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References

Biologie

Kwon 2023

Diana Kwon, *How the Brain Controls Sickness and Health*. nature **614** (2023), 613–615.

Scientists hope that deciphering the connections between the brain and the immune system will help to treat a range of diseases.

Energie

Akhtar 2022

Naveed Akhtar, Beate Geyer & Corinna Schrum, *Impacts of accelerating deployment of offshore windfarms on near-surface climate*. Scientific Reports **12** (2022), 18307. DOI:10.1038/s41598-022-22858-9.

The European Union has set the ambitious goal of becoming climate neutral by 2050, which has stimulated renewable energy production and accelerated the deployment of ofshore wind energy in the North Sea. Here, a high-resolution regional climate model was used to investigate the impact on the sea surface climate of large-scale ofshore wind farms that are proposed for the North Sea. The Results show a signiicant reduction in the air-sea heat luxes and a local, annual mean net cooling of the lower atmosphere in the wind farm areas down to more than 2.0 Wm-2, due to a decrease in 10 m wind speed and turbulent kinetic energy and an increase in low-level clouds. Mean surface winds decreased by approximately 1 ms-1 downstream of wind farms. Furthermore, an increase of approximately 5 % in mean precipitation was found over the wind farm areas. At a seasonal timescale, these diferences are higher during winter and autumn than in other seasons. Although the ofshore wind farms reduce the heat transport from the ocean to the atmosphere in the region of large wind farms, the atmospheric layers below the hub height show an increase in temperature, which is on the order of up to 10 % of the climate change signal at the end of the century, but it is much smaller than the interannual climate variability.)n contrast, wind speed changes are larger than projected mean wind speed changes due to climate change. Our results suggest that the impacts of large clustered ofshore wind farms should be considered in climate change impact studies. Moreover, the identiied ofshore windfarm impacts on the sea surface climate and the introduced spatial pattern in atmospheric conditions, in particular the modeled wind speed changes, suggest potential impacts on local ocean dynamics and the structure of the marine ecosystem. This should be considered in future scenarios for the North Sea marine environment and taken into account as a structuring inluence in the offshore environment.

Kleidon 2023

Axel Kleidon, *Windenergie in der Deutschen Bucht, Konsequenzen großskaliger Offshore-Windenergienutzung*. Physik in unserer Zeit **54** (2023), 30–36.

Über dem Meer weht der Wind stärker und verlässlicher als über Land. So wird für die Energiewende ein großer Beitrag an Offshore-Windenergie erwartet,

insbesondere in der Deutschen Bucht. Aber was passiert, wenn eine wachsende Zahl von Windparks der Atmosphäre mehr und mehr Windenergie entziehen?

Ein wesentlicher Beitrag zur Energiewende wird von OffshoreWindenergie in der deutschen Bucht erwartet. Wegen der starken und steten Winde erscheint die Offshore-Stromerzeugung als sehr effizient. Für 2050 geht die Bundesregierung von einer installierten Leistung von 70 GW aus, also einer Verzehnfachung im Vergleich zu heute. Was passiert aber, wenn so viele Windturbinen dem Wind ihre Energie entziehen? Das lässt sich mithilfe der kinetischen Energiebilanz der Atmosphäre über den Windparks leicht ermitteln. Da der Eintrag von Bewegungsenergie begrenzt ist, müssen mit zunehmender Nutzung der Windenergie die Windgeschwindigkeiten in der Region sinken – und damit die Effizienz der Turbinen. Es wird also weniger Strom erzeugt, als man ohne diesen Effekt erwarten würde. Bei 70 GW würde das die Stromerzeugung um bis zu 40 % reduzieren. Trotzdem könnte sie einen großen Teil des gegenwärtigen Strombedarfs abdecken. Für die effiziente Windenergienutzung auf dem Meer empfiehlt es sich daher, Windparks möglichst weit verstreut zu planen, damit man ihren Einfluss auf die Windfelder verringert.

Keywords: Windenergie | Offshore | Energiewende | erneuerbare Energie | Volllaststunden | kinetische Energie | Windgeschwindigkeit | Leistungskennwert | Kapazitätsfaktor | Kinetische Energiebilanz der Atmosphäre (KEBA).

Thess 2022

André D. Thess & Philipp Lengsfeld, *Side Effects of Wind Energy, Review of Three Topics—Status and Open Questions.* Sustainability **14** (2022), 16186, 1–17. DOI:10.3390/su142316186.

Wind energy is considered a pillar of the low-carbon energy system of the future. Whereas the side effects and social costs of fossil energy sources (coal, oil and gas), as well as those of nuclear energy, are well-documented and quantified, understanding of the analogous questions with respect to wind energy is far less advanced. However, such understanding is crucial in order to minimize the influence of wind energy on the environment and to compare its social costs with those of conventional energy sources. Here, we summarize the state of knowledge of three side effects of wind energy that have not been convincingly evaluated to date. We focus our analysis on three topics, namely (1) the impact of wind energy on insects; (2) the impact of wind energy on the spatiotemporal distribution of air velocity, temperature, moisture and precipitation in the vicinity of wind parks; and (3) the impact of wind energy on humans through noise emission. For each topic, we formulate open research questions that should be addressed by responsible policy incentives in order to comprehensively assess the social costs of wind energy and to develop wind farms with minimal impact on their environment.

Keywords: wind power | insect migration | insect impingement | infrasound emission | alteration of weather patterns

Klima

Durusu-Tanriöver 2023

Müge Durusu-Tanrıöver, *Signs of climate crisis as an ancient empire unravelled.* nature **614** (2023), 625–626.

An assessment of juniper tree-ring samples from central Turkey, together with other types of dating analysis, demonstrate that a devastating drought in 1198–1196 bc contributed to the end of the Hittite empire.

Manning 2023

Sturt W. Manning, Cindy Kocik, Brita Lorentzen & Jed P. Sparks, *Severe multi-year drought coincident with Hittite collapse around 1198–1196 bc*. nature **614** (2023), 719–724.

n614-0719-Supplement.pdf

The potential of climate change to substantially alter human history is a pressing concern, but the speciic efects of diferent types of climate change remain unknown. This question can be addressed using palaeoclimatic and archaeological data. For instance, a 300-year, low-frequency shift to drier, cooler climate conditions around 1200 bc is frequently associated with the collapse of several ancient civilizations in the Eastern Mediterranean and Near East1–4. However, the precise details of synchronized climate and human-history-scale associations are lacking. The archaeological–historical record contains multiple instances of human societies successfully adapting to low-frequency climate change5–7. It is likely that consecutive multi-year occurrences of rare, unexpected extreme climatic events may push a population beyond adaptation and centuries-old resilience practices5,7–10. Here we examine the collapse of the Hittite Empire around 1200 bc. The Hittites were one of the great powers in the ancient world across ive centuries11–14, with an empire centred in a semi-arid region in Anatolia with political and socioeconomic interconnections throughout the ancient Near East and Eastern Mediterranean, which for a long time proved resilient despite facing regular and intersecting sociopolitical, economic and environmental challenges. Examination of ring width and stable isotope records obtained from contemporary juniper trees in central Anatolia provides a highresolution dryness record. This analysis identiies an unusually severe continuous dry period from around 1198 to 1196 (±3) bc, potentially indicating a tipping point, and signals the type of episode that can overwhelm contemporary risk-bufering practices.

Palacio-Castro 2023

Ana M. Palacio-Castro et al., *Increased dominance of heat-tolerant symbionts creates resilient coral reefs in near-term ocean warming*. PNAS **120** (2023), e2202388120.

pnas120-e2202388120-Supplement.pdf

Climate change is radically altering coral reef ecosystems, mainly through increasingly frequent and severe bleaching events. Yet, some reefs have exhibited higher thermal tolerance after bleaching severely the irst time. To understand changes in thermal tolerance in the eastern tropical Paciic (ETP), we compiled four decades of temperature, coral cover, coral bleaching, and mortality data, including three mass bleaching events during the 1982 to 1983, 1997 to 1998 and 2015 to 2016 El Niño heatwaves. Higher heat resistance in later bleaching events was detected in the dominant framework-building genus, Pocillopora, while other coral taxa exhibited similar susceptibility across events. Genetic analyses of Pocillopora spp. colonies and their algal symbionts (2014 to 2016) revealed that one of two Pocillopora lineages present in the region (Pocillopora “type 1”) increased its association with thermotolerant algal symbionts (Durusdinium glynnii) during the 2015 to 2016 heat stress event. This lineage experienced lower bleaching and mortality compared with Pocillopora “type 3”, which did not acquire D. glynnii. Under projected thermal stress, ETP reefs may be able to preserve high coral cover through the 2060s or later, mainly composed of Pocillopora colonies that associate with D. glynnii. However, although the low-diversity, high-cover reefs of the ETP could illustrate a potential functional state for some future reefs, this state may only be temporary unless global greenhouse gas emissions and resultant global warming are curtailed.

Keywords: coral bleaching | Durusdinium glynnii | El Niño | Pocillopora | thermal stress

Ana M. Palacio-Castro, Tyler B. Smith, Viktor Brandtneris, Grace A. Snyder, Ruben van Hooidonk, Juan L. Maté, Derek Manzello, Peter W. Glynn, Peggy Fong & Andrew C. Baker

Significance: Global warming is causing the loss of coral reefs worldwide, as a result of heat-induced coral bleaching and mortality. Here, we examined the potential mechanisms that have increased the heat resistance of dominant framework-building coral taxa (Pocillopora spp.) on reefs in the eastern tropical Paciic. We propose that increasing abundance of a thermotolerant symbiotic alga (Durusdinium glynnii) hosted by these corals has facilitated the maintenance of high coral cover after three mass coral bleaching events. This study reveals a mechanism by which some reefs may be more resilient than previously thought and illustrates how future reefs might still maintain high cover for several decades, albeit with low diversity, provided other stressors are minimized.

Mathematik

Johnson 2023

Valen E. Johnson, Sandipan Pramanik & Rachael Shudde, *Bayes factor functions for reporting outcomes of hypothesis tests*. PNAS **120** (2023), e2217331120.

pnas120-e2217331120-Supplement.pdf

Bayes factors represent a useful alternative to P-values for reporting outcomes of hypothesis tests by providing direct measures of the relative support that data provide to competing hypotheses. Unfortunately, the competing hypotheses have to be specified, and the calculation of Bayes factors in high-dimensional settings can be difficult. To address these problems, we define Bayes factor functions (BFFs) directly from common test statistics. BFFs depend on a single noncentrality parameter that can be expressed as a function of standardized effects, and plots of BFFs versus effect size provide informative summaries of hypothesis tests that can be easily aggregated across studies. Such summaries eliminate the need for arbitrary P-value thresholds to define "statistical significance." Because BFFs are defined using nonlocal alternative prior densities, they provide more rapid accumulation of evidence in favor of true null hypotheses without sacrificing efficiency in supporting true alternative hypotheses. BFFs can be expressed in closed form and can be computed easily from z, t, $\div 2$, and F statistics.

Keywords: Bayes factors | meta-analysis | P-value | replication study | significance threshold

Significance: Bayes factors represent an informative alternative to P-values for reporting outcomes of hypothesis tests. They provide direct measures of the relative support that data provide to competing hypotheses and are able to quantify support for true null hypotheses. However, their use has been limited by several factors, including the requirement to specify alternative hypotheses and difficulties encountered in their calculation. Bayes factor functions (BFFs) overcome these difficulties by defining Bayes factors from classical test statistics and using standardized effect sizes to define alternative hypotheses. BFFs provide clear summaries of the outcome from a single experiment, eliminate arbitrary significance thresholds, and are ideal for combining evidence from replicated studies.

Maran 2022

Joseph Maran, *The Demise of the Mycenaean Palaces, The Need for an Interpretative Reset*. In: Reinhard Jung & Eleftheria Kardamaki (Hrsg.), *Synchronizing the Destructions of the Mycenaean Palaces*. Mykenische Studien 36 (Wien 2022), 231–253.

This paper dealing with the demise of the Mycenaean palaces is intended as a plea for an interpretive reset and a departure from any search for a single 'prime mover' allegedly responsible for this historical watershed. The doubts regarding the validity of the 'earthquake hypothesis' should be perceived as an opportunity to look for alternatives to previous explanatory approaches that were too simplistic. In order to do this, attention must shift away from events and towards assessing those structures and processes that enabled the palaces' demise. In this respect, three closely interrelated factors of historical, political, and social relevance to which I ascribe a crucial importance will be discussed: irst, conlicts among the elites; second, large-scale construction projects; and, third, changes in the palatial armed forces. It is argued that the palaces were brought down irst and foremost by internal contradictions that had long built up in the palatial polities and were exploited by members of the elite. Alongside antagonistic fault lines that developed over a long period of time, centrifugal forces were unleashed by social groups pursuing their own interests and forging alliances to strengthen their power base.

Keywords: Mycenaean palaces | destructions | medium- and long-term factors | collective violence