Liste erstellt am 2019-05-03

References

Afrika

Brandt 2017

Steven Brandt, Elisabeth Hildebrand, Ralf Vogelsang, Jesse Wolfhagen & Hong Wang, *A new MIS 3 radiocarbon chronology for Mochena Borago Rockshelter, SW Ethiopia, Implications for the interpretation of Late Pleistocene chronostratigraphy and human behavior*. Journal of Archaeological Science: Reports **11** (2017), 352–369.

With excavated layers spanning a period from N49 ka to ≈36 ka, Mochena Borago Rockshelter reveals a complex sequence of Late Pleistocene human occupation punctuated by volcanic events. Fifty-nine radiocarbon agesmake Mochena Borago one of the best-dated Late Pleistocene archaeological sites in eastern and northeastern Africa. However, complex site formation processes, dramatic stratigraphic differences between non-contiguous excavation areas, and "outlier" dates that appear in various parts of Mochena Borago's sequence, complicate efforts to develop a secure and detailed chronology for local and regional behavioral changes. This article focuses on contiguous squares within the Block Excavation Area (BXA) trench at the northern end of the shelter. Bayesian modeling of thirty-seven dates from six major lithostratigraphic units within the BXA yields a revised series of age ranges; these differ from the previous age model (derived from weighted means) in subtle but important ways. Perspectives gained through Bayesian analysis stimulate more careful consideration of the complex site formation processes operating at Mochena Borago, the contextual integrity of the site's robust and distinctive flaked stone artifact assemblages (lithics), and potential correlations between lithic changes and environmental events that occur on local, regional, and global scales. As these factors comeinto focus, Mochena Borago can serve as an important chronological benchmark to better understand human behavior in eastern and northeastern Africa around the time of the second major dispersal of Homo sapiens.

Keywords: MIS 3 | Ethiopia | Lithic technology | Radiocarbon | Late Pleistocene | Bayesian modeling

Reber 2018

David Reber, Mekbib Fekadu, Florian Detsch, Ralf Vogelsang, Tamrat Bekele, Thomas Nauss & Georg Miehe, *High-Altitude Rock Shelters and Settlements in an African Alpine Ecosystem, The Bale Mountains National Park, Ethiopia*. Human Ecology **46** (2018), 587–600.

This first survey of rock shelters and settlements in the Bale Mountains in Ethiopia is a baseline assessment for further research into the settlement history of Africa's largest alpine highlands. Extensive GPS-based mapping and interviews resulted in two detailed maps, a catalogue of profiles, and complete photographic documentation. In total, 331 rock shelters (four permanently inhabited, 51 seasonally inhabited, and 276 currently uninhabited) and 870 settlements (207 permanently inhabited, 449 seasonally inhabited, 214 uninhabited) were recorded together with information about the activities and livelihoods of the inhabitants of the current settlements. This 2015 study was part of the Ethiopian-European research project "The mountain exile hypothesis – how humans benefited from and re-shaped

African high-altitude ecosystems during Quaternary climate changes" (DFG FOR 2358). It was designed to support future management plans in this internationally important conservation area that has recently faced increasing land-use pressure and the threat of degradation.

Keywords: High-altitude habitation | Tropical mountains | Pastoralism | Settlement history | GPS mapping | Bale Mountains National Park | Ethiopia

Vogelsang 2018

Ralf Vogelsang, Olaf Bubenzer, Martin Kehl, Svenja Meyer, Jürgen Richter & Bahru Zinaye, *When Hominins Conquered Highlands, An Acheulean Site at 3000 m a.s.l. on Mount Dendi/Ethiopia*. Journal of Paleolithic Archaeology **1** (2018), 302–313.

The site DEN12-A02 shows that hominins might have settled in high-altitude regions already before the advance of Homo sapiens sapiens. This would question the concept of modern humans' superiority in a wide range of domains, such as subsistence strategies and hunting equipment in comparison to extinct hominins (for a critical discussion of this concept see: Villa and Roebroeks 2014). In any case, for millennia modern Homo sapiens seemed to have no reasons to colonize high mountains in Europe.

Why hominins conquered the tropical high-altitude habitat already at this early time is still an open question. Was the area a common habitat or was it only used as a refugium during times of environmental stress? Is the case of Dendi, an exception from the general settlement scheme or is the absence of sites the result of a research deficit in high-altitude regions? It is striking that with only one exception, all Acheulean sites in high-altitude environments are located in Ethiopia. Under certain environmental conditions, high mountains in tropical zones might have been favorable ecological niches despite the general stress factor for hominins in high altitudes. Fresh water availability may have played a key role. Modern circulation patterns suggest the Ethiopian Highlands are likely to have received more rainfall than surrounding regions of northern Africa and the Horn during prehistoric times. The region receives moisture from both the Atlantic and Indian Ocean system (Umer et al. 2004) and as a major topographic feature, the highlands capture high orographic rainfall. In the case of Mount Dendi, the crater lakes, if they already existed, might have been important water reservoirs during arid periods.

The ongoing analysis of lacustrine and terrestrial sediment cores from the crater lakes and the caldera deposits hopefully will elucidate the climate history and environmental conditions of the area and might help to answer these questions.

Aktuell

Choi 2019

Charles Q. Choi, *Scientific Computing With Limited Resources*. nature **569** (2019), 147–148.

Unreliable Internet, power and infrastructure can challenge researchers. But there are workarounds.

Anthropologie

Warren 2019

Matthew Warren, *Biggest Denisovan fossil yet spills ancient human's secrets*. nature **569** (2019), 16–17.

Jawbone identified using only protein analysis reveals that the species was widespread.

The team faced a problem. The remains at Denisova Cave had all been identified because they still contained some DNA, which could be compared with genetic sequences from other ancient humans. But there was no DNA left in the jawbone. Instead, the scientists looked for ancient proteins, which tend to last longer than DNA. In dentine from the teeth, they found collagen proteins suitable for study. The team compared these with equivalent proteins in great apes including Denisovans and Neanderthals, and found that they lined up closest with samples from Denisovans.

The altitude of the new Denisovan's home — 3,280 metres above sea level — surprised researchers, and helps to solve a mystery about Denisovans' genetic contribution to modern Tibetans. "It is astonishing that any ancient humans were at that altitude," says Stringer. [...] The latest study suggests that Denisovans evolved the adaptation on the Tibetan Plateau and passed it to Homo sapiens when the species arrived around 30,000–40,000 years ago, says coauthor Frido Welker, a molecular anthropologist at the University of Copenhagen.

Bibel

Schroer 2017

Silvia Schroer & Stefan Münger (Hrsg.), *Khirbet Qeiyafa in the Shephelah, Colloquium of the Swiss Society for Ancient Near Eastern Studies, University of Bern, September 6, 2014*. Orbis Biblicus et Orientalis 282 (Fribourg 2017).

The discussions about the finds and findings from Khirbet Qeiyafa among the scholarly community are at times quite heated, not just in Israel. When we invited the members of the Swiss Society for Ancient Near Eastern Studies (SGOA) to a conference on September 6, 2014 with the excavator Yosef Garfinkel and other renowned presenters, it was our aim to facilitate scholarly discussion without undue excitement and at a level at which the main issues could be easily understood. Thanks to the informative and factual contributions, we were able to achieve this aim. The conference participants were able to get a good overview of the significance of the site, the excavations, individual finds and the archaeological and cultural-historical context. Encouraging feedback has led us to make the results of the conference available to the wider public through the series 'Orbis Biblicus et Orientalis'. Even though publications discussing Khirbet Qeiyafa are quite numerous, particularly in Israel and in the English-speaking world, based on its concise layout and content the present volume should nevertheless prove useful to readers.

Biologie

Ioannou 2019

Christos C. Ioannou, Florence Rocque, James E. Herbert-Read, Callum Duffield & Josh A. Firth, *Predators attacking virtual prey reveal the costs and benefits of leadership*. PNAS **116** (2019), 8925–8930.

pnas116-08925-Supplement1.pdf, pnas116-08925-Supplement2.txt, pnas116-08925-Supplement3.csv, pnas116-08925-Supplement4.csv, pnas116-08925-Supplement5.avi

A long-standing assumption in social behavior is that leadership incurs costs as well as benefits, and this tradeoff can result in diversified social roles in groups. The major cost of leadership in moving animal groups is assumed to be predation, with individuals leading from the front of groups being targeted more often by predators. Nevertheless, empirical evidence for this is limited, and experimental tests are entirely lacking. To avoid confounding effects associated with observational studies, we presented a simulation of virtual prey to real fish predators to directly assess the predation cost of leadership. Prey leading others are at greater risk than those in the middle of groups, confirming that any benefits of leading may be offset by predation costs. Importantly, however, followers confer a net safety benefit to leaders, as prey leading others were less likely to be attacked compared with solitary prey. We also find that the predators preferentially attacked when solitary individuals were more frequent, but this effect was relatively weak compared with the preference for attacking solitary prey during an attack. Using virtual prey, where the appearance and behavior of the prey can be manipulated and controlled exactly, we reveal a hierarchy of risk from solitary to leading to following social strategies. Our results suggest that goal-orientated individuals (i.e., potential leaders) are under selective pressure to maintain group cohesion, favoring effective leadership rather than group fragmentation. Our results have significant implications for understanding the evolution and maintenance of different social roles in groups.

Keywords: spatial position | followers | predation | collective behavior | virtual prey

Significance: Across a wide range of animals, it is assumed that leading from the front of a group exposes individuals to greater predation risk, generating a cost that explains variation between individuals in their tendencies to lead and follow. Remarkably, there is scant empirical evidence to support this, and there are no experimental tests. By presenting real predators with a simulation of collective behavior, we were able to exclude any correlation between social behavior and other traits that could confound effects on predation risk. We show that virtual prey leading others were preferentially attacked, but leaders were still safer than solitary prey. Leaders benefit from being followed, and they should act to maintain group cohesion and avoid splitting from their followers.

Silk 2019

Joan B. Silk, *Hyena politics, The dynamics of dynasties.* PNAS **116** (2019), 8644–8645.

For monkeys and spotted hyenas, there are farreaching consequences of this process. High-ranking femalemonkeys generally reproduce more successfully than lower-ranking females. High-ranking female hyenas have higher lifetime reproductive success than lower-ranking females (5) because they begin breeding at younger ages, are more capable of sustaining concurrent pregnancies and lactation, have shorter interbirth intervals, and produce more surviving offspring than low-ranking females.

The combination of high-rank stability and rankrelated differences in reproductive success can have profound effects on the composition of groups over time. Daughters of high-ranking females will grow up to become high ranking and reproductively successful themselves, while the daughters of low-ranking females will become low ranking and reproduce relatively unsuccessfully. If no other processes are operating, highranking lineages will expand and low-ranking lineages will shrink.

The analyses that Strauss and Holekamp present offer a larger lesson about the effects of conventional systems for resolving conflicts of interest between individuals. Hierarchies that are based on inherited privilege are likely to have more lasting impacts than hierarchies based on other types of conventions, such as age and tenure. This is because the properties that confer success (and fitness advantages) are transmitted from parents to offspring. A female hyena (or baboon) who is lucky enough to be born into a high-ranking family will become high ranking and reproduce successfully herself. However, a female wasp who queues for the top-ranking position in her group will produce daughters who must still wait for their own turn at the top. Dynastic systems, like those of spotted hyenas, which combine inheritance of traits that confer fitness advantages with limited opportunities for social mobility, generate inequality that will be perpetuated and magnified across generations.

Strauss 2019

Eli D. Strauss & Kay E. Holekamp, *Social alliances improve rank and fitness in convention-based societies*. PNAS **116** (2019), 8919–8924.

pnas116-08919-Supplement.pdf

Social hierarchies are widespread in human and animal societies, and an individual's position in its hierarchy affects both its access to resources and its fitness. Hierarchies are traditionally thought of in terms of variation in individual ability to win fights, but many are structured around arbitrary conventions like nepotistic inheritance rather than such traits as physical strength or weapon size. These convention-based societies are perplexing because position in the hierarchy appears to be gained irrespective of individual physical ability, yet social status strongly affects access to resources and fitness. It remains unclear why individuals abide by seemingly arbitrary conventions regarding social status when they stand to benefit by ignoring these conventions and competing for top positions or access to resources. Using data from wild spotted hyenas collected over 27 y and five generations, we show that individuals who repeatedly form coalitions with their top allies are likely to improve their position in the hierarchy, suggesting that social alliances facilitate revolutionary social change. Using lifetime reproductive success as a fitness measure, we go on to demonstrate that these status changes can have major fitness consequences. Finally, we show that the consequences of these changes may become even more dramatic over multiple generations, as small differences in social rank become amplified over time. This work represents a first step in reconciling the advantages of high status with the appearance of "arbitrary" conventions that structure inequality in animal and human societies.

Keywords: dominance hierarchy | behavioral ecology | social alliances | rank reversal | social mobility

Significance: What forces produce and maintain social inequality, and why do society members tolerate this inequality? The "One Percent" clearly benefit from having high status, but low-status individuals have strong incentive to challenge the established pecking order and try to improve their position. This conundrum is particularly striking in the societies of many primates and spotted hyenas, where females who are born to low-status mothers rarely manage to improve their position. Here we find that females who are strongly allied with their group-mates are more likely to improve their status, and that upward social mobility is often achieved with support from their closest allies. This suggests that, much like some animals compete physically for status, these species compete through social alliances.

Datierung

Feng 2019

Zhongyi Feng et al., *Dating glacier ice of the last millennium by quantum technology*. PNAS **116** (2019), 8781–8786.

pnas116-08781-Supplement.pdf

Zhongyi Feng, Pascal Bohleber, Sven Ebser, Lisa Ringena, Maximilian Schmidt, Arne Kersting, Philip Hopkins, Helene Hoffmann, Andrea Fischer, Werner Aeschbach & Markus K. Oberthaler

Radiometric dating with 39Ar covers a unique time span and offers key advances in interpreting environmental archives of the last millennium. Although this tracer has been acknowledged for decades, studies so far have been limited by the low abundance and radioactivity, thus requiring huge sample sizes. Atom trap trace analysis, an application of techniques from quantum physics such as laser cooling and trapping, allows us to reduce the sample volume by several orders of magnitude compared with conventional techniques. Here we show that the adaptation of this method to 39Ar is now available for glaciological applications, by demonstrating the entire process chain for dating of alpine glacier ice by argon trap trace analysis (ArTTA). Ice blocks as small as a few kilograms are sufficient and have been obtained at two artificial glacier caves. Importantly, both sites offer direct access to the stratigraphy at the glacier base and validation against existing age constraints. The ice blocks obtained at Chli Titlis glacier at 3,030 m asl (Swiss Alps) have been dated by state-of-the-art microradiocarbon analysis in a previous study. The unique finding of a bark fragment and a larch needle within the ice of Schaufelferner glacier at 2,870 m asl (Stubai Alps, Austria) allows for conventional radiocarbon dating. At both sites the existing age information based on radiocarbon dating and visual stratigraphy corroborates the 39Ar ages. With our results, we establish argon trap trace analysis as the key to decipher so far untapped glacier archives of the last millennium.

Keywords: glacier ice dating | argon-39 | atom trap trace analysis

Significance: Alpine summit glaciers have a characteristic age range between 100 and 1,000 years. Reliable dating is the key to access this valuable environmental archive, including the Little Ice Age. Glacier ice contains past air and thus also the rare radioisotope 39Ar, uniquely suitable as an age tracer for this time span. Only argon trap trace analysis (ArTTA), the adaptation of techniques from quantum optics to 39Ar, enables small sample sizes necessary for the application to glacier ice. We present the first dating of glacier ice using less than 2 mL STP of argon from ≈5 kg of ice, finally opening the door for radioargon dating in glaciology.

Grabung

Bonnet 1981

Charles Bonnet, Suzanne Plouin & François Lambach, *Les tertres du Bronze Moyen d'Appenwihr, forêt de Kastenwald (Haut-Rhin)*. Bulletin de la Société préhistorique française **78** (1981), 432–471.

Die Hügelgruppe von Appenwihr, welche schon wichtiges Gerät aus der Eisenzeit geliefert hat (wir denken an das Grab mit etruskischem Bronzematerial), bringt jetzt zahlreiche Erzeugnisse aus der Hügelgräberkultur. Die reich ausgestattenen Appenwihrer Gräber betonen, für beide Perioden, die Wichtigkeit des Kastenwaldes. Die neue Ausgrabungen füllen eine Lücke aus, da die mittlere Bronzezeit sehr schlecht bekannt war in der Kolmarer Gegend, ausser einige Keramikstücke von der Höhensiedlung Hohlandsberg. Die Nachforschungen bringen ausserdem

ihren Beitrag zur bessere Kenttnisse des Begräbnisritus der Bronzezeit und auch der interregionalen Beziehungen.

Dehn 2008
Rolf Dehn, *Glas wertvoller als Gold ? Die Schale von Ihringen am Kaiserstuhl*. Archäologische Nachrichten aus Baden **76** (2008), 28–29.

Diese Schale ist das älteste Glasgefäß dieser Art, das bisher in Europa gefunden wurde. [...] In dem Mann, der unter dem Hügel bestattet ist, dürfen wir sicherlich den ersten uns bekannt gewordenen Angehörigen der Oberschicht des in Sichtweite gelegenen Fürstensitzes auf dem Breisacher Münsterberg sehen. Nach heutigen Kenntnissen kann diese Glasschale nicht in Mitteleuropa hergestellt worden sein. [...] Man wird daher vorerst weiter ihren Ursprung im Vorderen Orient sehen müssen, wo die Glastechnologie seit der Mitte des 2. Jahrtausends v.Chr. bekannt ist. Von hier wird die Schale wohl als Gastgeschenk auf dem Donauweg oder über das antike Massalia den Breisacher Münsterberg erreicht haben.

Dehn 2008
Rolf Dehn, *Gelungene Rekonstruktion*, *Das Trinkhorn aus dem Fürstengrab von Kappel am Rhein*. Archäologische Nachrichten aus Baden **76** (2008), 30–31.

Besondere Rätsel gaben vier mit Tüllen versehene Fundstücke auf, alle mit Kettchen und daran hängenden Klapperblechen, von denen am eindruckvollsten zwei bronzene Gabeltüllen mit Stierköpfchen sind. Sie lagen am Boden eines großen Bronzekessels nahe beisammen, so dass anzunehmen war, dass sie alle zu einem Fundobjekt gehörten. Ging man bisher aufgrund eines entsprechenden Fundes aus dem Fürstengrab von Hochdorf davon aus, dass das Trinkhorn erst Mitte des 6. Jahrhunderts v.Chr. aus dem griechisch geprägten Mittelmeerraum in Mitteleuropa übernommen wurde, so ist das wiedergewonnene Trinkhorn von Kappel a.Rh. mit seinen anzuschließenden Vergleichsstücken ein deutlicher Beleg dafür, dass diese Sitte sich schon seit der späten Urnenfelderkultur in der Oberschicht Mitteleuropas entwickelt hat. Woher damals die Anregung zur Übernahme und Weiterentwicklung kam, ist noch näher zu untersuchen.

Kraft 1936
G. Kraft, W. Rest & F. Moog, *Der Hallstattgrabhügel von Schlatt A. Staufen*, *Die Eisenschlacken von Schlatt*. Badische Fundberichte **3** (1936), x, 406–423.

Islam

Bowden 2010
Jeremiah J. Bowden, *Marriageable Age in Islam*, *A Study on Marriageable Age Laws and Reforms in Islamic Law*. unknown (2010), preprint, 1–23. .

In the preceding pages I have argued that the polemicists arguments that claim Muhammad was pedophile have little basis in reality. To prove this I have placed the tradition in its proper historical context and placed it beside Americas laws concerning legitimate sexual relations. I find Kecia Alis assertion that “It is indeed extremely hypocritical and self righteous to judge other centuries, based on new criteria to be right on the mark.

I have also argued that the rulings of the jurists intended to promote maslaha, or more specifically the protection of a humans ability to procure the five essential elements for their well-being, namely, their religion, life, intellect, offspring, and property. When the rulings of the jurists are viewed through this lens the reader is able to decipher the universal truth that ought to be mined from Muhammads actions – that even when it is permissible to have sexual relations, i.e. for a groom to sleep with his bride, there is an age when this practice is permissible and an age when it is not.

When the law is viewed in such a way, reform is much easier to come by. This is true because reformers are able to argue that maslaha is at stake when the young girls are married at a young age. A marriage of this sort not only affects the intellect, insofar as it limits access to education, but it also jeopardizes the life of the girl and her offspring. Furthermore, insofar as it subjects Islam to ridicule, it also harms Muslims religion.

Another integral aspect of understanding the debate is being able to distinguish between Islamic culture and Islamic law. This is admittedly not an easy task, but by comparing minimum marriageable age laws between states in the U.S. one gains a better understanding of the role culture plays in determining social mores. This is perhaps another reason why simply grafting secular Western marriage laws onto foreign cultures often ends in failure.

However, the main issue being addressed was the logical error that the Taliban and other repressive regimes make when they try to universalize a particular action of the Prophet and then claim that this act is normative for all believers. To simply cut and paste historical juridical precedents to contemporary juristic crises closes the gate of ijtihad and dooms the practice of Islamic jurisprudence to the realm of insignificance.

Jungpaläolithikum

Chu 2018

Wei Chu, György Lengyel, Christian Zeeden, Attila Péntek, Ľubomíra Kaminská & Zsolt Mester, *Early Upper Paleolithic surface collections from loess-like sediments in the northern Carpathian Basin*. Quaternary International **485** (2018), 167–182.

The way in which modern humans first entered Europe has been a recent focus of Upper Paleolithic research. A leading theory posits that the Danube served as a conduit for migration from Southeastern into Central and Western Europe. However, a challenge to this has been the scarcity of Early Upper Paleolithic sites along the Middle Danube (Carpathian) Basin. Though several sites with Early Upper Paleolithic features (Szeletian, Aurignacian) are known from surface prospections, few have been archeologically investigated in detail. Here, our aim is to elucidate this long-standing deficiency by evaluating two unknown and three known sites from the northern Carpathian Basin in Hungary and Slovakia through a series of "keyhole" excavations. The objectives were to see if in situ stratified material still existed and to characterize the sites' archeological assemblages and sedimentological contexts. To do this, field observations supplemented by granulometry were employed to determine if the surrounding sedimentary matrix was eolian loess and/or if it had been mixed with underlying older deposits. The results indicate that the lithics represent Early Upper Paleolithic assemblages that experienced post-depositional mixing. However, two sites (Sena I, Nagyrede 1) showed more nuanced site formation processes and may contain in situ artifacts warranting further exploration. These studies highlight the importance of including

sedimentological research into archeological investigations, because the paucity of sites may not simply mean a lack of human occupation, but can indicate a dynamic geomorphological evolution of the Pleistocene landscape that may have erased past traces of human settlements through insufficient sedimentation. The results provide new insights into the Early Upper Paleolithic settlement and the sedimentary dynamics of the Carpathian Basin ultimately leading to a greater understanding of the early modern human settlement patterns in Europe.

Keywords: Danube corridor hypothesis | Szeletian | Aurignacian | Carpathian basin | Grain-size analysis

Hauck 2018

Thomas C. Hauck, Frank Lehmkuhl, Christian Zeeden, Janina Bösken, Arne Thiemann & Jürgen Richter, *The Aurignacian way of life, Contextualizing early modern human adaptation in the Carpathian Basin.* Quaternary International **485** (2018), 150–166.

The culture and dispersal of early modern humans are top priorities of many research agendas. While the debate primarily centers on genetics, dispersal trajectories and points of earliest presence, the context (climate, landscape, demography, culture) of the colonizing process is usually considered in a coarsegrained manner or even ignored. To understand the context of human dispersal and to decipher relevant push and pull factors requires the consideration of multiple environmental proxies and the research on different geographic scales. In this paper, we present the Late Quaternary Carpathian Basin as a specific context area of early modern human dispersal into Europe. The multitude of Early Upper Paleolithic sites in this region suggests that it was part of a major dispersal corridor along the Danube and its catchment area some 40,000 years ago. The Aurignacian land-use model describes the interaction of early modern humans with their environment. One important parameter is the specific distribution of archaeological sites that exemplifies their boundedness to specific eco-zones. To reconstruct the latter, paleo-environmental proxies and archaeological data are examined together in regional vector models and in a GIS based landscape archaeology approach. In the final section, we present the Carpathian Basin as an idiosyncratic habitat that mirrors the dynamics and complexity of early modern human adaptation.

Keywords: Aurignacian | Carpathian Basin | Land-use model | Paleo-landscape | Site catchment analysis | Upland-lowland transects

Klima

Keellings 2019

David Keellings & José J. Hernández Ayala, *Extreme Rainfall Associated With Hurricane Maria Over Puerto Rico and Its Connections to Climate Variability and Change.* Geophysical Research Letters **46** (2019), 2964–2973.

GeoResLet46-02964-Supplement1.docx, GeoResLet46-02964-Supplement2.pdf

Key Points:

- Hurricane Maria was the most extreme rainfall event when compared to 129 tropical cyclones
- Return periods for Hurricane Maria's precipitation decreased by at least half across Puerto Rico, indicating increased likelihood in recent years
- The probability of Maria's heaviest precipitation has likely increased as a result of long-term climate trends

Abstract Hurricane Maria was associated with recordbreaking rainfall over Puerto Rico and caused unprecedented ooding and landslides. Here we analyze the extreme rainfall produced by Hurricane Maria using 35 stations with daily precipitation data from 1956–2016. A covariate-based extreme value analysis point process approach that accounts for natural climate variability and long-term climate change inuences on extreme rainfall is applied. Hurricane Maria produced the single largest maximum rainfall event since 1956 and had the highest total averaged precipitation of 129 storms that have impacted the island since 1956. Return periods for an event of Hurricane Maria's precipitation magnitude decreased in 48.6 % of stations across Puerto Rico and at least halved when averaged across the island. Within the most affected areas it is likely that the probability of precipitation of Maria's magnitude has increased by a factor greater than 1 (best estimate 4.85) as a result of long-term climate trends.

Plain Language Summary Hurricane Maria was associated with record-breaking rainfall over Puerto Rico, which caused unprecedented ooding and landslides across the island and led to widespread devastation. Here we analyze the extreme rainfall produced by Hurricane Maria using 35 historical weather stations with daily precipitation data from 1956–2016. We use a statistical analysis technique to determine how unusual Maria's rainfall was and if Maria's rainfall can be attributed to climate variability and/or climate change. We find that Hurricane Maria produced the single largest maximum rainfall event since 1956 and had the highest precipitation of 129 storms that have impacted the island since 1956. Our study concludes that extreme precipitation, like that of Hurricane Maria, has become much more likely in recent years and long-term trends in atmospheric and sea surface temperature are both linked to increased precipitation in Puerto Rico. These results place Maria prominently in the context of extreme storms that have impacted Puerto Rico and indicate that such events are becoming increasingly likely.

Marvel 2019

Kate Marvel, Benjamin I. Cook, Céline J. W. Bonfils, Paul J. Durack, Jason E. Smerdon & A. Park Williams, *Twentieth-century hydroclimate changes consistent with human influence*. nature **569** (2019), 59–65.

n569-0059-Supplement1.csv, n569-0059-Supplement2.xlsx, n569-0059-Supplement3.xlsx

Although anthropogenic climate change is expected to have caused large shifts in temperature and rainfall, the detection of human influence on global drought has been complicated by large internal variability and the brevity of observational records. Here we address these challenges using reconstructions of the Palmer drought severity index obtained with data from tree rings that span the past millennium. We show that three distinct periods are identifiable in climate models, observations and reconstructions during the twentieth century. In recent decades (1981 to present), the signal of greenhouse gas forcing is present but not yet detectable at high confidence. Observations and reconstructions differ significantly from an expected pattern of greenhouse gas forcing around mid-century (1950–1975), coinciding with a global increase in aerosol forcing. In the first half of the century (1900–1949), however, a signal of greenhouse-gas-forced change is robustly detectable. Multiple observational datasets and reconstructions using data from tree rings confirm that human activities were probably affecting the worldwide risk of droughts as early as the beginning of the twentieth century.

Ozeanien

Prebble 2019

Matthew Prebble et al., *Early tropical crop production in marginal subtropical and temperate Polynesia*. PNAS **116** (2019), 8824–8833.

pnas116-08824-Supplement1.pdf, pnas116-08824-Supplement2.xlsx

Matthew Prebble, Atholl J. Anderson, Paul Augustinus, Joshua Emmitt, Stewart J. Fallon, Louise L. Furey, Simon J. Holdaway, Alex Jorgensen, Thegn N. Ladefoged, Peter J. Matthews, Jean-Yves Meyer, Rebecca Phillipps, Rod Wallace & Nicholas Porch

Polynesians introduced the tropical crop taro (Colocasia esculenta) to temperate New Zealand after 1280 CE, but evidence for its cultivation is limited. This contrasts with the abundant evidence for big game hunting, raising longstanding questions of the initial economic and ecological importance of crop production. Here we compare fossil data from wetland sedimentary deposits indicative of taro and leaf vegetable (including Sonchus and Rorippa spp.) cultivation from Ahuahu, a northern New Zealand offshore island, with Raivavae and Rapa, both subtropical islands in French Polynesia. Preservation of taro pollen on all islands between 1300 CE and 1550 CE indicates perennial cultivation over multiple growing seasons, as plants rarely flower when frequently harvested. The pollen cooccurs with previously undetected fossil remains of extinct trees, as well as many weeds and commensal invertebrates common to tropical Polynesian gardens. Sedimentary charcoal and charred plant remains show that fire use rapidly reduced forest cover, particularly on Ahuahu. Fires were less frequent by 1500 CE on all islands as forest cover diminished, and short-lived plants increased, indicating higher-intensity production. The northern offshore islands of New Zealand were likely preferred sites for early gardens where taro production was briefly attempted, before being supplanted by sweet potato (Ipomoea batatas), a more temperate climate-adapted crop, which was later established in large-scale cultivation systems on the mainland after 1500 CE.

Keywords: Polynesia | crop husbandry | commensal species | fire | extinction

Significance: Fossil evidence shows that Polynesians introduced the tropical crop taro (Colocasia esculenta) during initial colonization of the subtropical South Pacific islands and temperate New Zealand after 1200 CE, establishing garden ecosystems with similar commensal plants and invertebrates. Sedimentary charcoal and fossil remains indicate how frequent burning and perennial cultivation overcame the ecological constraints for taro production, particularly the temperate forest cover of New Zealand. An increase in short-lived plants, indicating a transition toward higher-intensity production, followed rapid woody forest decline and species extinctions on all islands. The relatively recent fossil records from the subtropical and temperate islands of Polynesia provide unique insights into the ecological processes behind the spread of Neolithic crops into areas marginal for production.

Story or Book

Kiser 2019

Barbara Kiser, *Cities: The First 6,000 Years*. nature **569** (2019), 37.

Cities: The First 6,000 Years. Monica L. Smith. Viking (2019)

Seedbeds of civilization and economic nodes, cities have thrummed with enterprise and wallowed in waste from the start, some 6,000 years ago. Archaeologist Monica Smith examines the evolution of urbanization through the lens of her field,

showing the remarkable persistence of material and social norms — takeaway shops, upward mobility, crime and more. From digs such as Tell Brak in Syria and India's Sisupalgarh, Smith's journey explores methodologies and advances including magnetic gradiometry, but is at heart a revelation of the drive and creative flux of the metropolis over time.