Jahr 2021: 105 weitere Studien bzgl. Temperatur-Aufzeichnungen veröffentlicht, die keine globale Erwärmung und keinen Hockeyschläger zeigen

geschrieben von Chris Frey | 1. Februar 2022

Kenneth Richard

Seit 2019 wurden mehr als 350 begutachtete wissenschaftliche Arbeiten veröffentlicht, die zeigen, dass es in der Neuzeit keine Erwärmung gab und/oder dass die Temperaturen viel höher lagen als heute, als der CO_2-Gehalt zwischen 180 und 280 ppm lag (Holozän, Pleistozän).

Unten finden Sie den Link zur aktualisierten (jetzt einschließlich 2021) Datenbank mit Temperaturaufzeichnungen von Orten auf der ganzen Welt, die allesamt keine Hockeyschlägerform zeigen.

Diese Hunderte von Veröffentlichungen legen nahe, dass a) die Erde während eines Großteils der letzten 11.700 Jahre (Holozän) um mehrere Grad wärmer war als heute und b) es nichts Ungewöhnliches an den Temperaturveränderungen in der Neuzeit gegeben hat.

Die ersten 8 Arbeiten auf der Liste 2021 sind hier als Beispiele aufgeführt.

Über 350 Nicht-Hockeyschläger (2019 bis 2021)

Zhou et al., 2021: Südchinesisches Meer wies eine ~4°C höhere Wassertemperatur auf während des mittleren Holozäns … 1994-2004 niedrigste Temperaturen der letzten 6000 Jahre

Sea surface temperature seasonality in the northern South China Sea during the middle Holocene derived from high resolution Sr/Ca ratios of *Tridacna* shells

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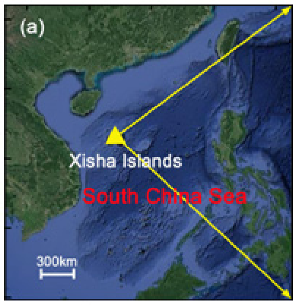
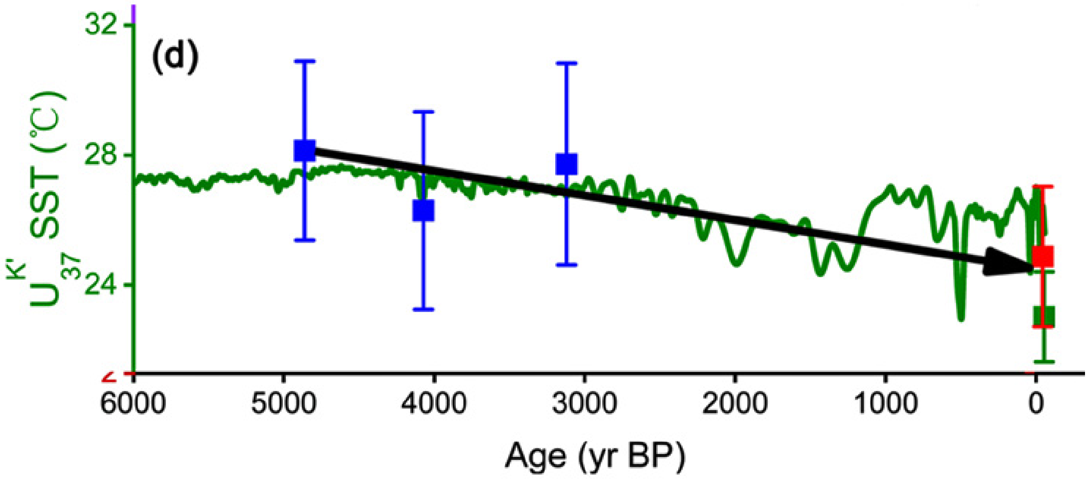
Pengchao Zhou, Hong Yan, Ge Shi, Chengcheng Liu, Fan Luo, Tao Han, Guozhen Wang, Hanfeng Wen, Nanyu Zhao, John Dodson, Yue Li and Weijian Zhou

All of these paleoclimate records showed that the EAWM strengthened from the middle Holocene to the present, which probably led to a decrease of the winter SST in the northern SCS and resulted in a larger SST seasonality. This may be the reason for the smaller SST seasonality changes during the middle Holocene recorded in our *Tridacna* specimen records. A recent reconstruction of the Holocene mean annual SST in the northern SCS derived from the long-chain unsaturated alkenones $U^{K'}_{37}$ emphasized the more important role of winter temperatures, and indicated a warmer SST during the middle Holocene (Zhang et al., 2019; Fig. 11d), also consistent with our deductions.





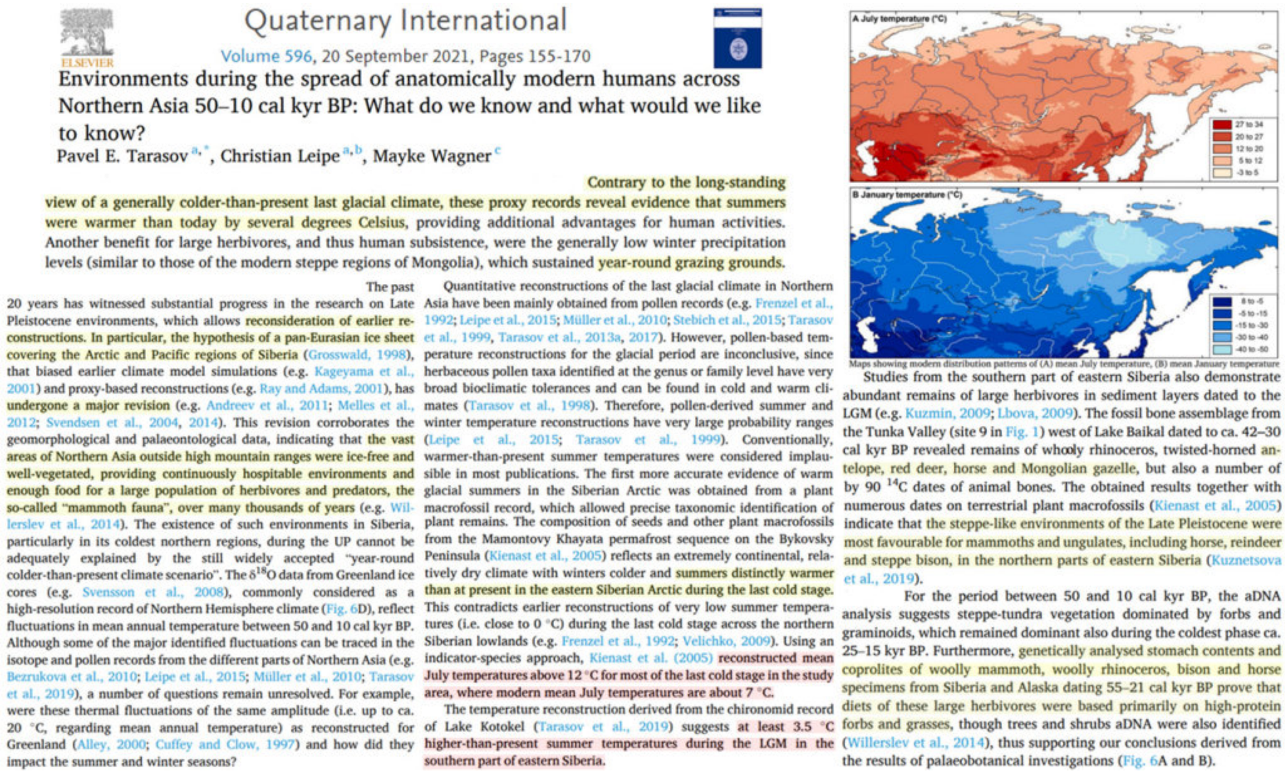
(d) Reconstruction of Holocene mean annual SST in the northern SCS derived from long-chain unsaturated alkenones $U^{K'}_{37}$ (Zhang et al., 2019). red squares indicate the Sr/Ca ratio of a modern *Tridacna gigas* specimen (YX1), and green squares indicate modern instrumental SST data (AD 1994–2004).

[Studie hinter Zahlschranke {30 Euro}]

Tarasov et al., 2021 (vollständige Studie) Das arktische Sibirien war während des Höhepunkts der letzten Eiszeit (180 ppm CO_2) 3,5 bis 5 °C wärmer als heute und bot großen Pflanzenfressern das ganze Jahr über Weideflächen

Umweltbedingungen während der Ausbreitung des anatomisch modernen Menschen in Nordasien 50-10 cal kyr BP … Nordasien (hier die Russische Föderation östlich des Urals) spielte eine Schlüsselrolle bei der Ausbreitung des anatomisch modernen Menschen (AMH) über den eurasischen Kontinent während des oberen Paläolithikums (UP). … Im Gegensatz zu der seit langem vertretenen Ansicht, dass das Klima während der letzten Eiszeit generell kälter war als heute, zeigen diese Proxy-Aufzeichnungen, dass die Sommer um mehrere Grad Celsius wärmer waren als heute, was zusätzliche Vorteile für menschliche Aktivitäten mit sich brachte. Ein weiterer Vorteil für große Pflanzenfresser und damit für die menschliche Subsistenz waren die allgemein geringen

Winterniederschläge (ähnlich denen in den heutigen Steppenregionen der Mongolei), die ganzjährige Weideflächen ermöglichten. Diese Faktoren überwogen offenbar die strengen, kälteren Winterbedingungen und förderten die Besiedlung von AMH in Nordasien sogar während des letzten glazialen Maximums (LGM) ca. 30-18 cal kyr BP. … Rekonstruierte mittlere Juli-Temperaturen von 12°C für den größten Teil der letzten Kältephase im Untersuchungsgebiet, wo die heutigen mittleren Juli-Temperaturen bei etwa 7°C liegen … Es gab um mindestens 3,5 °C höhere Sommertemperaturen als heute während des letzten glazialen Maximums [CO_2 180 ppm] im südlichen Teil Ostsibiriens.



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Environments during the spread of anatomically modern humans across Northern Asia 50–10 cal kyr BP: What do we know and what would we like to know?

Pavel E. Tarasov [a,*], Christian Leipe [a,b], Mayke Wagner [c]

Contrary to the long-standing view of a generally colder-than-present last glacial climate, these proxy records reveal evidence that summers were warmer than today by several degrees Celsius, providing additional advantages for human activities. Another benefit for large herbivores, and thus human subsistence, were the generally low winter precipitation levels (similar to those of the modern steppe regions of Mongolia), which sustained year-round grazing grounds.

The past 20 years has witnessed substantial progress in the research on Late Pleistocene environments, which allows reconsideration of earlier reconstructions. In particular, the hypothesis of a pan-Eurasian ice sheet covering the Arctic and Pacific regions of Siberia (Grosswald, 1998), that biased earlier climate model simulations (e.g. Kageyama et al., 2001) and proxy-based reconstructions (e.g. Ray and Adams, 2001), has undergone a major revision (e.g. Andreev et al., 2011; Melles et al., 2012; Svendsen et al., 2004, 2014). This revision corroborates the geomorphological and palaeontological data, indicating that the vast areas of Northern Asia outside high mountain ranges were ice-free and well-vegetated, providing continuously hospitable environments and enough food for a large population of herbivores and predators, the so-called "mammoth fauna", over many thousands of years (e.g. Willerslev et al., 2014). The existence of such environments in Siberia, particularly in its coldest northern regions, during the UP cannot be adequately explained by the still widely accepted "year-round colder-than-present climate scenario". The $\delta^{18}O$ data from Greenland ice cores (e.g. Svensson et al., 2008), commonly considered as a high-resolution record of Northern Hemisphere climate (Fig. 6D), reflect fluctuations in mean annual temperature between 50 and 10 cal kyr BP. Although some of the major identified fluctuations can be traced in the isotope and pollen records from the different parts of Northern Asia (e.g. Bezrukova et al., 2010; Leipe et al., 2015; Müller et al., 2010; Tarasov et al., 2019), a number of questions remain unresolved. For example, were these thermal fluctuations of the same amplitude (i.e. up to ca. 20 °C, regarding mean annual temperature) as reconstructed for Greenland (Alley, 2000; Cuffey and Clow, 1997) and how did they impact the summer and winter seasons?

Quantitative reconstructions of the last glacial climate in Northern Asia have been mainly obtained from pollen records (e.g. Frenzel et al., 1992; Leipe et al., 2015; Müller et al., 2010; Stebich et al., 2015; Tarasov et al., 1999, Tarasov et al., 2013a, 2017). However, pollen-based temperature reconstructions for the glacial period are inconclusive, since herbaceous pollen taxa identified at the genus or family level have very broad bioclimatic tolerances and can be found in cold and warm climates (Tarasov et al., 1998). Therefore, pollen-derived summer and winter temperature reconstructions have very large probability ranges (Leipe et al., 2015; Tarasov et al., 1999). Conventionally, warmer-than-present summer temperatures were considered implausible in most publications. The first more accurate evidence of warm glacial summers in the Siberian Arctic was obtained from a plant macrofossil record, which allowed precise taxonomic identification of plant remains. The composition of seeds and other plant macrofossils from the Mamontovy Khayata permafrost sequence on the Bykovsky Peninsula (Kienast et al., 2005) reflects an extremely continental, relatively dry climate with winters colder and summers distinctly warmer than at present in the eastern Siberian Arctic during the last cold stage. This contradicts earlier reconstructions of very low summer temperatures (i.e. close to 0 °C) during the last cold stage across the northern Siberian lowlands (e.g. Frenzel et al., 1992; Velichko, 2009). Using an indicator-species approach, Kienast et al. (2005) reconstructed mean July temperatures above 12 °C for most of the last cold stage in the study area, where modern mean July temperatures are about 7 °C.

The temperature reconstruction derived from the chironomid record of Lake Kotokel (Tarasov et al., 2019) suggests at least 3.5 °C higher-than-present summer temperatures during the LGM in the southern part of eastern Siberia.

Maps showing modern distribution patterns of (A) mean July temperature, (B) mean January temperature

Studies from the southern part of eastern Siberia also demonstrate abundant remains of large herbivores in sediment layers dated to the LGM (e.g. Kuzmin, 2009; Lbova, 2009). The fossil bone assemblage from the Tunka Valley (site 9 in Fig. 1) west of Lake Baikal dated to ca. 42–30 cal kyr BP revealed remains of whooly rhinoceros, twisted-horned antelope, red deer, horse and Mongolian gazelle, but also a number of by 90 ^{14}C dates of animal bones. The obtained results together with numerous dates on terrestrial plant macrofossils (Kienast et al., 2005) indicate that the steppe-like environments of the Late Pleistocene were most favourable for mammoths and ungulates, including horse, reindeer and steppe bison, in the northern parts of eastern Siberia (Kuznetsova et al., 2019).

For the period between 50 and 10 cal kyr BP, the aDNA analysis suggests steppe-tundra vegetation dominated by forbs and graminoids, which remained dominant also during the coldest phase ca. 25–15 kyr BP. Furthermore, genetically analysed stomach contents and coprolites of woolly mammoth, woolly rhinoceros, bison and horse specimens from Siberia and Alaska dating 55–21 cal kyr BP prove that diets of these large herbivores were based primarily on high-protein forbs and grasses, though trees and shrubs aDNA were also identified (Willerslev et al., 2014), thus supporting our conclusions derived from the results of palaeobotanical investigations (Fig. 6A and B).

Wetterich et al., 2021: Sibirische Arktis hatte „höhere Temperaturen als heute (um bis zu 4-4,5° C)“ während der letzten Eiszeit (180 ppm CO2), oder zwischen „39 und 31 cal kyr BP“

Zwischen 48 und 38 cal kyr BP wird die Chironomidenfauna von typischen aquatischen Taxa dominiert, obwohl die Anzahl und Vielfalt der Chironomiden zwischen 46 und 44 cal kyr BP erheblich abnimmt, wenn die rekonstruierte T_{July} um bis zu 1,5 °C über die heutige Temperatur steigt. Der Zeitraum zwischen 44 und 41,5 cal kyr BP ist durch die höchste Vielfalt und Konzentration von Chironomiden gekennzeichnet. Die Gemeinschaften werden von der Art Heterotrissocladius grimschawi dominiert, die in oligotrophen Seen vorkommt und auf gemäßigte Bedingungen mit einem Temperaturoptimum von 11-12°C hindeutet. … Die rekonstruierte T_{July} schwankt leicht um die moderne T_{July} mit einem wärmeren als der heutigen T_{July} um 41 cal kyr BP. … Bei etwa 51 cal kyr BP und 40 cal kyr BP in der Bykovsky-Aufzeichnung liefert das Vorkommen der gemäßigten Wasserpflanze Callitriche hermaphroditica Beweise für eine mittlere T_{July} von 12° C oder mehr, während der Fund des

Steppentaxons Thesium, der auf 51 cal kyr datiert wurde, auf eine T_{July} von 15°C oder mehr hindeutet. Die auf Chironomiden basierende T_{July}-Rekonstruktion für MIS 3 aus dem Sobo-Sise Yedoma Datensatz zeigt einige Abweichungen (Abbildung 5) und deutet auf wärmer als heute (>11° C) Temperaturen um 51 cal kyr BP, 46-44 und 41 cal kyr BP hin, was eine allgemeine Übereinstimmung mit den auf Pflanzenmakrofossilien basierenden T_{July}-Schätzungen aus dem Bykovsky Yedoma Datensatz (Kienast et al., 2005) zeigt. … T_{July}-Rekonstruktionen aus dem westlichen Teil des Yana-Indigirka-Tieflands (östlich des Untersuchungsgebiets) zeigen ähnliche oder wärmere Temperaturen als heute (um bis zu 4-4,5 °C) und höhere Jahresniederschläge als heute (um bis zu 50-100 mm) zwischen etwa 39 und 31 cal kyr BP (Pitulko et al., 2017) frontiers in Earth Science

Paleo-Ecology of the Yedoma Ice Complex on Sobo-Sise Island (EasternLena Delta, Siberian Arctic)

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ORIGINAL RESEARCH
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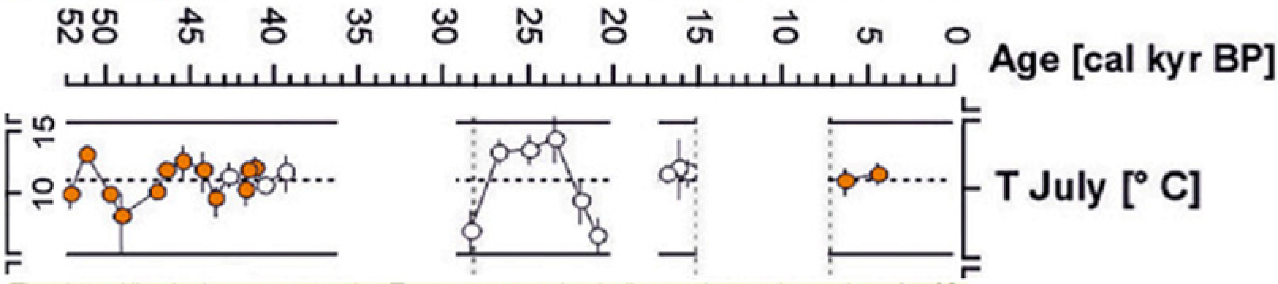
Between 48 and 38 cal kyr BP, the chironomid fauna is dominated by typical aquatic taxa although chironomid counts and diversity decrease considerably between 46 and 44 cal kyr BP when the reconstructed T_{July} rises up to 1.5°C above modern. The period between 44 and 41.5 cal kyr BP is characterized by the highest diversity and concentration of chironomids. The communities are dominated by the *Heterotrissocladius grimschawi*-type that occurs in oligotrophic lakes and is indicative of moderate conditions with temperature optima of 11–12°C. Reconstructed T_{July} slightly varies around modern with warmer-than-today T_{July} around 41 cal kyr BP.

At about 51 cal kyr BP and 40 cal kyr BP in the Bykovsky record, the occurrence of the temperate aquatic plant *Callitriche hermaphroditica* provides evidence of mean T_{July} of 12°C or more, while the finding of the steppe taxon *Thesium* dated to 51 cal kyr suggests T_{July} of 15°C or more. The chironomid-based T_{July} reconstruction for MIS 3 from the Sobo-Sise Yedoma record shows some variation (**Figure 5**) and points to warmer-than-today (>11°C) temperatures at about 51 cal kyr BP, 46-44 and 41 cal kyr BP showing a general agreement with the plant macrofossil-based T_{July} estimates from the Bykovsky Yedoma record (Kienast et al., 2005).



The dotted line in the reconstruction T_{July} reconstruction indicates the modern value of 11°C.

Sobo-Sise chironomid record supports warmer-than-today summers as recorded in the Bykovsky and Kurungnakh-Sise Yedoma archives given dating uncertainties and different proxies. T_{July} reconstructions from the western part of the Yana-Indigirka lowland (east of the study area) reveal similar-to or warmer-than-today temperatures (by up to 4–4.5°C) and higher-than-today annual precipitation (by up to 50–100 mm) between about 39 and 31 cal kyr BP (Pitulko et al., 2017). Compared to modern Yakutian diatom reference data with statistically quantified optimum ecological rages of certain conditions (Pestryakova et al., 2018) three species are found in the Holocene Sobo-Sise diatom record. Those are *Diploneis elliptica* (optimum T_{July} of 11.9°C) and *Stauroneis anceps* (optimum T_{July} of 11.2°C) from Unit C deposits dated from 6.4 to 2.5 cal kyr BP. Compared to the Holocene chironomid-based T_{July} reconstruction of ca 11.5°C at 6.4 to 4.4 cal kyr BP it seems obvious that the chironomid-based and diatom-based T_{July} reconstructions do not contradict each other. The finding of the diatom species *Epithemia adnata* (T_{July} >15°C) in the uppermost sample of Unit C points to warmer conditions than today, while the indication of optimum ion content (expressed as electrical conductivity of 586 µs cm^{-1}) of *E. adnata* would support such warm summer temperatures with increased evaporation.

In 1988, the first radiocarbon date on bone material from Sobo-Sise was published where a tusk fragment found *in situ* at about 13–15 m arl revealed an age of 14,340 ± 120 yr BP (17,490 cal yr BP; GIN-4115) (Grigoriev, 1988). Another mammoth bone found on Sobo-Sise was dated to 24,400 ± 650 yr BP (28,620 cal yr BP; IM-835) although no further information is available (**Table 2**). Six bones were found on Sobo-Sise in 1998 in course of the Russian-German Expedition “Lena Delta,” of which five belong to mammoth (one skull fragment, two rib fragments and two vertebral fragments) and one to horse (humerus fragment). One mammoth rib fragment (MKh-O621) was radiocarbon-dated to 19,200 ± 220 yr BP (23,180 cal yr BP; GIN-10235) and one mammoth vertebral fragment (MKh-O624) to >45,000 yr BP (GIN-13929, GrA 46013) (**Table 2**).

Two more horse bones were found in 2000 and identified as the damaged shoulder blade and the right branch of pelvis. A sample of a mammoth forearm (LDR-O299) from this collection was radiocarbon-dated to 17,070 ± 70 yr BP (20,630 cal yr BP; KIA-32839). The overall collection of prevalence of mammoth bones and the presence of other large grazers such as horse and bison. The finding of woolly rhinoceros remains is somewhat remarkable as it has not been found in the Lena Delta records so far (Wetterich et al., 2008a; Kuznetsova

Civel-Mazens et al., 2021 Vor 22.000 Jahren (180 ppm CO_2) erreichte die Wassertemperatur des Südlichen Ozeans einen Höchststand von 13,6 °C, was etwa 4-5 °C wärmer ist als heute (~9 °C)

Quaternary Science Reviews 251 (2021) 106711

Impact of the Agulhas Return Current on the oceanography of the Kerguelen Plateau region, Southern Ocean, over the last 40 kyrs

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MD12-3396CQ

In MD12-3396CQ, both temperature records decrease progressively from an early Holocene climate optimum (~10 kyrs) towards modern values with a high millennial-scale variability.

SSTdiat decrease from 11.7 °C to 8.9 °C with millennial oscillations up to ~4 °C

Over the same time interval, the SSTdiat in the same core show a decreasing trend, from 9.6 °C to 6 °C, interrupted by a large peak reaching 13.6 °C during the LGM, centred at 22 kyrs (Fig. 2A).

Unexpectedly, the SSTdiat record in the same core presents higher SST during the 40-24 kyrs period than during the Holocene

MD11-3353

Both SSTdiat and sub-STrad (Fig. 3K-L) follow a comparable pattern that is in agreement with EDC air temperature record. According to our results, both surface and sub-surface ocean temperatures were low during MIS 2 and MIS 3 at the MD11-3353 core site. They increased during the deglaciation, reached a maximum during the early Holocene and subsequently decreased slightly towards modern values (Fig. 3K-L).

After the deglaciation, a climate optimum is reached, the EDC ice cores record their highest temperatures for last ~ 40 kyrs at 10.5 kyrs. From this climate optimum, air temperatures progressively decreased to modern values (Fig. 3M).

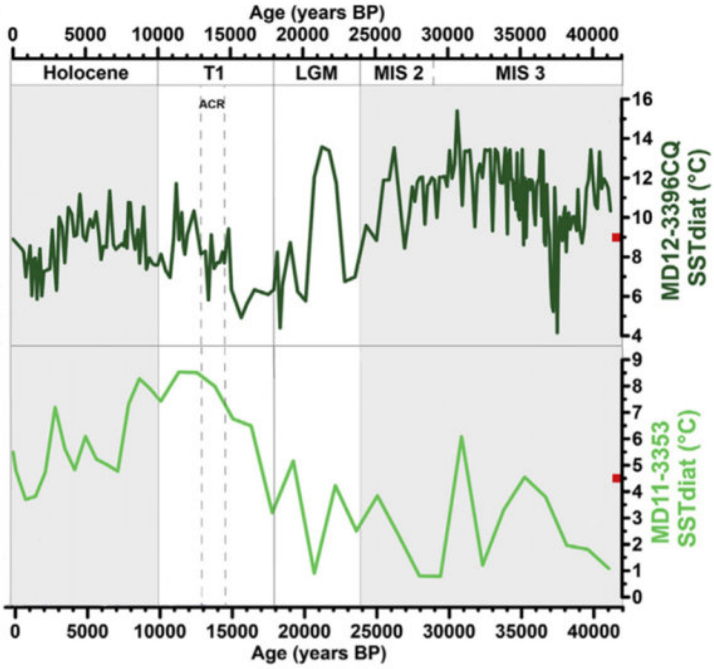

Fig. 2. Diatom-based SST (green) reconstructed with MAT covering the last 40 kyrs
Red squares on each Y axis indicate modern temperature value for both core locations

Cruz et al., 2021: In Argentinien war es 1,7°C bis 4,4°C wärmer als heute in den 1800er Jahren.

Die paläoklimatische Geschichte der Tixi-Höhle (Tabelle 3, Abbildung 4) zeigt im Vergleich zur Gegenwart ein kälteres (-3,3 °C) und trockeneres (-274,6 mm) Klima für den Übergang vom Pleistozän zum frühen Holozän (vor 12.287±212 bis vor 11.609±218ca Jahren BP). Diese kalten und trockenen Bedingungen blieben während des Mittelholozäns (vor 5592±79ca BP) mit einer niedrigeren mittleren Jahrestemperatur (-2,4°C) und geringeren Niederschlägen (-201,2mm) als heute erhalten. Der Wandel vollzog sich im Spätholozän IV (vor 3496±81ca BP) mit wärmeren und feuchteren Bedingungen als den heutigen, die einen Anstieg der durchschnittlichen Jahrestemperatur (+3,5°C) und des Jahresniederschlags (+90,8 mm) aufweisen. Diese warmen und feuchten Bedingungen wurden während des restlichen Spät-Holozäns III-I (1656±96 bis 160±120 ca BP) beibehalten, mit einem Anstieg der mittleren Jahrestemperatur zwischen 1,7°C und 4,4°C und jährlichen Niederschlägen von 27,5-263,6 mm, die höher waren als die heutigen.

The mutual ecogeographical range and paleoclimatic reconstruction during the Late Pleistocene-Holocene in the Pampas (Argentina) using meso and microvertebrate fossils

José Alberto Cruz,[1] José Luis Prado[2] and Joaquín Arroyo-Cabrales[3]

The Holocene
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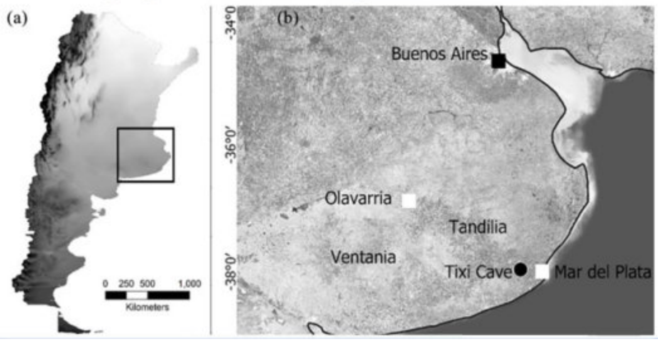
journals.sagepub.com/home/hol
SAGE

The paleoclimatic history of Tixi Cave (Table 3, Figure 4), compared to the present, indicates a colder (−3.3°C) and dryer (−274.6 mm) climate for the Pleistocene-Early Holocene transition (12,287 ± 212–11,609 ± 218 ca BP). These cold and dry conditions remained during the Middle-Holocene (5592 ± 79 ca BP) with lower mean annual temperature (−2.4°C) and lower precipitation (−201.2 mm) than the present. The change happened during the Late-Holocene IV (3496 ± 81 ca BP) with warmer and humid conditions than the current conditions, showing an increase in average annual temperature (+3.5°C) and annual precipitation (+90.8 mm). These warm and humid conditions were kept during the rest of Late-Holocene III–I (1656 ± 96–160 ± 120 ca BP) with an increase in mean annual temperature between 1.7°C and 4.4°C and annual precipitation 27.5–263.6 mm, higher than the current.

Table 3. Paleoclimatic reconstruction of the Late Pleistocene-Holocene of the Tixi Cave, inferred by the meso and fossil microvertebrate assembling, comparing the values with the present.

Stratigraphic unit	Age ca BP	MAT (°C)
Present		13.8 ± 0.7
H-I	160 ± 120	18.3 ± 3.7
H-II	646 ± 51	16.8 ± 1.6
H-III	1656 ± 96–1150 ± 87	15.5 ± 0.5
H-IV	3496 ± 81	17.3 ± 3.3
mH	5592 ± 79	11.5 ± 2.1
P-eH	12,287 ± 212–11,609 ± 218	10.54 ± 2.3

The ages are calibrated before the present (ca BP). All values were compared with the difference concerning the Present (DCP). P-eH: Late Pleistocene-Early Holocene; mH: Middle-Holocene; H-IV to I: Late-Holocene.



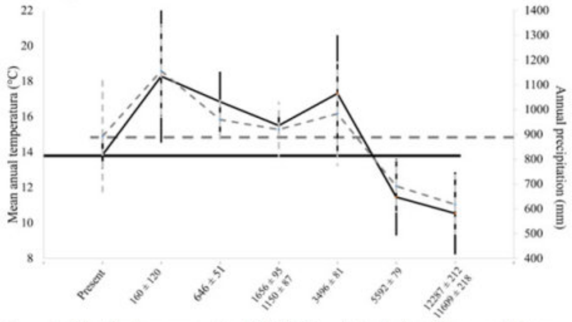


Figure 4. Paleoclimatic reconstruction of the Tixi Cave during the Late Pleistocene-Holocene

[**Nazarova et al., 2021**](#) [(vollständig)](#) In Ostrussland war es während der mittelalterlichen Warmzeit (750-1250 n. Chr.) 1,5°C wärmer als heute

Das mittelalterliche Klimaoptimum (Nara-Heian-Kamakura-Stadium in Japan), das für den östlichen Teil der Region Primorskij im Zeitraum von vor 1250 bis 750 Jahren rekonstruiert wurde, zeichnete sich durch ein feuchtes Klima mit Sommertemperaturen aus, die ca. 1,5°C höher waren als heute. Der Zeitraum vor 750 bis vor 250 Jahren korreliert mit der Kleinen Eiszeit: Die Sommertemperaturen waren auf 1,5-2°C unter die heutigen Werte gesunken.

Springer Link

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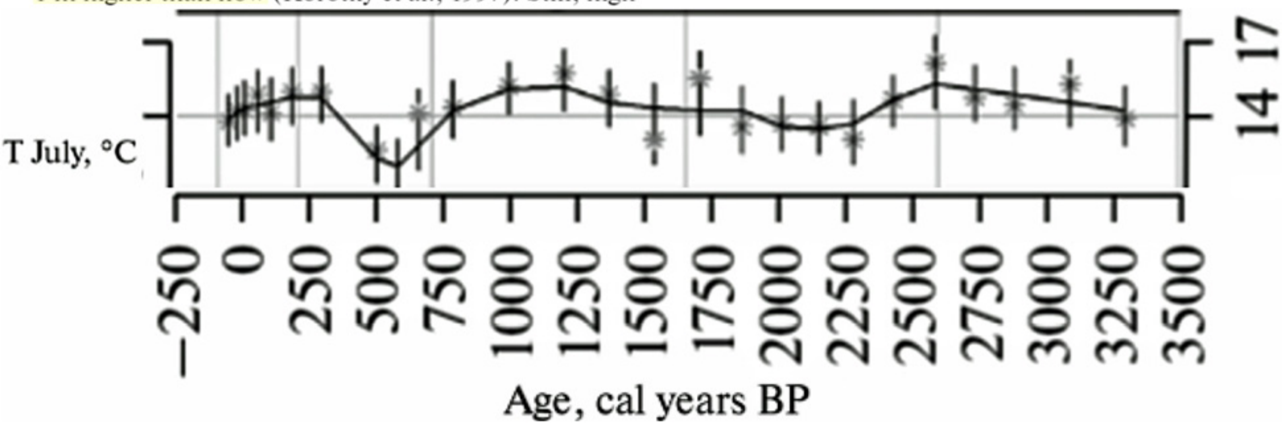
Reconstruction of Environmental Conditions in the Eastern Part of Primorsky Krai (Russian Far East) in the Late Holocene

L. B. Nazarova, N. G. Razjigaeva, L. V. Golovatyuk, B. K. Biskaborn, T. A. Grebennikova, L. A. Ganzey, L. M. Mokhova & B. Diekmann

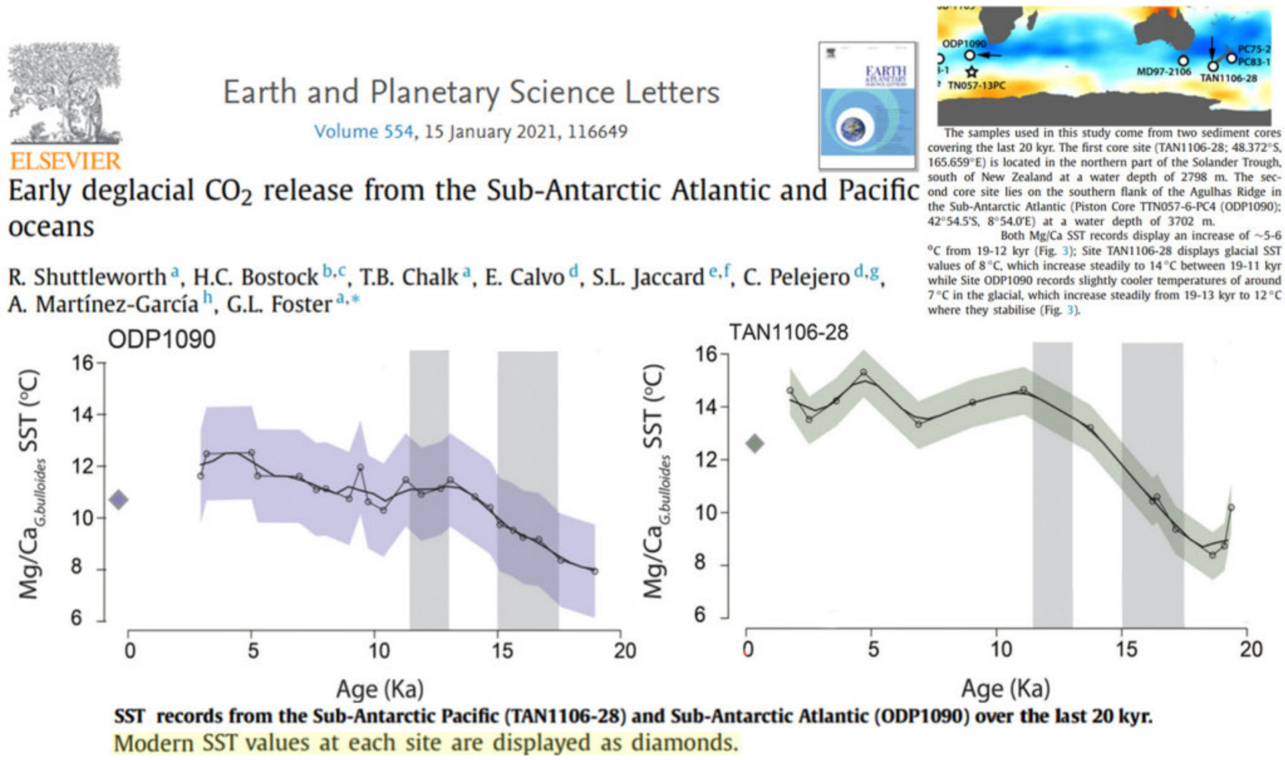
Contemporary Problems of Ecology **14**, 218–230 (2021)

The reconstructed summer temperatures increase, reaching the highest values between 1250 and 990 cal years BP (1.5°C above the current level). The period between 1250 and 750 cal years BP can be associated with the Medieval Climatic Optimum (warm Nara–Heian–Kamakura stage in Japan, 1220–650 cal years BP) with its warmer winters and summers (Sakaguchi, 1983). The impact of the sea on the studied reservoir is insignificant, even though a transgression is observed in that period (Sakaguchi, 1983; Razjigaeva et al., 2018). At ca. 1000 years ago, the sea level was approximately 1 m higher than now (Korotky et al., 1997). Still, high

In the southern part of the archipelago (Kunashir Island), the role of oak and other broad-leaved species increased. Fir predominated in the vegetation of Shikotan Island, reaching a maximum around 1000–870 cal years BP. Birch forests became widespread in the northern part of Urup Island (Razjigaeva et al., 2013). In the southern part of the continental Far East, the temperature was 1°C higher in comparison with the current level (Korotky et al., 1997).



[Shuttleworth et al., 2021](#) Der Subantarktischer Atlantik war vor ~4000 bis ~5000 Jahren um ~2°C wärmer


Earth and Planetary Science Letters
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ELSEVIER

Early deglacial CO_2 release from the Sub-Antarctic Atlantic and Pacific oceans

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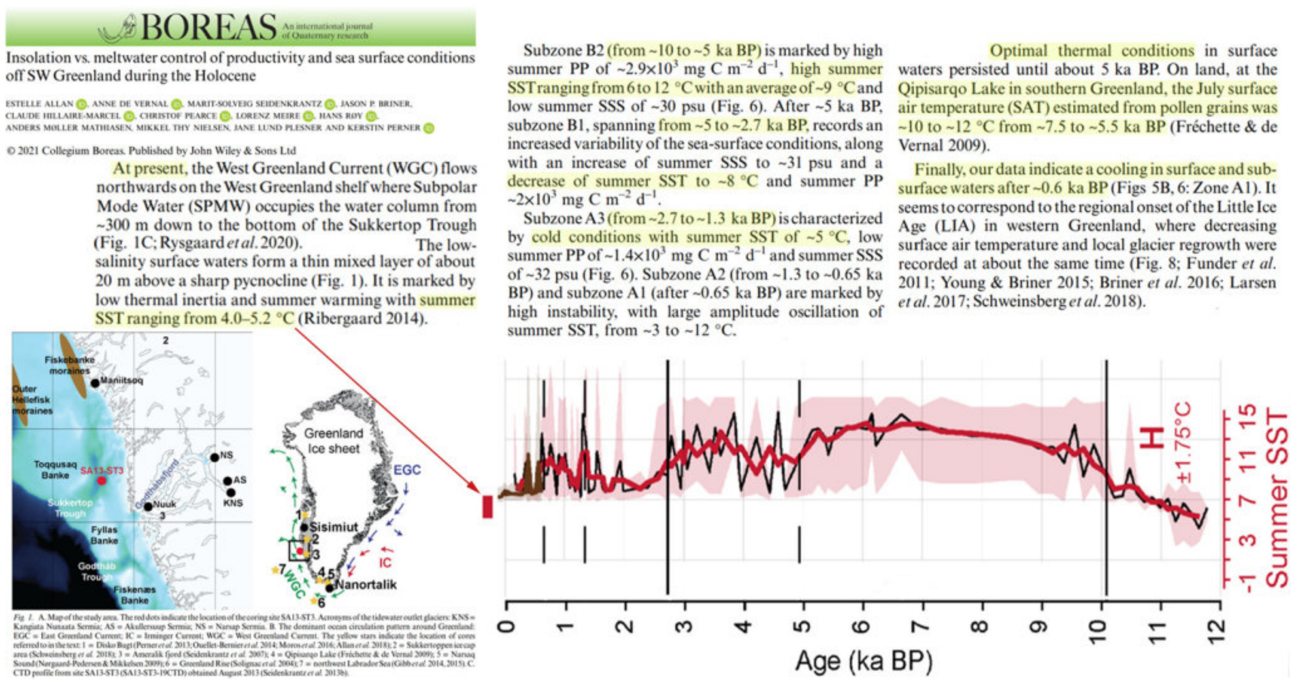
The samples used in this study come from two sediment cores covering the last 20 kyr. The first core site (TAN1106-28; 48.372°S, 165.659°E) is located in the northern part of the Solander Trough, south of New Zealand at a water depth of 2798 m. The second core site lies on the southern flank of the Agulhas Ridge in the Sub-Antarctic Atlantic (Piston Core TTN057-6-PC4 (ODP1090); 42°54.5'S, 8°54.0'E) at a water depth of 3702 m.

Both Mg/Ca SST records display an increase of ~5-6 °C from 19-12 kyr (Fig. 3); Site TAN1106-28 displays glacial SST values of 8 °C, which increase steadily to 14 °C between 19-11 kyr while Site ODP1090 records slightly cooler temperatures of around 7 °C in the glacial, which increase steadily from 19-13 kyr to 12 °C where they stabilise (Fig. 3).

SST records from the Sub-Antarctic Pacific (TAN1106-28) and Sub-Antarctic Atlantic (ODP1090) over the last 20 kyr.
Modern SST values at each site are displayed as diamonds.

Allan et al., 2021 Grönland war vor 7.500 bis 5.500 Jahren 5-7°C wärmer (4-5°C vs. 10-12°C) als heute.

Gegenwärtig … Sommer-SST zwischen 4,0-5,2 °C (Ribergaard 2014). … Subzone B2 (von ~10 bis 5 ka BP) ist gekennzeichnet durch … hohe Sommer-SST von 6 bis 12 °C mit einem Durchschnitt von ~9 °C … Subzone A3 (von ~2,7 bis ~1,3 ka BP) ist gekennzeichnet durch kalte Bedingungen mit einer Sommer-SST von ~5 °C … Optimale thermische Bedingungen … die anhand von Pollenkörnern geschätzte Oberflächenlufttemperatur (SAT) im Juli betrug ~10 bis ~12 °C von ~7,5 bis ~5,5 ka BP (Frechette & de Vernal 2009)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Insolation vs. meltwater control of productivity and sea surface conditions off SW Greenland during the Holocene

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At present, the West Greenland Current (WGC) flows northwards on the West Greenland shelf where Subpolar Mode Water (SPMW) occupies the water column from ~300 m down to the bottom of the Sukkertop Trough (Fig. 1C; Rysgaard et al. 2020). The low-salinity surface waters form a thin mixed layer of about 20 m above a sharp pycnocline (Fig. 1). It is marked by low thermal inertia and summer warming with summer SST ranging from 4.0–5.2 °C (Ribergaard 2014).

Subzone B2 (from ~10 to ~5 ka BP) is marked by high summer PP of ~2.9×10³ mg C m⁻² d⁻¹, high summer SST ranging from 6 to 12 °C with an average of ~9 °C and low summer SSS of ~30 psu (Fig. 6). After ~5 ka BP, subzone B1, spanning from ~5 to ~2.7 ka BP, records an increased variability of the sea-surface conditions, along with an increase of summer SSS to ~31 psu and a decrease of summer SST to ~8 °C and summer PP ~2×10³ mg C m⁻² d⁻¹.

Subzone A3 (from ~2.7 to ~1.3 ka BP) is characterized by cold conditions with summer SST of ~5 °C, low summer PP of ~1.4×10³ mg C m⁻² d⁻¹ and summer SSS of ~32 psu (Fig. 6). Subzone A2 (from ~1.3 to ~0.65 ka BP) and subzone A1 (after ~0.65 ka BP) are marked by high instability, with large amplitude oscillation of summer SST, from ~3 to ~12 °C.

Optimal thermal conditions in surface waters persisted until about 5 ka BP. On land, at the Qipisarqo Lake in southern Greenland, the July surface air temperature (SAT) estimated from pollen grains was ~10 to ~12 °C from ~7.5 to ~5.5 ka BP (Fréchette & de Vernal 2009).

Finally, our data indicate a cooling in surface and subsurface waters after ~0.6 ka BP (Figs 5B, 6: Zone A1). It seems to correspond to the regional onset of the Little Ice Age (LIA) in western Greenland, where decreasing surface air temperature and local glacier regrowth were recorded at about the same time (Fig. 8; Funder et al. 2011; Young & Briner 2015; Briner et al. 2016; Larsen et al. 2017; Schweinsberg et al. 2018).

Link:
https://notrickszone.com/2022/01/31/105-more-non-global-warming-non-hockey-stick-temperature-records-added-to-the-database-in-2021/

Übersetzt von Christian Freuer für das EIKE