Byzantine Resilience: Environmental History of the Eastern Romans](#)" (2018–2023) at Jena, analyzing environmental and written data in the area of Greece, Macedonia, and Western Turkey.

quest by Aksum, a neighboring Christian kingdom. The region offers natural archives from monsoon proxy records showing extreme precipitation to cave speleothems. Following the assumption that a drought caused the collapse of Ḥimyar, analyses do show long-lasting and pronounced aridity at the time, with potential far-reaching consequences: some historians have correlated the rise of Islam on the Arabian peninsula to the socio-political vacuum left by Ḥimyar.

Concluding the conference with a look beyond the Mediterranean, **LIANG EMLYN YANG** (Kiel) demonstrated how the physical challenges and environmental conditions endured along its route make the Silk Road an interesting object of historical study. Tradespeople would traverse deserts and cross mountains, risking catastrophic economic losses; despite the climatic difficulties, the route was maintained for millennia, connecting the East to the West. While climatic change over time significantly influenced socio-cultural systems, Yang outlined how the population remained resilient to climate impacts by adapting to change.³

Issues highlighted by the contributors, as well as the challenges of interdisciplinarity in academia overall, were summarized in the final discussion. A concern raised multiple times was the risk of generalization based on trends, a valid point when considering a region as vast as the Mediterranean. Concerning connectivity over larger areas, it was surmised that climate impact was often not correlated, accentuating regionality, the effects of an economic crisis, however, would have been more widely felt across the ancient world. Participants also considered a change in the character of interdisciplinary research, moving from academics established in a discipline widening their scope, to cross-disciplinary approaches being encouraged from the early stages of a degree. Conference organizer and ancient historian Prof. Dr. Sabine R. Huebner is in the process of establishing the “[Basel Climate Science & Ancient History Lab](#)” in cooperation with climatologists Prof. Dr. Jürg Luterbacher and Prof. Dr. Markus Stofel, aiming to continue this type of collaboration between the sciences in cooperation with research projects worldwide.

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³ Yang’s presented research results are outlined in his eponymous book on last year’s workshop in Kiel “The Role of Environment in the Socio-Cultural Changes of the Ancient Silk Road Area”, 28-29.09.2017 (to be published open-access by [Springer](#) in 2019).

Conference Program:

Panel I (Chair: Sabine R. Huebner)

ADAM W. SCHNEIDER (University of Colorado Boulder): “New Data for an Old Question: New Paleoclimate Proxy Archives and their Potential Implications for Understanding Societal Disruptions in the Archaic Aegean during the 8th–7th Centuries BC”

RUBEN POST (University of Pennsylvania): “Perceptions of and Responses to Climate Change in Classical and Hellenistic Greece”

ANTON BONNIER (Uppsala University): “Domesticated Landscapes of the Peloponnese: Speleothem Data, Climate Variability and Land-Use Dynamics in the Hellenistic and Roman Peloponnese”

JOANA SEGUIN (Christian-Albrechts-University Kiel): “Lake Stymphalia Record Reveals 2’500 Years of Landscape Transformation in Southern Greece”

Panel II (Chair: Serena Causo)

PAUL ERDKAMP (Vrije Universiteit Brussel): “Climate Change and the Productive Landscape in the Mediterranean in the Roman period”

Keynote Lecture

JÜRIG LUTERBACHER (Justus-Liebig-University Giessen): “Reconstructing Climate back to Greek and Roman Times: Challenges, Opportunities, and Uncertainties”

Panel III (Chair: Matthias Stern)

JOSEPH MANNING (Yale University): “Volcanic Forcing of Nile Variability and Ptolemaic History?”

SABINE R. HUEBNER & MARKUS STOFFEL (University of Basel & University of Geneva): “Reconstructing Egyptian Climate during the Graeco-Roman Millennium: Natural and Human Archives”

PAUL KELLY (King’s College London): “Climate Risks and the Economy of Roman Egypt”

IRENE SOTO MARÍN (University of Basel): “Beyond the Nile: Wells, Desertification, and Economic Impact in the Western Oases of Roman Egypt”

Panel IV (Chair: Irene Soto Marín)

JOSEPH R. MCCONNELL (Desert Research Institute, Nevada): “Lead Pollution Archived in Greenland Ice as a Proxy for Economic Activity during European Antiquity”

JONATHAN P. STANFILL (University of Portland): “A Deafening Silence: The Challenges of Writing an Environmental History of the Goths”

ADAM IZDEBSKI & GIORGOS LIAKOPOULOS (Max Planck Institute, Jena): “Was Byzantium Resilient to Climate Change? State of the Question and Ways Forward”

Panel V (Chair: Jürg Luterbacher)

MATTHEW JACOBSON (University of Reading): “Did a Drought Cause Ḥimyar to ‘Collapse’? Did This Enable the Advent of Islam?”

LIANG EMLYN YANG (Christian-Albrechts-University Kiel): “The Role of Environment in the Socio-Cultural Changes along the Historical Silk Road in Central Asia