

## **DEEPER EXPLANATIONS OF SOME HISTORICAL CLIMATE CHANGES**

### **\*Warm Period in Middle Ages**

There was a warm period between about 800-1300 AD. During this period, some parts of the globe may have been warmer than they are today, such as the North Atlantic. The effects of the warm period were particularly evident in Europe, where grain crops flourished, alpine tree lines rose, many new cities arose, and the population more than doubled.

Excavations have shown the presence of birch trees during the early Viking period. The Vikings took advantage of the climatic amelioration to colonise southern Greenland in 985 AD, when milder climates allowed favourable open-ocean conditions for navigation and fishing. Erik the Red explored Greenland from Iceland and gave it its name. He claimed land in southern Greenland and became a chieftain in about 985 AD. Greenlanders brought grain seed, probably barley, oats and rye, horses, cattle, pigs, sheep and goats. The southern coastal area was forested at the time. Greenland settlements lasted about 500 years before cooling during the Little Ice Age ended the settlements. From 1000 to 1300 AD the settlements thrived under a climate favourable to farming, trade, and exploration. A cooling, steadily deteriorating climate began after 1300 AD and farming became impractical. A bishop who travelled there about 1350 AD found that the settlement was completely abandoned. The church abandoned Greenland in 1378 AD because ships could not get through the sea ice between Iceland and Greenland.

During the Medieval Warm Period, wine grapes were grown as far north as England or North America, where growing grapes is now not feasible, and about 500 km north of present vineyards in France and Germany. Wheat and oats were grown around Trondheim, Norway, suggesting that the climate was about 1°C warmer than it is at present.

Evidence also suggests that some places were very much cooler than today including the tropical pacific. This arid period may have depopulated the Great Plains of North America.

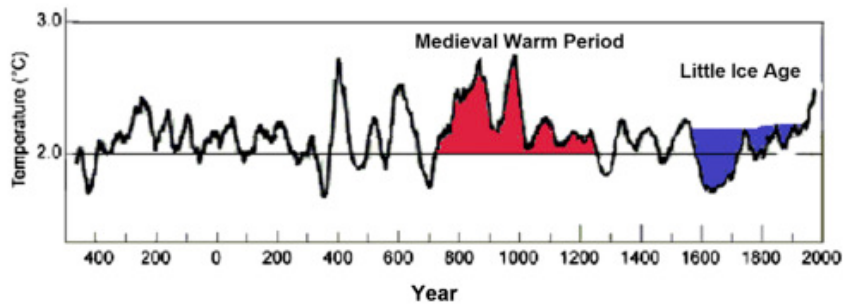


Figure 21.10. Temperature reconstruction from tree rings in China. (Red = warm, blue = cool.)

Graphic source: EASTERBROOK,, *Evidence-Based Climate Science*, Nature, 2016

Source: *Why Greenland Viking vanished*, Smithsonian, 2019, *Medieval warm period*, Skeptical Science

### \*Medieval Little Ice Age

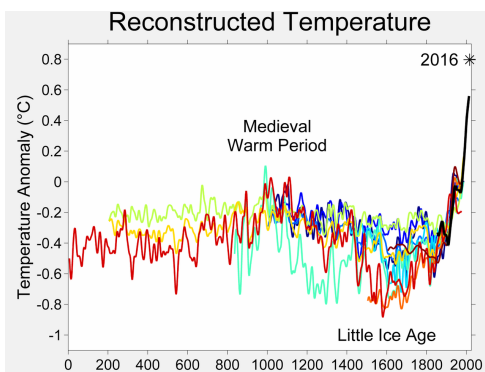
At the end of the Medieval Warm Period, ~**1300 AD**, temperatures dropped dramatically in parts of Europe and North America and the cold period that followed is known as the Little Ice Age. The periods of colder climate that ensued for five centuries were devastating. The population of Europe had become dependent on cereal grains as a food supply and with the colder climate, early snows, violent storms, and recurrent flooding that swept Europe, massive crop failures occurred, resulting in widespread famine and disease. Glaciers in Greenland and elsewhere began advancing and pack ice extended southward in the North Atlantic, blocking ports and affecting fishing.

The change from the warm to the cold period was abrupt and devastating, leading to the Great Famine from 1310 to 1322. In the winter of 1309–1310, the Thames River froze over and poor people were especially affected. The year 1315 was particularly bad. Jean Desnouelles wrote at the time:

“Exceedingly great rains descended from the heavens and they made huge and deep mud-pools on the land. Throughout nearly all of May, June, and August, the rains did not stop.” Corn, oats, and hay crops were beaten to the ground, August and September were cold, and floods swept away entire villages. Crop harvests in 1315 were a disaster, affecting an enormous area in northern Europe. In some places, up to half of farmlands was eroded away. Cold, wet weather prevented grain harvests, and fall plantings failed, triggering famines.

In 1316 AD, spring rain continued, impeding the sowing of grain crops, and harvests failed once again. Diseases increased, newborns and elderly people died of starvation, and multitudes scavenged anything edible. Entire communities disappeared and many farms were abandoned. This year was the worst for cereal crops in the entire Middle Ages. Cattle couldn't be fed, hay wouldn't dry and couldn't be moved so it just rotted.

Thousands of cattle froze during the bitterly cold winter of 1317–1318 and many others starved. The cold immobilised shipping. Rain continued through the summer and people suffered for another seven years.



The Little Ice Age was not a time of continuous cold climate, but rather repeated periods of cooling and warming, each of which occurred during times of solar minima, characterised by low sunspot numbers, low total solar irradiance, decreased solar magnetism, increased cosmic ray intensity, and increased production of radiocarbon and beryllium in the upper atmosphere.

Graphic source: [2000 year temperature comparison](#),  
Wikimedia

Sources: [Medieval Warm Period](#), Science direct, EASTERBROOK, D, [Evidence Based Climate Science](#), HUHTAMAA, H, [Climate and the Crises of the Early Fourteenth Century in Northeastern Europe](#)

**\*1815, the year without a summer,**

happened in the middle of the Little Ice Age from 1790 to 1830 due to volcanic dust. This year was also called the Poverty Year, because of severe climate abnormalities that cause average global temperatures to decrease by 0.4–0.7 °C., which resulted in major food shortages.

Evidence suggests that the anomaly of having the lowest sun sort number to date since record, was predominantly caused by the 1815 eruption of *Mount Tambora* in April in the Dutch East Indies (now Indonesia). This eruption was the world's largest eruption in at least 1,300 years. It ejected immense amounts of volcanic ash into the upper atmosphere, where the jet stream carried it around the world. The result was a further reduction in solar irradiance that brought record cold to much of the world during the summer. The unusual cold played havoc with agricultural production in many parts of the world, resulting in crop failures, dramatic increases in food prices, famine, cultural disruptions, and epidemics of cholera and other diseases. Rapid,

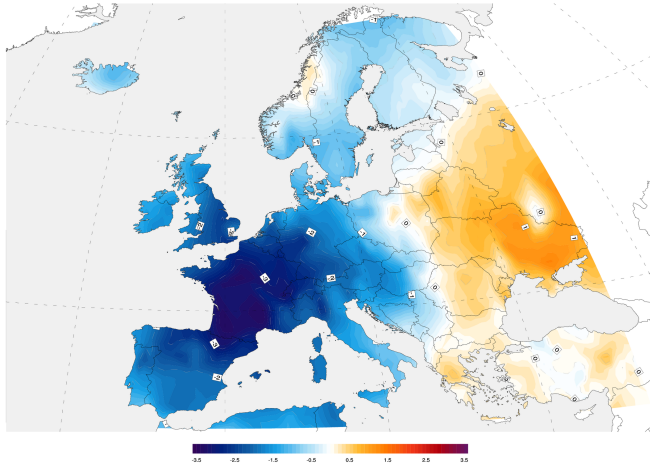
dramatic temperature changes occurred frequently, as temperatures sometimes went from above-normal summer levels to near freezing within hours. U.S. grain prices at least quadrupled, and oat prices increased almost eightfold.

Elsewhere around the world, famine, riots, arson, and looting occurred in many European cities, while China suffered from massive crop failures and disastrous floods. A disruption in the Indian summer monsoon spread a cholera outbreak

from a region near the River Ganges all the way to Moscow. “The Year Without a Summer” also had cultural effects:

- The lack of oats to feed horses likely inspired German inventor Karl Drais to research new ways of horseless transportation, which led to his invention of the precursor to the bicycle.

1816 Summer Temperature Anomaly



- Many Americans left New England for the Midwest, accelerating the westward movement of the American people. Vermont alone had as many as 15,000 people emigrate, including the family of Joseph Smith, who moved from Norwich, Vermont, to Palmyra, New York. This move may have made possible the publication of the Book of Mormon and the founding of the Church of Jesus Christ of Latter-day Saints.
- In June 1816, Mary Shelley was forced by the weather to spend her Swiss holiday indoors with her literary companions, where to pass the time they decided to have a contest to see who could write the scariest story. The result was the novel *Frankenstein; or, The Modern Prometheus*.

Map source: *Year without summer*, Wikipedia.  
source: *Blast of the Past*, Smithsonian magazine