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On Historical Climatology: A Brief Introduction

Felix Schneider

Shortly before his death in 1858, the great naturalist and polymath Alexander von Humboldt speculated that humans, through the massive destruction of forests, could influence the broader climate. A hypothesis that was both daring and accurate, considering that Alexander von Humboldt lived in a world that – by today's CO_2 standards – would seem almost paradisiacal. In the mid-19th century, our planet was home to just about 1.2 billion people; the internal combustion engine had not yet been invented, and the Anthropocene did not yet have a name.

The industrial heart of Berlin during the time of Alexander von Humboldt, the so-called "Feuerland" in the suburb of Oranienburg, painting by Karl Eduard Biermann, 1847. (Wikimedia Commons, 1999)

Even before anthropogenic climate change, the climate – or, more accurately, the change in climatic conditions – had always been a determining factor in the societal evolution of Homo sapiens.

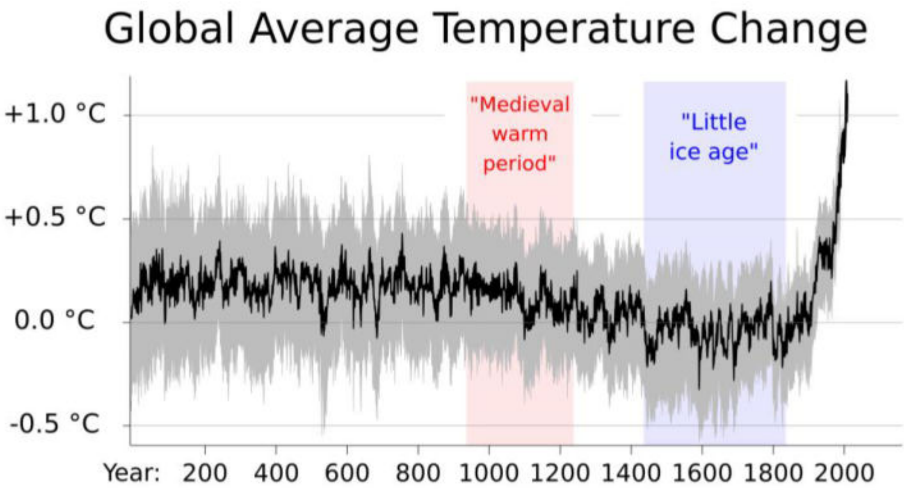
The scientific findings of the last few decades leave no doubt that the constant shift between cold and warm periods – essentially “natural climate change” – has always had immense effects on the development of flora, fauna, and indeed humans throughout the entire evolution.

Today, we live in a post-glacial period. Ice ages are defined in such a way that warm and cold periods alternate within these long-term climate periods. Even these glacial and interglacial phases are further divided into so-called stadials and interstadials, meaning shorter-lasting cold and warm periods. Humans today live in an interglacial of the Holocene, a post-glacial age, which began about 11,700 years ago.

Historical Climatology broadly deals with the impacts of the ever-changing climate on human society. It’s a relatively young science, akin to a science in its infancy. Its object of study is human society itself, and its findings hold significant importance for historical research. Just a few years ago, the assertion that the climate had a decisive influence on human development would have been somewhat controversial: One would have easily been lumped in with old-school climate determinists, shaped by colonial thinking, who claimed less than a hundred years ago that climate was the determining factor for a people’s intellectual development and thereby, as if divinely ordained, determined its standing among the world’s cultures.

As it goes with fundamentally new insights, the idea of considering the climate factor also needs its time before it can take its deserved place in the literature. Even today, in standard historical works – or especially there – you will find little or no mention of the influence of climate (or even climate change) on the development of humanity. Textbooks and prevailing opinions are sometimes marked by strong forces of inertia (Mauelshagen & Pfister, 2010).

Pioneers of Historical Climatology, such as the French historian Emmanuel Le Roy Ladurie or the British climatologist Hubert Horace Lamb, delved into the history of climate and scientifically analysed the development of humanity in the context of climatic anomalies. In his 1967 work “Histoire du climat depuis l’an mil”, Le Roy Ladurie for instance focused on the “Little Ice Age” (15th-19th century), while Hubert Lamb coined the term “Medieval Warm Period” (11th-12th century).



Medieval Warm Period and Little Ice Age. (Wikimedia Commons, 2020b)

As previously mentioned, historical climate research is still a very young science. It wasn’t until the mid-20th century that there was an intensive examination of human history in relation to climate change. At that time, the focus was initially on the so-called “Little Ice Age” and various shorter warm periods, which for the first time could be substantiated by scientific data from the past 2,000 years. The significant comparison that could have been made with the 20th century was initially overlooked. Only in the 1990s anthropogenic climate change did gradually become a topic of Historical Climatology as well.

From this perspective, in Historical Climatology, there are generally two “climate-changing” phenomena to distinguish: On the one hand, we have “natural climate change” and its impacts on the history of human societies. On the other hand, particularly for a deeper understanding of our current climatic situation, man-made (anthropogenic) climate change is what is, quite literally, “burning at our fingertips” today.

Many problems in today's historical scholarship stem from the fact that the history of climate is still very rarely understood as an integral part of historical events. Given this, it is not surprising that historical climatology is only slowly being integrated into our overall historical thinking. To give a very basic example: the history of the Arctic, for instance, can no longer be fully presented without also addressing anthropogenic climate history. It is high time that *climate history*, alongside the classic three core parameters *economy, culture*, and *politics*, finally takes its place as a solid fourth pillar in historical considerations.

One of the fundamental problems of weather and climate observation is the limited lifespan of the observer, Homo sapiens itself. Fortunately, we live in times when (at least in the so-called "First World") men and women can expect a lifespan that already extends well beyond the age of 80 – but for observing climatic changes, this has hitherto been simply too short. This means that in our recent past, weather observations, if they were recorded at all, depended on the existence of written records. And it is here that civilized Homo sapiens quickly reaches its historical limits.

Gods and Scholars – on the Availability of Sources

As for investigating past climatic changes, science has several options. One of the most famous examples is tree rings. The oldest trees on our planet are over 5,000 years old. Yet even this span of time, seen from a climatological perspective, is still relatively short. Ice cores, for instance, provide further insights into the climate that prevailed hundreds of thousands of years ago. The "ice archive" of Antarctica can offer insights into the last 800,000 years of climate history. Stalactite caves are also highly valued as excellent "preservators" of climatic events, as they accumulate "weather data" in the form of stalactites over long periods, shielded from the outside world. Data from coral reefs and pollen analyses even allow inferences spanning several tens of millions of years. However, a geologist will only smile at all these timeframes. The oldest rocks and minerals on our planet are over four billion years old. Thus, it is primarily sediment formations that provide us with insights into the oldest climate history of our planet.

But back to the history of humanity. At this point, allow me a particularly basic question: Since when has the term 'climate' even existed? The concept of climate is a recent one. Definitions of climate are as numerous as they are diverse. A common one defines climate as the totality of weather values averaged over a longer period (usually a reference period of at least 30 years) in a larger geographical region. And this is where historians face a significant problem: Without consistent records, long-term observations couldn't naturally be conveyed to future generations. And the lifespan of a Stone Age observer, of course, wasn't sufficient to make genuinely scientific statements.

But – and the question is allowed here – why would a Neolithic 'Ötzi' have wanted to study the weather for regularities and anomalies? It is assumed that, up until the modern age, humans mainly considered weather and natural phenomena to be the responsibility of one or more deities. It wasn't until the Enlightenment in Europe at the end of the 17th century that the scientific ball began to roll slowly. One of the most famous representatives of the Enlightenment, Galileo Galilei, is credited with the quote, 'We must measure what is measurable, and make measurable what is not.' From this point on, it wasn't the gods that were in the focus, but humans (Kleinert, 1988).

Let's just imagine for a moment that we ourselves are the Stone Age Ötzi, the man from the Similaun Glacier. And let's further imagine that we are about to cross the Alps under increasingly wintry conditions. In this attempt, we would be caught by a winter storm. Thunder, lightning, and a snowstorm – how would Ötzi have judged this weather phenomenon? Would he have cursed about another Adriatic low? Would he have blamed an unfavourable combination of air layers? Hardly. The man from the Similaun Glacier would most likely have held the gods responsible for the weather. Ötzi might have perceived the sudden winter storm as a test or even divine punishment. And with this assumption, he would probably have been in good company with his comrades of the Chalcolithic Period.

But even if one were to disregard the realm of the gods for a moment: There is another very important factor to consider when accepting climate change: Until well into modern times, due to the lack of scientific research, verified data and the fear of Gods, people were not even aware that the climate changes at all! They expected the weather (climate) to essentially follow a more or less static course, with or without divine influence. The idea of human-caused, anthropogenic change wasn't even touched upon! Even today, this is an inconvenient truth that, sadly, is still widely accepted. Despite globally accessible clear data and climate insights, science often still faces a significant task in convincing people, at the very least, of our anthropogenic wrongdoings.

It's not surprising that all major ancient civilizations paid the highest respect to their respective weather gods within their pantheons. In fact, in most cases, the weather god was considered the highest of all gods. Weather was a matter of utmost importance. The list of examples is long: It ranges from the Mesopotamian weather god Hadad, the "Lord of Thunder", to the lightning-throwing Greek god Zeus, the supreme Roman god Jupiter, and to the legendary Germanic thunder and weather god Thor, the "Thunderer". Even in monotheistic Christian belief, the Apostle Simon Peter is often colloquially seen as the "weather god" or at least the one responsible for the weather.

Which brings us to the question: When did "climate" actually become a subject of science?

What is Climate?

In fact, it was the ancient Greeks who first set standards in this context. Our modern word "climate" is derived from the ancient Greek "κλίμα (klíma)". Originally, it referred to the "inclination of the Earth from the equator to the poles". Both Hippocrates (460-377 BC) and Parmenides (515-450 BC) divided the world into "climate zones", which they determined based on the respective geographical latitude. These zones indicated whether a region was cool or hot. But it didn't stop there: The "barbarians" who lived in these regions were also ascribed specific mental traits based on their place of residence. "Climata" as "factors shaping mentality" - an early "climatic determinism" approach that we will encounter again, especially in the race theories of the 19th century influenced by European colonialism.

One of the early eastern "observers" of the subject, whom we know to have contemplated "climate change", was the high-ranking Chinese official Shen Kuo, who lived in the 11th century AD. Shen Kuo was a kind of polymath and is credited with inventing the navigational compass. Shen Kuo was considered the most prominent scientist of the Chinese Song Dynasty and left behind a 30-volume work, the "Mengxi Bitan". This compilation includes his records on meteorology. At the core of his observations of nature was the realization that the presence of fossilized bamboo in northern regions of China suggested that once the moist-hot "climate" essential for bamboo growth must have prevailed there... These petrified witnesses were therefore also evidence that the weather ("climate") could not be an eternal constant.

The British scholar Robert Hooke (1635-1702) was among the first to conduct regular weather observations on behalf of the British Royal Society. Hooke also reflected on the fossils regularly unearthed in England and ultimately concluded that the Earth must be older than the 6,000 years reported in the Bible – a view that was quite risky during the time of the major witch hunts...

In 1742, still within the climate period now referred to as the "Little Ice Age," the Swiss mathematician Pierre Martel (1706-1767) spent an extended period in the Chamonix valley for research purposes. He subsequently wrote a letter to the British politician and naturalist William Windham, who had also traveled to the area, recounting his travel experiences. In the text that has been preserved to this day, "Voyage aux glacières du Faucigny," he shared with Windham his observations regarding the glacier formations found there. Martel noticed that the extent to which the glacier tongues of the Mont Blanc Massif had advanced must have varied greatly over the centuries. This observation led him to reasonably question whether a different kind of "weather" might have prevailed over longer periods in the past.

A French scientist, the mathematician and physicist Jean Baptiste Joseph Fourier (1768-1830), demonstrated in 1824 through his calculations that the Earth should actually be much colder than it is – based on its distance from the Sun. Fourier posited the theory that this phenomenon was possible only because of the Earth's atmosphere, which acted like a bell jar, thereby warming the Earth's surface. This "greenhouse theory" corresponds to what we colloquially understand today as the greenhouse effect.

The Irish mathematician John Tyndall (1820-1893) subsequently deduced that methane, carbon dioxide, and water vapor were responsible for retaining the Earth's thermal radiation. Tyndall, in his quest to explain the phenomenon of ice ages, travelled to high-alpine glacier regions in Central Europe and proposed that ultimately, over long periods, changes in the concentrations of carbon dioxide and water vapor in the atmosphere must be accountable.

He was the first to conduct scientific measurements in this context, thereby establishing the greenhouse effect on a completely new foundation.

The Swedish physicist Svante August Arrhenius (1859-1927) eventually set early standards for proving anthropogenic factors in global warming. At a time when the combustion engine was still in its infancy and most of the local transportation worldwide was still conducted by horse-drawn carriages, the Swedish researcher and later Nobel laureate predicted in 1896 that the use of fossil fuels by humans would further accelerate the warming of the Earth's atmosphere. Svante Arrhenius forecast an increase of up to 5 degrees Celsius with a doubling of CO_2 concentration in the atmosphere (Universität Würzburg, n.d.).

The fundamental scientific realization that the industrial combustion of coal, oil, and gas would lead to a rise in the Earth's atmospheric temperature is today perhaps the most crucial factor in humanity's desperate attempt to mitigate global warming by reducing these greenhouse gases.[1]

The evidence for this was finally presented by the British engineer Guy Stewart Callendar (1898-1964). In over thirty articles published between 1938 and 1964 on the worldwide emission of carbon dioxide into the Earth's atmosphere, predictions about global warming were developed on a scientific basis for the first time. In his 1938 paper "The artificial production of carbon dioxide and its influence on temperature", meteorological measurement data from 200 weather stations dating back to the 1870s were compiled for the first time. Callendar noticed that the Earth's atmosphere had warmed by 0.005 degrees Celsius annually over the past 50 years, with a calculated emission of about 150 million tons of carbon dioxide. Guy Stewart Callendar estimated that about two-thirds of the emitted carbon dioxide must still be in the Earth's atmosphere – an amount that (back then) caused an annual

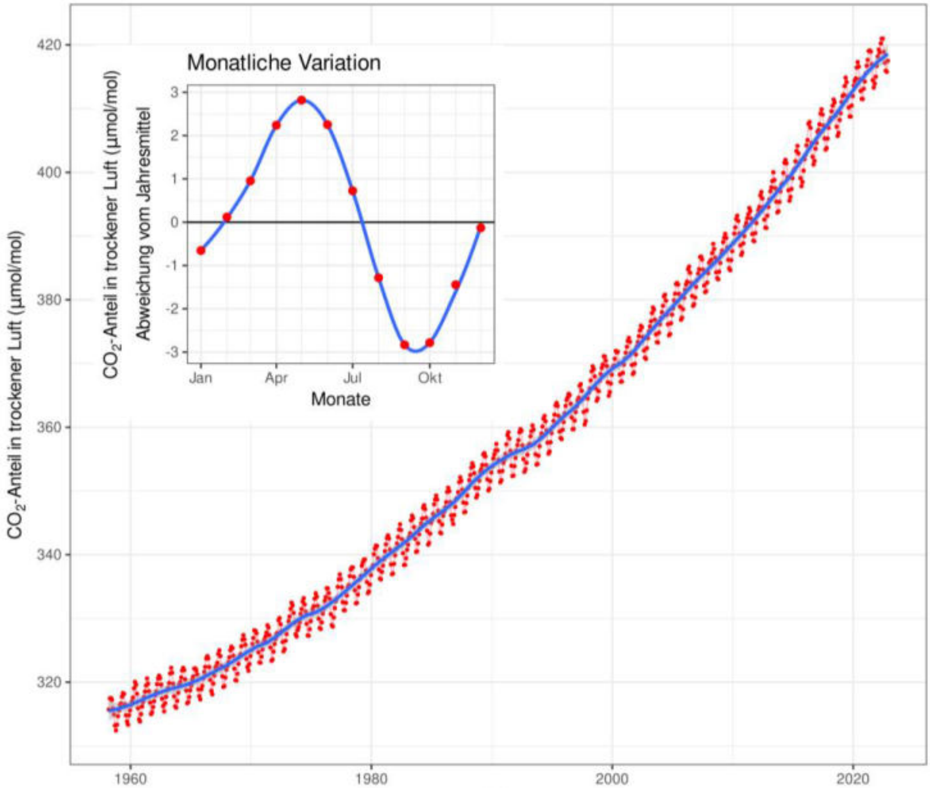
[1] However, the Swede born in Uppsala did not only see negatives in human-induced warming. He especially envisioned new agricultural possibilities for the inhospitably cold regions of the world: "Yet it may perhaps serve as consolation that, as so often, there is no harm without some good. Through the influence of increased carbon dioxide content in the air, we hope to gradually approach times with more consistent and improved climatic conditions, especially in the colder parts of the Earth; times when the Earth can bear significantly increased harvests for the benefit of the rapidly growing human population." (cf. Arrhenius, 2012)

temperature increase of 0.003 degrees Celsius. Based on these calculations, he projected a carbon dioxide concentration in the Earth's atmosphere for the year 2100, which, in fact was already reached by 2013! For in 1938, the Briton's assumed cumulative anthropogenic emission was far too low at 4.5 billion tons annually; in 2021 alone, humanity worldwide emitted 37.1 billion tons of carbon dioxide (Statista, 2022).

Guy Stewart Callendar, whose distinction of the greenhouse effect was termed the "Callendar Effect," faced global criticism at the time of his early research (as did the previously mentioned Svante Arrhenius). Nevertheless, he deserves credit for being the first to provide evidence that humanity influences the climate.

Both Arrhenius and Callendar, despite their insights, had found positive aspects to global warming, likely due to their underestimation of the quantities of greenhouse gases that would burden the atmosphere, especially from the second half of the 20th century onwards. The American oceanographer and climatologist Roger Revelle (1901-1991) was among the first vocal advocates to urgently warn against further uncontrolled emissions of greenhouse gases. Together with Hans E. Suess (1909-1993), an Austrian nuclear physicist who emigrated from Vienna to the USA in 1950, Revelle published in 1957 the pivotal article "Carbon Dioxide Exchange Between Atmosphere and Ocean and the Question of an Increase of Atmospheric CO_2 during the Past Decades" (Revelle et al., 1957, p.18-27). The two scientists highlighted the influence of human CO_2 emissions in the atmosphere and the associated effect, namely that the oceans, as the largest CO_2 reservoirs, simply couldn't absorb these quantities anymore (known as the "Suess Effect"). As a result, the atmosphere is being slowly but steadily warmed by industrialization: "Thus, human beings are now carrying out a large-scale geophysical experiment of a kind that could not have happened in the past nor be reproduced in the future." (Revelle et al., 1957, p.18-27)

Another U.S. climate researcher, Charles David Keeling (1928-2005), demonstrated through systematic measurements spanning several decades that the CO_2 content of the Earth's atmosphere was indeed steadily rising. The so-called "Keeling Curve" scientifically documented, based on measurement data, what earlier climate researchers (as mentioned above) had hypothesized based on their own observations over the years. However, due to the lack of advanced measurement technology, they hadn't been able to conclusively prove that industrialization by humans played a pivotal role in the constant warming of the Earth's atmosphere. Measurements began in Hawaii in 1958, and within a few years, it became evident that there was a consistent rise in the CO_2 content in the atmosphere, which seemed to have global consequences. By the 1990s, for example, it was demonstrable that, due to global warming on the Northern Hemisphere, spring began about a week earlier than before the measurements started in the 1950s. The burning of fossil fuels by humans was clearly to blame. The term "global warming" was coined.



Monthly average CO_2 concentration 1958-2022. (Wikimedia Commons, 2019a)

Climate Change as a Driver of Human Development and Violence

Weather-related extremes, which are increasing in number due to climate change, will have long-term security policy implications. This has been the case in the past as well. As alluded to at the outset, even history itself is facing new challenges. These challenges manifest themselves in the future (and retrospective) consideration of a new parameter that needs to be integrated into the existing catalogue of historical elements – politics, society, and economy. The climate, or more specifically climate change, is responsible for the rise and fall of great empires, realms, and even entire advanced civilizations. On the other hand, it cannot be denied that climatic changes can also produce regional winners, who were (and are) able to derive immense benefits from the new climatic conditions. In the following pages, through various examples, the historical power of climate change will be demonstrated.

Climate Change as the Ignition of Human Development? *The Holocene Climatic Optimum*

With the onset of agriculture and animal husbandry about 12,000 years ago, humanity began that phase of societal development upon which we ultimately stand today. This transition, understood today as the "Neolithic Revolution," started replacing the hunter-gatherer cultures that had existed since the Paleolithic era, eventually leading to the permanent settlement of most people.[2]

The epoch of the New Stone Age had begun.

Even though this shift wasn't abrupt, and hunter-gatherer cultures coexisted alongside the region-bound sedentary farmers and herders for a long time, it's still fair to say that the Neolithic Revolution (or Evolution) represents perhaps the most crucial turning point in human history.

The inevitable question in this context is: Why just then? It's also worth noting that this evolutionary shift did not originate in one region and then embark on a global conquest. Instead, agriculture and animal husbandry emerged simultaneously in various regions worldwide. Based on current knowledge, the oldest sites are located in the "Fertile Crescent," China, and

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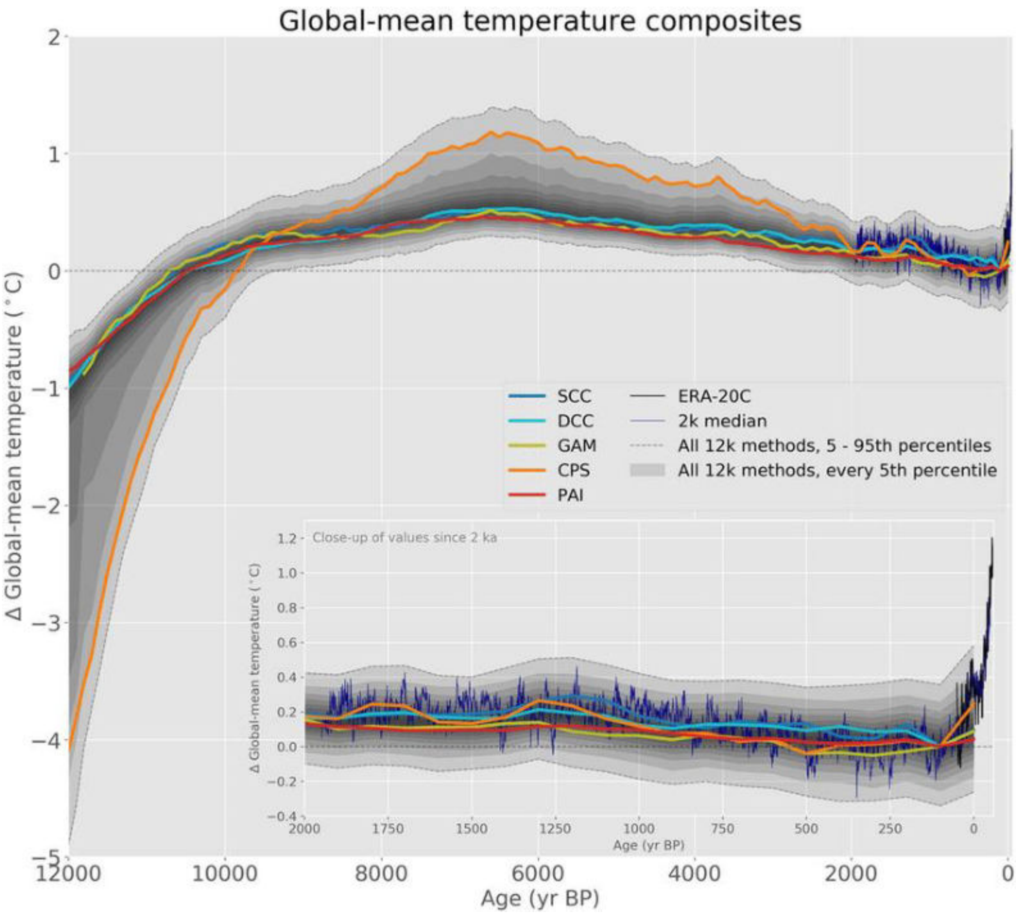
[2] To this day, the question remains unsettled whether sedentism was a consequence or a prerequisite for the development of agriculture. See, in this regard, as a representative example, Benz (2008).

New Guinea (9500-7000 BC), while sites in Mexico, South America, and Africa are dated about 3-4,000 years later.

A glance at the timeline introduces – in addition to numerous already existing theories – a new one that seems interesting in this context: Precisely when agriculture and animal husbandry began to develop, the Holocene era witnessed a so-called "Climatic Optimum," characterized by significantly warmer temperatures that greatly favoured the development of agriculture. It is plausible to assume that the changing climatic conditions acted at least as a strong catalyst for the transition from hunter-gatherer societies to a sedentary agricultural way of life.



Global temperature fluctuations during the Holocene. Notably, the "climate optimum" around 8000 BC. (Kaufman et. al., 2020)

22nd Century B.C.: The Fall of the Old Kingdom of Egypt

We start at the cradle of Mediterranean cultures with the forefather – a culture whose influence over centuries had a vast impact on the development of the entire Mediterranean region of antiquity – and thereby on the development of Europe. We start with Egypt.

What is it that ultimately binds a state or a political structure? In the context of antiquity, this question can essentially be answered in the same way as if we had posed it in our modern world today. The answer is: stability. Stability for the citizens of a modern political structure just as for the subjects of an ancient great empire. When stability can no longer be ensured, rule begins to be challenged.

In a modern democracy, this might merely be a matter of the next election, but for the Pharaohs of ancient Egypt, it was a question of legitimacy. In the Old Kingdom (2686-2160 BC), Pharaohs were worshipped as gods, and later, starting from the so-called First Intermediate Period (2160-2055 BC), they were seen as intermediaries between the divine realm and earthly events.

When one asks about the most dominant factor of stability in ancient Egypt, historians primarily think of one term: the annual Nile flood. This recurring climatic event was the guarantor of the Nile Valley's fertility and thus the number one factor of stability on the Pharaohs' list.

The ancient Egyptians referred to these vital Nile floods as Hapi, one of the four sons of the god Horus. With him, the Nile floods were honoured as a divine phenomenon, as it was believed that the gods themselves had blessed Egypt with this appearance. In hieroglyphic inscriptions, Hapi is depicted as an androgynous figure holding papyrus leaves, accompanied by frogs or crocodiles – all symbols of the Nile. The divine Hapi embodied fertility itself and was the "Lord of Neper", the goddess of grain...

Today, we know that these floods were not sent by the gods but were a result of the monsoon rains that fall with great intensity in the Ethiopian highlands each year. Most of these rains are collected by the Blue Nile and the Black Nile. In the summer months, a flood wave, sometimes more intense, sometimes less so, regularly surged from the mountains all the way to the Nile delta. The regular floods primarily brought fertile silt, turning ancient Egypt into the grain storehouse of its time.

Stability from a secured food supply and subsequent economic prosperity were the magic words during the great days of the Old Kingdom (2700 to around 2200 BC). When one speaks of the golden period in Egypt today, most people in the region automatically think of the Old Kingdom.

And then, about 4,200 years ago, this period of wealth and prosperity came to a sudden halt. Historians have long pondered what could have been the reason for the abrupt decline of the Old Kingdom.

The 4.2 Kilo Event Analyses of pollen, cave minerals, carbon compounds, and others have shown that between approximately 2250-1900 BC, at least in the Mediterranean region, Mesopotamia, and further to the Indus, a climatic event (or events) took place that is (are) attributed to a temporary (though regionally variable) cooling of the Earth's atmosphere. This is referred to as the so-called "4.2 Kilo Event". (Bini et al., 2017) It is possible that this atmospheric cooling was triggered by enormous local volcanic eruptions.

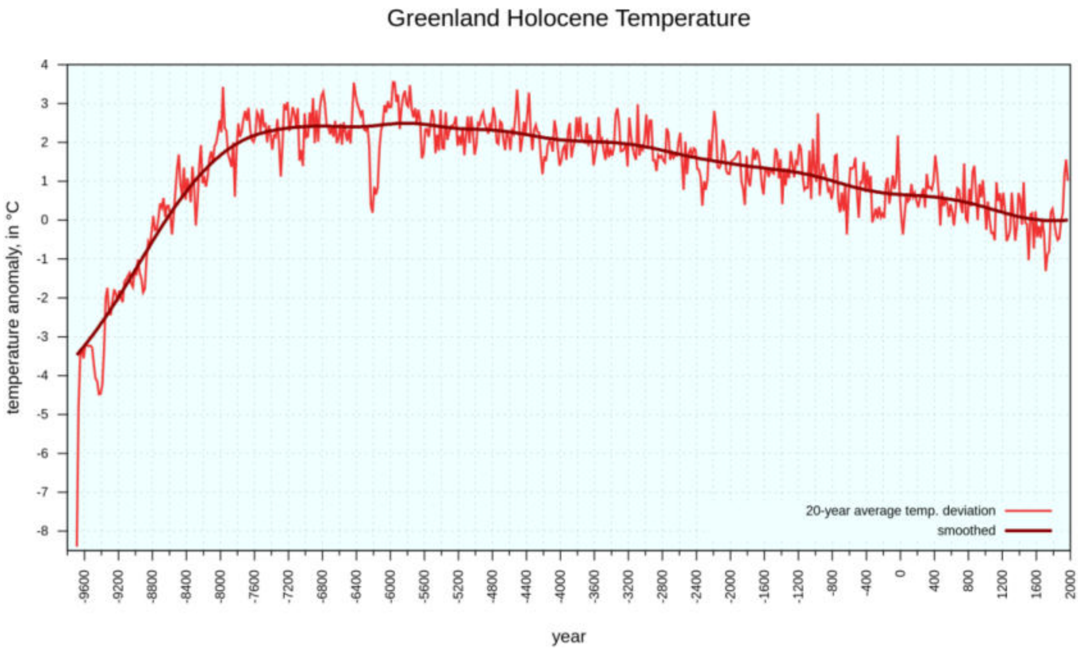
For the Old Kingdom of Egypt, this climatic anomaly manifested as a series of unusually low Nile floods, the Achilles' heel of the previously mentioned stability. The cause of these droughts seems to have been a sudden and significant reduction in the monsoon rains in Ethiopia. Coupled with attacks from hostile Near Eastern tribes from the north and significant supply difficulties, the political structure of Old Egypt was profoundly shaken in the 22nd century BC. The kingdom temporarily lost its central leadership and suffered from a partial societal collapse. Many great achievements of earlier Egyptian pharaoh dynasties were lost or abruptly halted, including the construction of the pyramids (Wanner, 2016).

Egypt took more than 40 years to slowly re-stabilize as a centrally governed state in certain regions. However, it did not return to its former glory for a long time, as political turmoil continued to have lasting effects.

Mesopotamia and the 4.2 Kilo Event

Similar catastrophic effects of a sudden onset drought period, which would last about 290 years, were observed in Mesopotamia. The region itself is today known as the first great civilization of humanity, the Sumerian. It was the region between the rivers, where cities like Ur, Uruk, and Nineveh emerged as the first city-states in the 4th millennium BC. This region produced the first complex script, the cuneiform. The legendary Sargon of Akkad is credited with uniting or subduing many of the city-states that existed during the Sumerian era, creating the first unified empire in this part of the "Fertile Crescent," although it lasted only about 150 years.

The Akkadian Empire, alongside the Old Kingdom of Egypt as the second centralized administrative territorial state, collapsed around the same time as the Old Kingdom of Egypt. It's suspected that the sudden decline of the thriving Akkad might also be linked to climate change. Preliminary evidence seems to have been found by researchers at the University of Oxford. In a stalactite cave in Northern Persia (Damavand region), interesting dating of dust particles in stalactites was conducted. They confirm that two major drought periods must have occurred in pre-Christian times in the concerned region (an 8.2 kilo-year event and a 4.2 kilo-year event). One of them coincides with the time of the fall of Akkad (and Old Egypt) (Carolin et al., 2018).

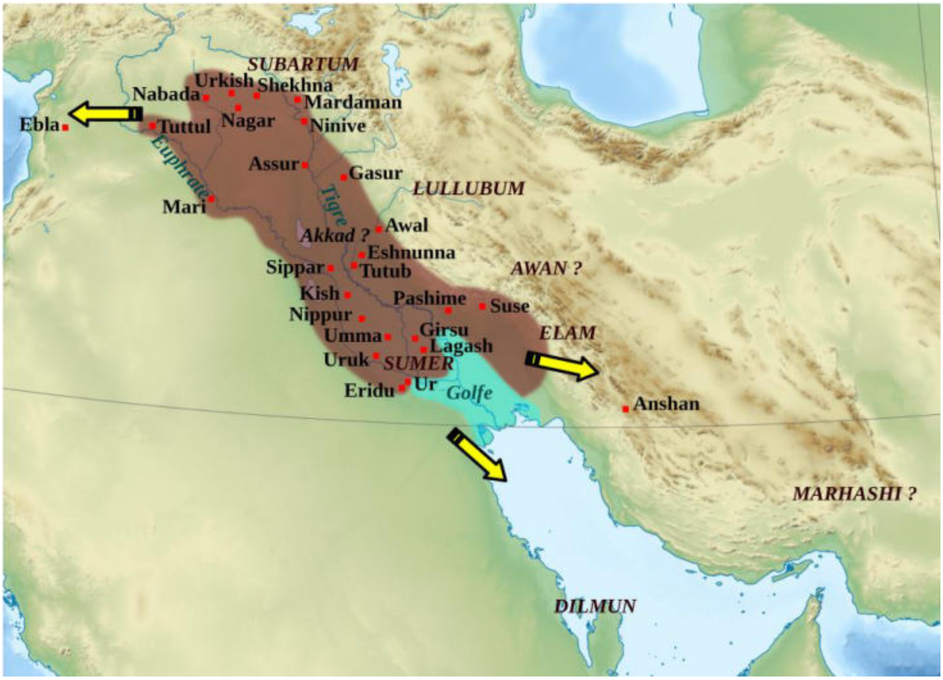


The "8.2-thousand-year event" and the "4.2-thousand-year event" analysed within the context of Greenland ice cores. What stands out is the pronounced nature of the 8.2-thousand-year event. This reinforces the suspicion that the 4.2-thousand-year event may not have had a pronounced global character. (Wikimedia Commons, 2019b)

This makes the previously assumed climate change as the cause of the collapse at least very likely. Additional evidence is provided by an inscription written in Sumerian cuneiform from that same period, which tells of a "Curse of Akkad": "*...large areas of farmland produced no grain, the flooded fields no fish, and the irrigated orchards neither syrup nor wine. The thick clouds brought no rain...*" (Podbrega, 2019).

Subsequently, Akkad could no longer fend off the Gutian tribes, which repeatedly invaded from the Persian region. Akkad itself was burned down by the Gutians in 2115 BC. Unlike the Old Kingdom of Egypt, there was massive migration from the cities in Mesopotamia during the period in question.[3]

As a result, the entire state structure collapsed in a very short time.



The extent of the Akkadian Empire, which dominated a significant portion of Mesopotamia, and which saw such a sudden end in the 22nd century BC. (Wikimedia Commons, 2010)

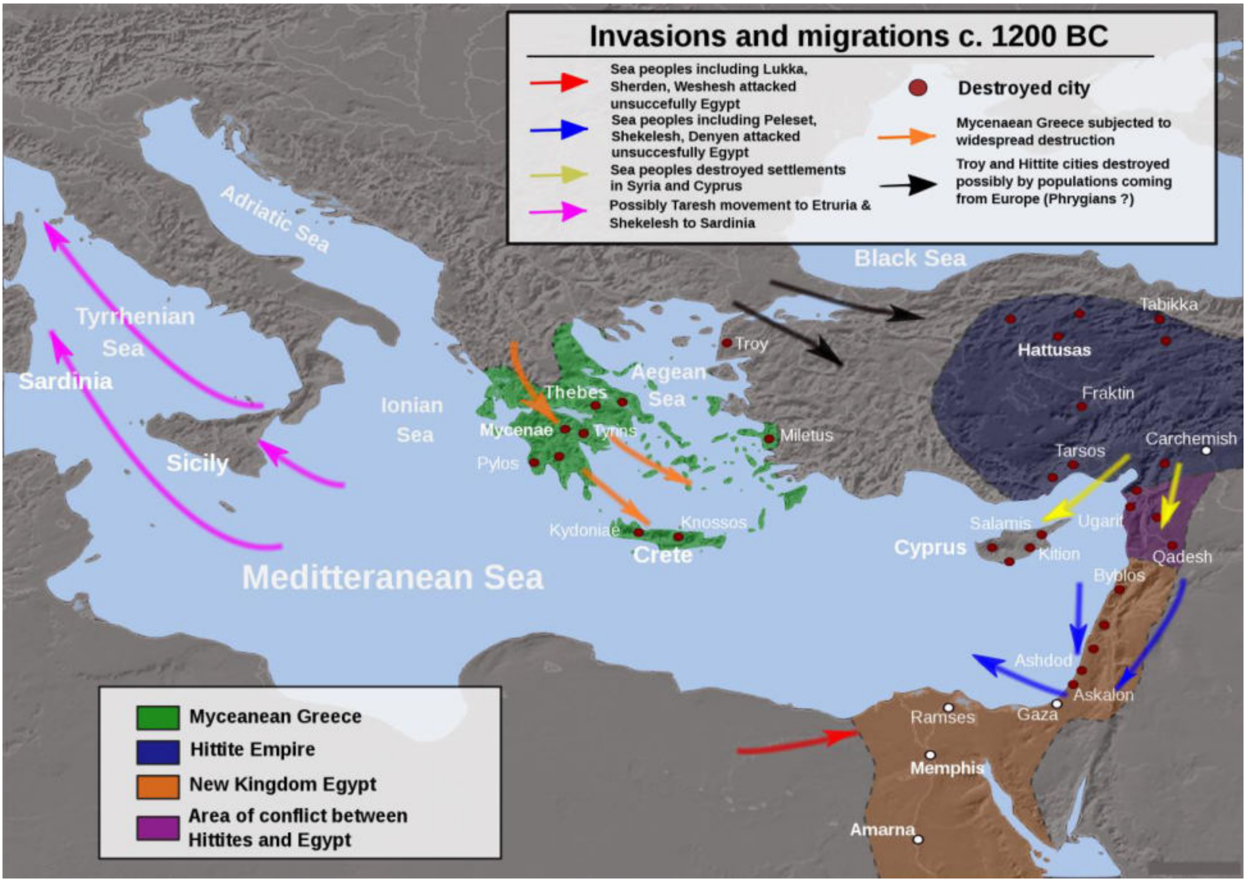
[3] The location of the legendary Akkad, the center of the empire, for example, remains unknown to this day. (Author's note.)

The End of the Bronze Age – An Event Full of Mysteries

Let's stay in the Bronze Age for another chapter. We are now in the 12th century BC, and thus in the Late Bronze Age. It wouldn't be incorrect to describe the great cultures that dominated the eastern Mediterranean at the time as economically "interconnected." These primarily included the New Kingdom of Egypt, which, after plunging into darkness and political instability about 1,000 years earlier, had structurally recovered and continued to be the main player on the southern edge of the eastern Mediterranean. We are now in the timeframe of the 20th Dynasty, the era of the great Ramesses III (1221-1156 BC), which will be discussed in the following.

Trade flourished in the Near and Middle East. For the involved powers, it was a kind of golden age. However, by the end of the 12th century BC, the entire region was shaken by events that left nothing but smoldering ruins from the power centers of Minoan, Babylonian, Mycenaean, Trojan, and Hittite civilizations. Only Egypt managed to narrowly avoid its own destruction.

Until recently, the sudden appearance of the so-called "Sea Peoples" was blamed for this multiple collapse, which today marks the end of the Bronze Age period. Emerging seemingly out of nowhere, they were said to possess superior maritime and weapons technology and ravaged the region in a short period of time, destroying the most flourishing trade network of antiquity and ending the "Golden Age of Antiquity."



The end of the Bronze Age. Can the simultaneous collapse of most of the advanced civilizations in the region be solely attributed to the mysterious "Sea Peoples" who suddenly emerged from historical obscurity? (Wikimedia Commons, 2013)

Was the simultaneous collapse of most of the region's advanced civilizations truly solely due to the mysterious "Sea Peoples" who suddenly appeared from the historical void? In 2014, US archaeologist and historian Eric H. Clyne, with his sensational work "1177 BC. – The Year Civilization Collapsed" (2014) published a study attempting to analyse the backgrounds of this abrupt downfall from various angles. After participating in over 30 excavation campaigns in the relevant region, Clyne concluded that it would have taken much more than fierce pirates to bring such a system crashing down. His theories primarily include the idea that rapidly changing climatic conditions were the main culprits, leading to instability, famines, and consequently, migrations from the traditional power centres. Pollen analyses from numerous drill cores from the Dead Sea and Cyprus, now supporting this theory, indeed point to sudden regional severe droughts, which must have resulted in catastrophic harvest failures. As already described in the context of the collapse of the Old Egyptian Kingdom, externally advancing hostile tribes (Sea Peoples?) would have had an easier time, as they wouldn't have encountered intact economic and military structures (except for Egypt). It remains debated whether these Sea Peoples themselves were forced into migration by climatic events. The suspected climatic triggers for the drought(s) remain a topic of scholarly discussion. Theories range from volcanic eruptions (Hekla?[4]), altered solar activities, to earthquakes and tsunamis.

Regardless of how the final scientific evaluation of the catastrophe of the 12th century BC ultimately turns out, the end of the Bronze Age serves as a prime example that single-cause explanations for complex events require close scrutiny. Sudden, even if short-lived, climate shifts in a world of fragile, exclusively weather-dependent food supply processes often form the basis for the rapid destabilization of political systems.

Climate Change, Rise and Fall of Rome

Today, the term 'climate change' is exclusively seen as a threatening concept, and it is consistently portrayed negatively in the media – and rightly so. However, if in the third century BC there had been any understanding of climate or even climate change, the term would have been viewed more favourably in Rome for the upcoming centuries. The Roman Empire's meteoric rise during its crucial expansion phase, from around the time of the Punic Wars until the fourth century AD, was not only due to its astute politics and superior army. The so-called "Roman Climatic Optimum," a period of unusually warm weather conditions in the Mediterranean and the North Atlantic during that time, is now seen as another significant factor in Rome's prominence during that era. The American ancient historian Kyle Harper, in his groundbreaking work "Fatum," even went as far as to divide the entire Roman history into climatic periods:

4 Compare Mühlenbruch (2021), which relativizes Clyne's thesis.

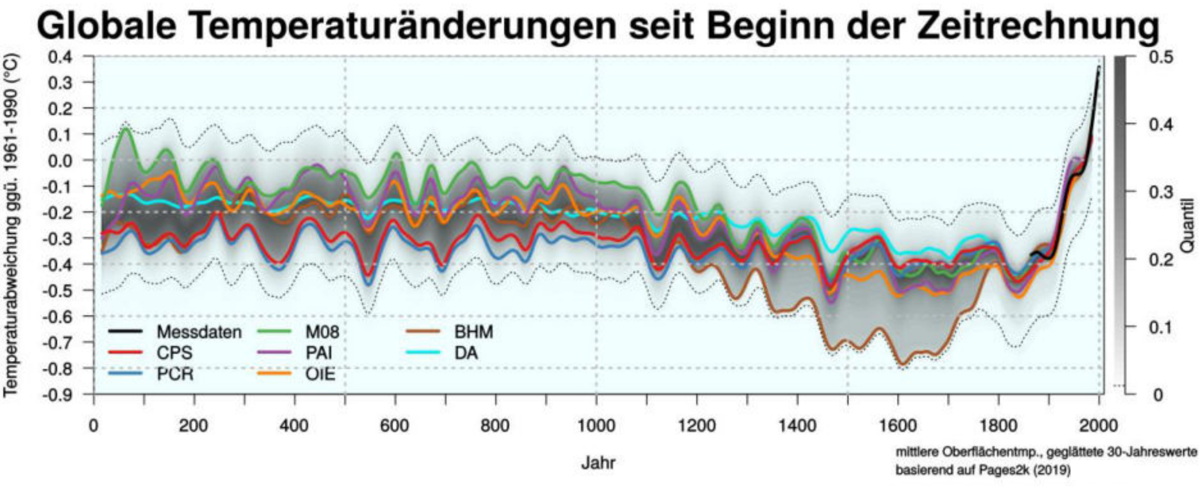
200 BC - 150 AD: Roman Climatic Optimum

150 AD - 450 AD: Roman Transitional Period

450 AD - 700 AD: Late Antique Little Ice Age (Harper, 2020)

The Roman Climatic Optimum allowed the rising power on the Tiber to undertake its expansions against a backdrop of continually improving agricultural yields, thus ensuring a stable food supply in the Roman Empire. The conquered Egypt quickly became the granary of the empire. Yet it wasn't only the inherently fertile Nile Valley that produced unusually high yields during this period, allowing Roman emperors to provide (sometimes even free of charge for Roman citizens) grain supply to the Eternal City. For instance, the Roman historian Tacitus (58-117 AD) reports on wine harvests in southern England (then the province of Britannia). This agricultural boom in the Mediterranean was further enhanced by the excellent Roman road network, ensuring supplies even in the empire's most remote regions.

But even the golden age of Rome had to come to an end. Is it mere coincidence that the fall of the Western Roman Empire coincided with the climatic downturn of the Migration Period?



Global temperature changes since the beginning of the Common Era. The climate low point at the beginning of the Migration Period and the "Little Ice Age" with its peaks in the 16th and 17th centuries are clearly visible. (Wikimedia Commons, 2019c)

Outlook

The framework of Historical Climatology outlined here on these few pages is merely a 'teaser' intended to spark more interest in the subject. The few ancient examples provided could, of course, be complemented by many other (equally interesting) ones, but space constraints prevented this. Popular examples like the "Medieval Warm Period" or the "Little Ice Age" were only briefly mentioned in passing. The intention was rather to call for a new, transdisciplinary approach in historical research, which must be considered if historical events, viewed through the "climate lens," might need to be re-assessed. In doing so, it's also essential to overcome resistance within the profession itself. Indeed, it seems that the clear signs of human-induced climate change were needed as a catalyst for the historical sciences to engage more deeply with this topic.

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