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Medieval warm period cause and effect

The Medieval Warm Period (MWP) is a name given to a period of unusually warm weather that occurred in the North Atlantic region, lasting from about 950 to about 1250. [1] It was probably[3] related to warming elsewhere[4][5][6] while some other regions were colder, such as the tropical Pacific. Average global average temperatures are calculated to correspond to warming in the early 1900s. Possible causes of the medieval heat period include increased solar activity, decreased volcanic activity, and changes in ocean circulation. [7] The period was followed by a cooler period in the North Atlantic and elsewhere ne 05. Some refer to the event as the medieval climatic anomaly as this term emphasizes that climatic effects other than temperature were important. [8] [9] It is believed that between about 950 and about 1100 was the warmest period in the Northern Hemisphere since the Roman Heat period. It wasn't until the 20th [recion needed] Climate proxy records show peak heat occurred at different times for different regions, indicating that the medieval heat period was not a globally consistent event. [10] Preliminary research The medieval heat period (MWP) is generally thought to have occurred from about 950-c. 1250, in the European Middle Ages. [2] In 1965, Hubert Lamb, one of the first paleoclimatologists, published research based on data from botany, historical documentary research and meteorology, combined with records indicating prevailing temperature and precipitation in England around about 1200 and around 1600. He suggested Evidence has piled up in many areas of the study pointing to a particularly hot climate in many parts of the world that lasted a few centuries around about 1000-c. 1200 e.K., and was followed by a drop in temperature levels until between about 1500 and about 1700 the coldest phase since the last ice age took place. [11] The warm period became known as the Medieval Hot Period, and the cold period was called the Little Ice Age (LIA). However, this view was seled out by other researchers. The IPCC's first assessment report from 1990 discussed the Medieval Sandy Period around the year 1000 e.Kr. (which may not have been global) and the little ice age, which only ended in the mid to late nineteenth century. It said temperatures in the late tenth to early thirteenth century (about 950-1250) appear to have been unusually warm in Western Europe, Iceland and Greenland. [12] The 2001 IPCC Third Assessment Report summarized recent research: Evidence does not support global synchronous periods of abnormal cold or heat in this time frame, and the conventional terms of 'Little Ice Age' /'Medieval Warm Period' seems to have limited utility in t trends in hemispherical or global average temperature changes in recent centuries. [13] Global temperature records taken from ice cores, tree rings and sea deposits have shown that the Earth may have been slightly cooler globally (by 0.03°C) than at the beginning and mid-20th century. [14] [15] Paleoclimatologists, which develop region-specific climatic reconstructions from earlier centuries, traditionally label their coldest range as lia and their warmest range as MWP. [14] [16] Others follow the Convention, and when a significant climate event exists in lia or MWP time frames, they link their events to the period. Some MWP events are thus wet events or cold events rather than strictly warm events, especially in central Antarctica, where climate patterns opposite the North Atlantic region have been noted. Globally A 2009 study by Michael E. Mann et al., examining spatial patterns of surface temperatures shown in multi-proxy reconstructions finds that the medieval heat period shows heat that matches or exceeds the past decade in some regions, but which fall well below recent levels globally. [2] Their reconstruction of the pattern is characterized by heat over much of the North Atlantic, South Greenland, the Eurasian Arctic and parts of North America, which appear to exceed the end of the baseline of the 20th century and are comparable or exceed the past decade or two in some regions. Certain regions, such as central Eurasia, northwestern North America, and (with less confidence) parts of the South Atlantic, exhibit abnormal coolness. In 2013, a study by the Pages-2k consortium suggested warming was not globally synchronous: Our regional temperature reconstructions also show little evidence of globally synchronized multi-decadal shifts that would mark well-defined worldwide MWP and LIA ranges. Instead, the specific timing of peak and cold intervals varies regionally, and the multidecadal variation results in regionally specific temperature departures from an underlying global cooling trend. [17] In direct contrast to these results, a 2013 study recreated a temperature record for the western equatorial Pacific beneath the surface and intermediate bodies of water over the last 10,000 years, showing that heat levels varied as both the northern and southern high-latitudes of the oceans. The findings support the view that the Holocene Thermal Maximum, the medieval heat period, and the small ice age were global events, and they provide a long-term perspective for evaluating the role of marine heat content in various warming scenarios for the future. [18] In 2019, the Pages-2k consortium confirmed, using an expanded proxy data set [19] that the medieval climate anomaly was not a globally synchronous event. The hottest 51-year period of the 'Medieval Period' did not take place at the same time Regions. They argue for a regional rather than global design of variability in the pre-industrial common era to support understanding. [20] North Atlantic Greenland ice sheet temperatures interpreted with 18O isotope from 6 ice cores (Vinther, B., et al., 2009). The dataset varies from 9690 f.Kr to AD1970 and has a resolution of about 20 years, meaning that each data point represents the average temperature in the surrounding 20 years. The last written records of the North Greenlanders are from an Icelandic marriage in 1408, but later recorded in Iceland in Hvalseyr Church, now the best preserved of the Nordic ruins. See also: Tropical cyclones and climate change Lloyd D. Keigwin's 1996 study of radiocarbon-dated box core data from marine sediments in the Sargasso Sea found that its sea surface temperature was about 1°C cooler about 400 years ago (the small ice age) and 1700 years ago and about 1°C warmer 1,000 years ago (medieval heat period). [21] Using sediment samples from Puerto Rico, the Gulf Coast and the Atlantic coast from Florida to New England, Mann et al. (2009) found consistent evidence of a peak in North Atlantic tropical cyclone activity during the medieval heat period, which was followed by a subsequent pause in activity. [22] By retrieving and isotope analysis of sea cores and from the study of mollusc growth patterns from Iceland, Patterson et al was able to reconstruct a mollusc growth record with a decade solution from the Roman hot period to the medieval heat period and the little ice age. [23] North America 1690 copy of 1570 Skálholt map, based on documentaries about previous Nordic sites in the Americas. In 2009, the Mann et al. study found heat above 1961-1990 levels in South Greenland and parts of North America during the medieval climate (defined in the study from 950 to 1250) with heat in some regions exceeding temperatures in the period 1990-2010. Much of the northern hemisphere showed significant cooling during the small ice age (defined in the study from 1400 to 1700), but Labrador and isolated parts of the United States appeared to be about as warm as during the period 1961-1990. [2] The north colonization of the Americas has been associated with warmer periods. The general theory is that the Norse people used ice-free seas to colonize areas in Greenland and other outer areas far north. [24] However, a study from Columbia University shows that Greenland was not colonized in warmer weather, but in fact the warming effect was very short-sighted. [25] circa 1000AD, the climate was sufficiently warm for the Vikings to travel to Newfoundland and establish a short-term outpost there. [26] From about 985, the Vikings founded the Eastern Settlement and Western Settlement, both near the southern tip of Greenland. In the early stages of the colony, they kept cattle, sheep and goats, with about a quarter of their diet from seafood. After the climate got colder and storms around 1250, their diet steadily shifted towards about 1300, seal hunting that was delivered over three-quarters of their food. In 1350 there was a reduced demand for their exports and trade with Europe fell. The last document from the settlements dates from 1412, and in the following decades the remaining Europeans are back in what appears to have been a gradual withdrawal, mainly caused by economic factors such as increased availability of farms in the Scandinavian countries. [27] L'Anse aux Meadows, Newfoundland, today, with a reconstruction of a Viking settlement. In the Chesapeake Bay (now Maryland and Virginia in the US), researchers found large temperature excursions (changes from average temperature at the time) during the medieval heat period (approx. 950-1250) and the Small Ice Age (circa 1400-1700, with cold periods continuing into the early 20th [28] Sediments in Piermont Marsh in the Lower Hudson Valley show a dry medieval southern period from 800 to 1300. [29] Prolonged drought affected many parts of the western United States and especially eastern California and the western part of the Great Basin. [14] [30] Alaska experienced three time intervals of comparable heat: 1-300, 850-1200 and post-1800. [31] Knowledge of the Warm Period of the North American Middle Ages has been useful during dating occupancy periods for certain Native American settlements, especially in arid parts of the western United States. [32] [33] MWP drought may also have affected Native American settlements in the eastern United States, such as in Cahokia. [34] [35] The review of recent archaeological research shows that as the search for signs of unusual cultural change has broadened, some of the early patterns (e.g. violence and health problems) have been considered to be more complicated and regionally varied than previously thought. Others, such as settlement disruptions, deterioration in distance trade and population movements, have been further confirmed. [36] Africa The climate in equatorial Eastern Africa has alternated, being between drier than today and relatively wet. The drier climate took place during the medieval heat period (1000-1270). [37] Antarctica A sediment core from the Eastern Bransfield Basin, the Antarctic Peninsula, preserves climatic events from the small ice age and the medieval warm period. The authors noted: The late Holocene records clearly identify Neoglacial events during the Small Ice Age (LIA) and medieval Warm Period (MWP). [38] Some Antarctic regions were atypically cold, while others were atypical heat between 1000 and 1200. [39] Pacific Ocean Corals in the tropical Pacific suggest that relatively cool, dry conditions may have been early in the millennium, consistent with a La Niña-like configuration of El Niño-Southern Oslationlci patterns. [40] South America The medieval warm period has been noted in Chile in a 1500-year-old seabed sequeudment[41] as well as in Eastern Cordillera of Ecuador. [42] A reconstruction based on ice cores found the medieval heat period could be distinguished in tropical South America from around 1050 to 1300, which in the 1400s was followed by the small ice age. Peak temperatures did not rise as high as those from the end of the 20th century, which was unprecedented in the area during the study period of 1600 years. [43] Asia Adhikari and Kumon (2001), which examined sediments in Lake Nakatsuna in central Japan, found a warm period from 900 to 1200, corresponding to the medieval hot period and three cool phases, two of which could be related to the small ice age. [44] Another research in northeastern Japan shows that there is a hot and humid range, from 750 to 1200, and two cold and dry intervals, from 1 to 750 and from 1200 to now. [45] Ge et al. studied temperatures in China over the last 2000 years and found great uncertainty before the 1500s, but good consistency over the last 500 years highlighted by the two cold periods, the 1620s-1710s and 1800s, and the warming of the 20th century. They also found that warming during the 10-14 century in some regions may be comparable in magnitude to the warming of the last few decades of the 20th [46] Oceania There is an extreme lack of data from Australia for both periods of the medieval heat period and the small ice age. But evidence from wave-built shingle terraces to a permanent full Lake Eyre[47] during the 9th century was found in the 19th century. A 1979 study from the University of Waikato found.Temperatures derived from an 18O/16O profile through a stalagmite found in a New Zealand cave (40.67°S, 172.43°E) suggested that the medieval heat period occurred between 1050 and about 1400 and to have been 0.75°C warmer than the current heat period. [48] More evidence in New Zealand is from a 1100-year-old tree-ring record. [49] See also Global warming portal Classic Maya collapse – simultaneously with the medieval heat period and marked by decades-long drought Chalk thermal maximum - A period of climate warming that reached its peak around 90 million years ago Description of the medieval heat period and Little Ice Age in the IPCC reports Historical climatology Holocene climate ethical optimal - A warm period over about the range of 9,000 to 5,000 years BP Hockey stick graph - Graf shows a big increase in recent centuries of temperatures similar to a hockey stick to demonstrate man-made climate change Late Antique Little Ice Age Paleoclimatology - Study of changes in ancient climate references ^ Hawkins, Ed (30. January, 2020). 2019 year. climate-lab-book.ac.uk. Archived from the original on February 2, 2020. (The data show that the modern is very different from what happened in the past. 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Time of warm climate in the North Atlantic region lasts from about 950 to about 1250 Global average temperatures show that the medieval heat period was not a phenomenon for the whole world. [1] The medieval heat period (MWP) also known as the Medieval Climate Optimum, or Medieval Climate Anomaly was a time of hot climate in the North Atlantic region, lasting from about 950 to about 1250. [2] It was probably[3] related to warming elsewhere[4][5][6] while some other regions were colder, such as the tropical Pacific. Average global average temperatures are calculated to correspond to warming in the early 1900s. Possible causes of the medieval heat period include increased solar activity, decreased volcanic activity, and changes in ocean circulation. [7] The period was followed by a cooler period in the North Atlantic and elsewhere ne 05. Some refer to the event as the medieval climatic anomaly as this term emphasizes that climatic effects other than temperature were important. 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Some MWP events are thus wet events or cold events rather than strictly warm events, especially in central Antarctica, where climate patterns opposite the North Atlantic region have been noted. Globally A 2009 study by Michael E. Mann et al., examining spatial patterns of surface temperatures shown in multi-proxy reconstructions finds that the medieval heat period shows heat that matches or exceeds the past decade in some regions, but which fall well below recent levels globally. [2] Their reconstruction of the pattern is characterized by heat over much of the North Atlantic, South Greenland, the Eurasian Arctic and parts of North America, which appear to exceed the end of the baseline of the 20th century and are comparable or exceed the past decade or two in some regions. Certain regions, such as central Eurasia, northwestern North America, and (with less confidence) parts of the South Atlantic, exhibit abnormal coolness. In 2013, a study by the Pages-2k consortium suggested warming was not globally synchronous: Our regional temperature reconstructions also show little evidence of globally synchronized multi-decadal shifts that would mark well-defined worldwide MWP and LIA ranges. Instead, the specific timing of peak and cold intervals varies regionally, and the multidecadal variation results in regionally specific temperature departures from an underlying global cooling trend. [17] In direct contrast to these results, a 2013 study recreated a temperature record for the western equatorial Pacific beneath the surface and intermediate bodies of water over the last 10,000 years, showing that heat levels varied as both the northern and southern high-latitudes of the oceans. The findings support the view that the Holocene Thermal Maximum, the medieval heat period, and the small ice age were global events, and they provide a long-term perspective for evaluating the role of marine heat content in various warming scenarios for the future. [18] In 2019, the Pages-2k consortium confirmed, using an expanded proxy data set [19] that the medieval climate anomaly was not a globally synchronous event. The hottest 51-year period of the 'Medieval Period' did not take place at the same time Regions. They argue for a regional rather than global design of variability in the pre-industrial common era to support understanding. [20] North Atlantic Greenland ice sheet temperatures interpreted with 18O isotope from 6 ice cores (Vinther, B., et al., 2009). The dataset varies from 9690 f.Kr to AD1970 and has a resolution of about 20 years, meaning that each data point represents the average temperature in the surrounding 20 years. The last written records of the North Greenlanders are from an Icelandic marriage in 1408, but later recorded in Iceland in Hvalseyr Church, now the best preserved of the Nordic ruins. See also: Tropical cyclones and climate change Lloyd D. Keigwin's 1996 study of radiocarbon-dated box core data from marine sediments in the Sargasso Sea found that its sea surface temperature was about 1°C cooler about 400 years ago (the small ice age) and 1700 years ago and about 1°C warmer 1,000 years ago (medieval heat period). [21] Using sediment samples from Puerto Rico, the Gulf Coast and the Atlantic coast from Florida to New England, Mann et al. (2009) found consistent evidence of a peak in North Atlantic tropical cyclone activity during the medieval heat period, which was followed by a subsequent pause in activity. [22] By retrieving and isotope analysis of sea cores and from the study of mollusc growth patterns from Iceland, Patterson et al was able to reconstruct a mollusc growth record with a decade solution from the Roman hot period to the medieval heat period and the little ice age. [23] North America 1690 copy of 1570 Skálholt map, based on documentaries about previous Nordic sites in the Americas. In 2009, the Mann et al. study found heat above 1961-1990 levels in South Greenland and parts of North America during the medieval climate (defined in the study from 950 to 1250) with heat in some regions exceeding temperatures in the period 1990-2010. Much of the northern hemisphere showed significant cooling during the small ice age (defined in the study from 1400 to 1700), but Labrador and isolated parts of the United States appeared to be about as warm as during the period 1961-1990. [2] The north colonization of the Americas has been associated with warmer periods. The general theory is that the Norse people used ice-free seas to colonize areas in Greenland and other outer areas far north. [24] However, a study from Columbia University shows that Greenland was not colonized in warmer weather, but in fact the warming effect was very short-sighted. [25] circa 1000AD, the climate was sufficiently warm for the Vikings to travel to Newfoundland and establish a short-term outpost there. [26] From about 985, the Vikings founded the Eastern Settlement and Western Settlement, both near the southern tip of Greenland. In the early stages of the colony, they kept cattle, sheep and goats, with about a quarter of their diet from seafood. After the climate got colder and storms around 1250, their diet steadily shifted towards about 1300, seal hunting that was delivered over three-quarters of their food. In 1350 there was a reduced demand for their exports and trade with Europe fell. The last document from the settlements dates from 1412, and in the following decades the remaining Europeans are back in what appears to have been a gradual withdrawal, mainly caused by economic factors such as increased availability of farms in the Scandinavian countries. [27] L'Anse aux Meadows, Newfoundland, today, with a reconstruction of a Viking settlement. In the Chesapeake Bay (now Maryland and Virginia in the US), researchers found large temperature excursions (changes from average temperature at the time) during the medieval heat period (approx. 950-1250) and the Small Ice Age (circa 1400-1700, with cold periods continuing into the early 20th [28] Sediments in Piermont Marsh in the Lower Hudson Valley show a dry medieval southern period from 800 to 1300. [29] Prolonged drought affected many parts of the western United States and especially eastern California and the western part of the Great Basin. [14] [30] Alaska experienced three time intervals of comparable heat: 1-300, 850-1200 and post-1800. [31] Knowledge of the Warm Period of the North American Middle Ages has been useful during dating occupancy periods for certain Native American settlements, especially in arid parts of the western United States. [32] [33] MWP drought may also have affected Native American settlements in the eastern United States, such as in Cahokia. [34] [35] The review of recent archaeological research shows that as the search for signs of unusual cultural change has broadened, some of the early patterns (e.g. violence and health problems) have been considered to be more complicated and regionally varied than previously thought. Others, such as settlement disruptions, deterioration in distance trade and population movements, have been further confirmed. [36] Africa The climate in equatorial Eastern Africa has alternated, being between drier than today and relatively wet. The drier climate took place during the medieval heat period (1000-1270). [37] Antarctica A sediment core from the Eastern Bransfield Basin, the Antarctic Peninsula, preserves climatic events from the small ice age and the medieval warm period. The authors noted: The late Holocene records clearly identify Neoglacial events during the Small Ice Age (LIA) and medieval Warm Period (MWP). [38] Some Antarctic regions were atypically cold, while others were atypical heat between 1000 and 1200. [39] Pacific Ocean Corals in the tropical Pacific suggest that relatively cool, dry conditions may have been early in the millennium, consistent with a La Niña-like configuration of El Niño-Southern Oslationlci patterns. [40] South America The medieval warm period has been noted in Chile in a 1500-year-old seabed sequeudment[41] as well as in Eastern Cordillera of Ecuador. [42] A reconstruction based on ice cores found the medieval heat period could be distinguished in tropical South America from around 1050 to 1300, which in the 1400s was followed by the small ice age. Peak temperatures did not rise as high as those from the end of the 20th century, which was unprecedented in the area during the study period of 1600 years. [43] Asia Adhikari and Kumon (2001), which examined sediments in Lake Nakatsuna in central Japan, found a warm period from 900 to 1200, corresponding to the medieval hot period and three cool phases, two of which could be related to the small ice age. [44] Another research in northeastern Japan shows that there is a hot and humid range, from 750 to 1200, and two cold and dry intervals, from 1 to 750 and from 1200 to now. [45] Ge et al. studied temperatures in China over the last 2000 years and found great uncertainty before the 1500s, but good consistency over the last 500 years highlighted by the two cold periods, the 1620s-1710s and 1800s, and the warming of the 20th century. They also found that warming during the 10-14 century in some regions may be comparable in magnitude to the warming of the last few decades of the 20th [46] Oceania There is an extreme lack of data from Australia for both periods of the medieval heat period and the small ice age. But evidence from wave-built shingle terraces to a permanent full Lake Eyre[47] during the 9th century was found in the 19th century. A 1979 study from the University of Waikato found.Temperatures derived from an 18O/16O profile through a stalagmite found in a New Zealand cave (40.67°S, 172.43°E) suggested that the medieval heat period occurred between 1050 and about 1400 and to have been 0.75°C warmer than the current heat period. [48] More evidence in New Zealand is from a 1100-year-old tree-ring record. [49] See also Global warming portal Classic Maya collapse – simultaneously with the medieval heat period and marked by decades-long drought Chalk thermal maximum - A period of climate warming that reached its peak around 90 million years ago Description of the medieval heat period and Little Ice Age in the IPCC reports Historical climatology Holocene climate ethical optimal - A warm period over about the range of 9,000 to 5,000 years BP Hockey stick graph - Graf shows a big increase in recent centuries of temperatures similar to a hockey stick to demonstrate man-made climate change Late Antique Little Ice Age Paleoclimatology - Study of changes in ancient climate references ^ Hawkins, Ed (30. January, 2020). 2019 year. climate-lab-book.ac.uk. Archived from the original on February 2, 2020. (The data show that the modern is very different from what happened in the past. 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