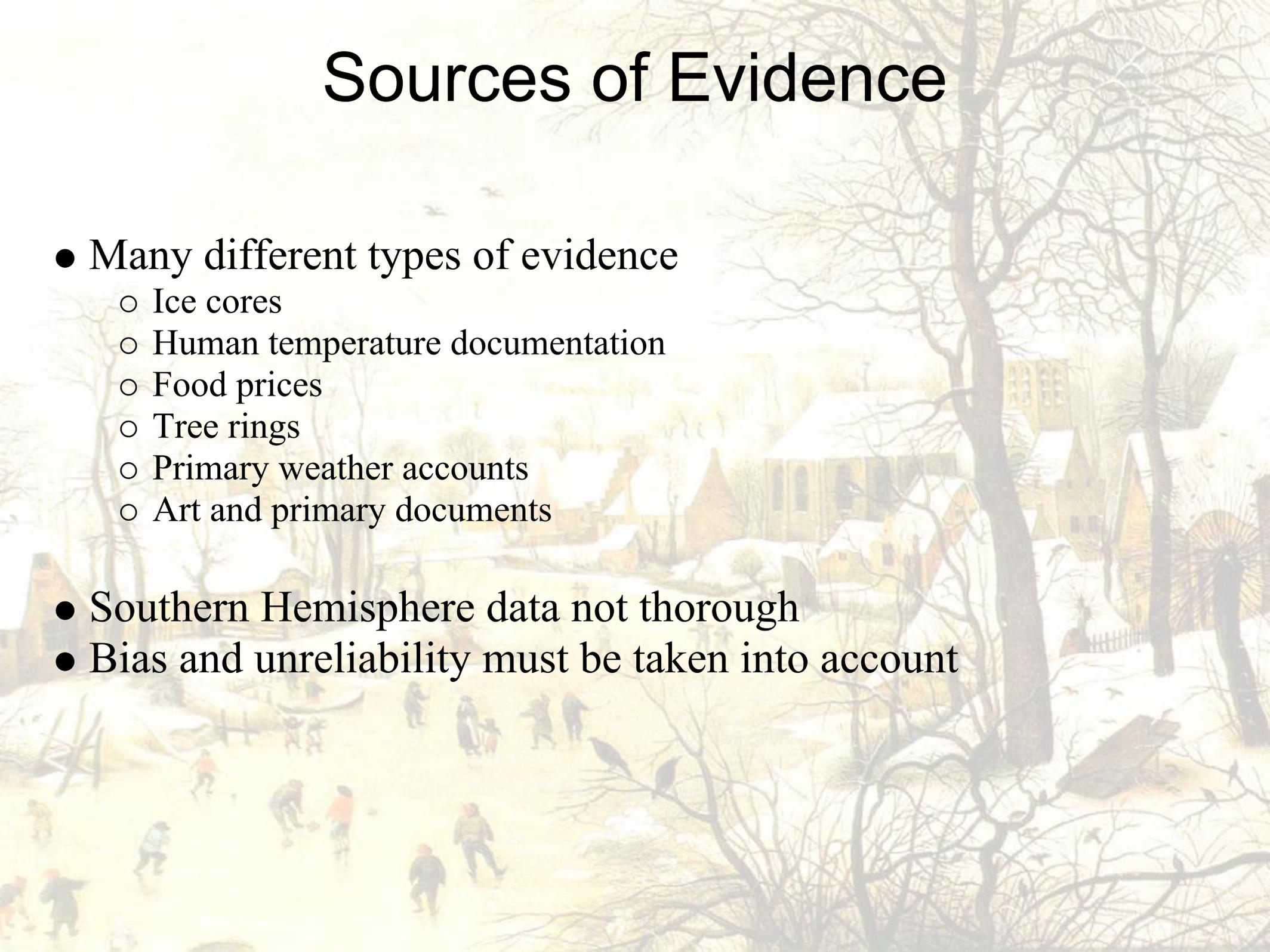


Perspectives on the Medieval Warm Period and the Little Ice Age

By Matt King

Sources of Evidence



- Many different types of evidence
 - Ice cores
 - Human temperature documentation
 - Food prices
 - Tree rings
 - Primary weather accounts
 - Art and primary documents
- Southern Hemisphere data not thorough
- Bias and unreliability must be taken into account

Slide 1 Notes: Before the scientific processes and perspectives of the Medieval Warm Period (MWP) and Little Ice Age (LIA) can be discussed, the evidence used by scientists must first be examined. Unlike contemporary issues, the evidence used in determining the temperature during the MWP and LIA is not limited to purely scientific processes. Although some ice core data is available, many more sources must be consulted to build an accurate estimate of temperature variation during this time period. Most data comes from the Northern hemisphere; few records are available from the Southern hemisphere although the data that does exist shows little or no variability in the MWP but some during the LIA.

The wide variation and relative unreliability of much of the data used to assess change during the MWP and LIA is great. Primary accounts describing the weather need to be taken with a grain of salt, for chroniclers are notorious for ridiculous hyperbole in their accounts. The other, less subjective data such as tree rings and ice cores can provide details of climate change, but they are not nearly as accurate as modern day temperature measurements.

-Background: <http://www.ibiblio.org/wm/paint/auth/bruegel/bird-trap.jpg> By Pieter Bruegel

-Source 1: Climate of the Last Millenium, Stephen Schneider

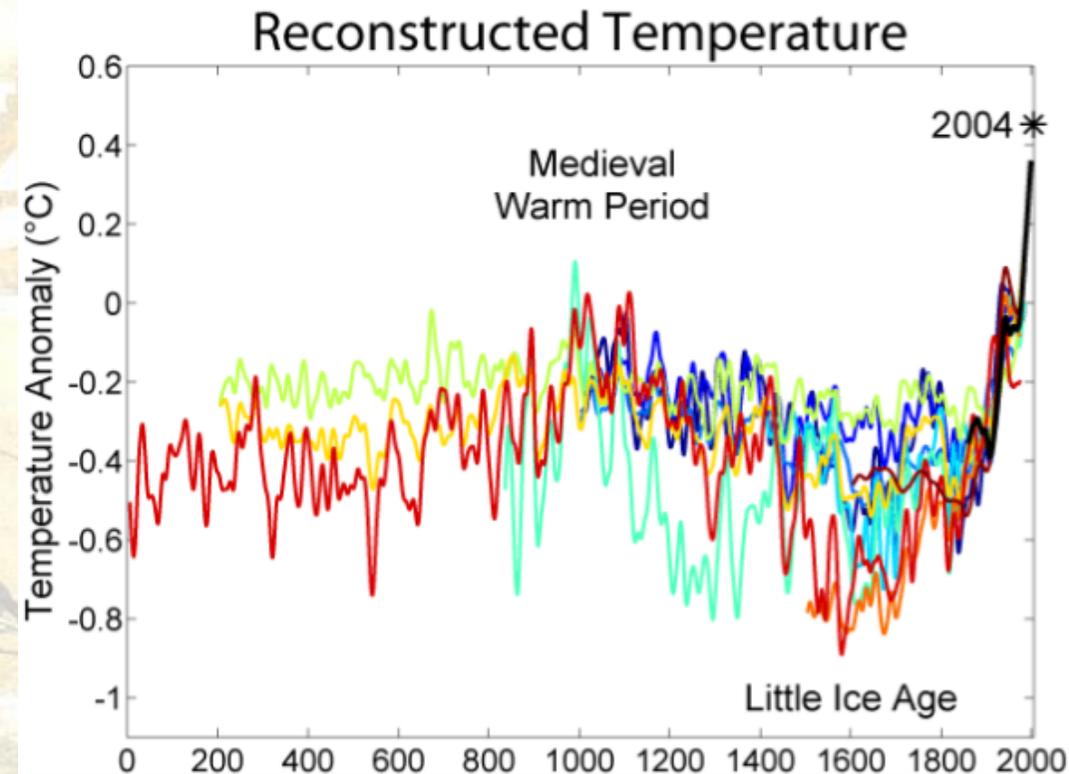
http://stephenschneider.stanford.edu/Publications/PDF_Papers/Bradley.pdf

-Source 2: The Medieval Warm Period, NOAA

<http://www.ncdc.noaa.gov/paleo/globalwarming/medieval.html>

The Medieval Warm Period

- Small temperature increase
- Lack of evidence in the Southern Hemisphere
- Possible causes:
 - Variable ocean circulation
 - High solar irradiation
 - Volcanic activity
- "Medieval Climate Anomaly" (1)



Slide 2 Notes: The MWP appears to be more moderate and regional in nature than many believe. The Northern Hemisphere mean temperature was .2C warmer in the MWP than during the LIA. However, certain areas such as Greenland and Northern Europe experienced more substantial warming. This regional warming indicates that "ocean circulation-related climate variability" (2) might be a factor. Dry summers and mild winters allowed for wine to be grown as high as England. The warming in winter over Northern Europe and Russia is possibly due to a change in wind patterns following volcanic eruptions. Increased solar irradiance may have also played a role in the modest warming of Europe and parts of the Northern Hemisphere. Temperatures from 1000-12000 match the 1902-1980 mean, so it is hotter now than it was during the MWP.

The graph on this slide is a compilation of different climate studies done concerning the last 2000 years of history. The line color for each study is indicative of how recent the study was done; studies that are redder are newer studies, while bluer ones are older. The chart labels the periods roughly associated with the MWP and LIA, and it is clear from these reconstructions that, although there is a definite trend towards either cooling or warming, it is difficult to define where these trends begin.

-Image: http://upload.wikimedia.org/wikipedia/commons/c/c1/2000_Year_Temperature_Comparison.png

Source 3: <http://www.sciencemag.org/cgi/reprint/302/5644/404.pdf>

Source 4: http://www.grida.no/publications/other/ipcc_tar/?src=/climate/ipcc_tar/wg1/070.htm

Source 5: http://www.grida.no/publications/other/ipcc_tar/?src=/climate/ipcc_tar/wg1/070.htm

Source 6: http://www.grida.no/publications/other/ipcc_tar/?src=/climate/ipcc_tar/wg1/070.htm

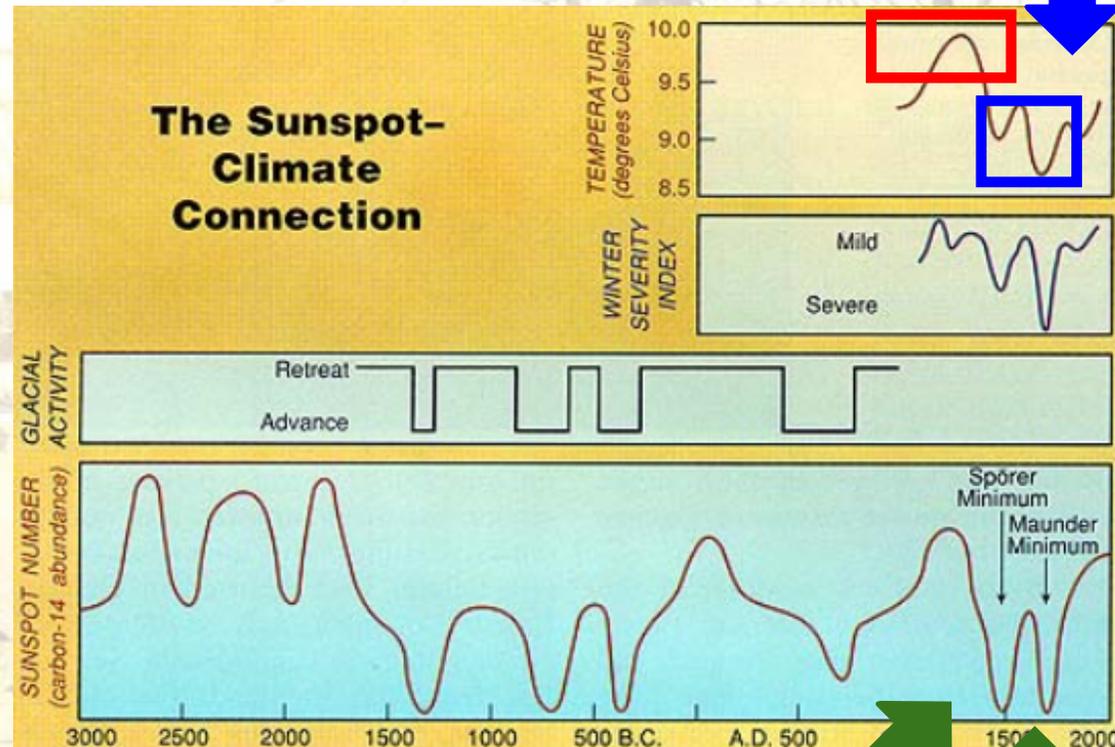
Source 7: http://www.grida.no/publications/other/ipcc_tar/?src=/climate/ipcc_tar/wg1/070.htm

The Little Ice Age

Little Ice Age

Medieval Warm Period

- Gradually declining temperatures
- Documented glacial advances
- More global implications
- More understood causes:
 - Slow thermohaline circulation
 - Increased volcanism
 - Decreased solar activity
- Speculated causes
 - Depopulation
 - Reforestation
- "Great deal of temperature variation both in time and space" (4)



Spörer and Maunder Minimums

Slide 3 Notes: Unlike the MWP, evidence for the LIA is more convincing. The LIA was most documented in Europe and North America, although it almost certainly occurred in most places in the world. The 1400s-1800s were the coldest in the millennium, and it is believed that the Northern Hemisphere was approximately 1C cooler than it was in the late 1900s. The LIA was characterized by gradually declining temperatures until the 1500s when almost areas showed prominent glacial advances. The causes of the LIA are more known than the MWP. It is believed that a weakening of the North Atlantic thermohaline circulation, increased volcanism, and decreased solar activity brought about the LIA. The Sporer and Maunder Minimums, showing a lack of sunspots, correspond with a decrease in temperatures throughout Europe and much of the Northern Hemisphere. Other more controversial causes have been put forth, including reforestation and depopulation because of the Black Death.

The chart on this slide shows the connection between solar activity and temperature drop on earth, one of the perceived reasons the LIA occurred. The Sporer and Maunder Minimums correspond to temperature drops on earth, while past glacial retreats and advances match solar activity.

-Image: http://bruderheim-rea.ca/images/sunspot_cnnctn.jpg

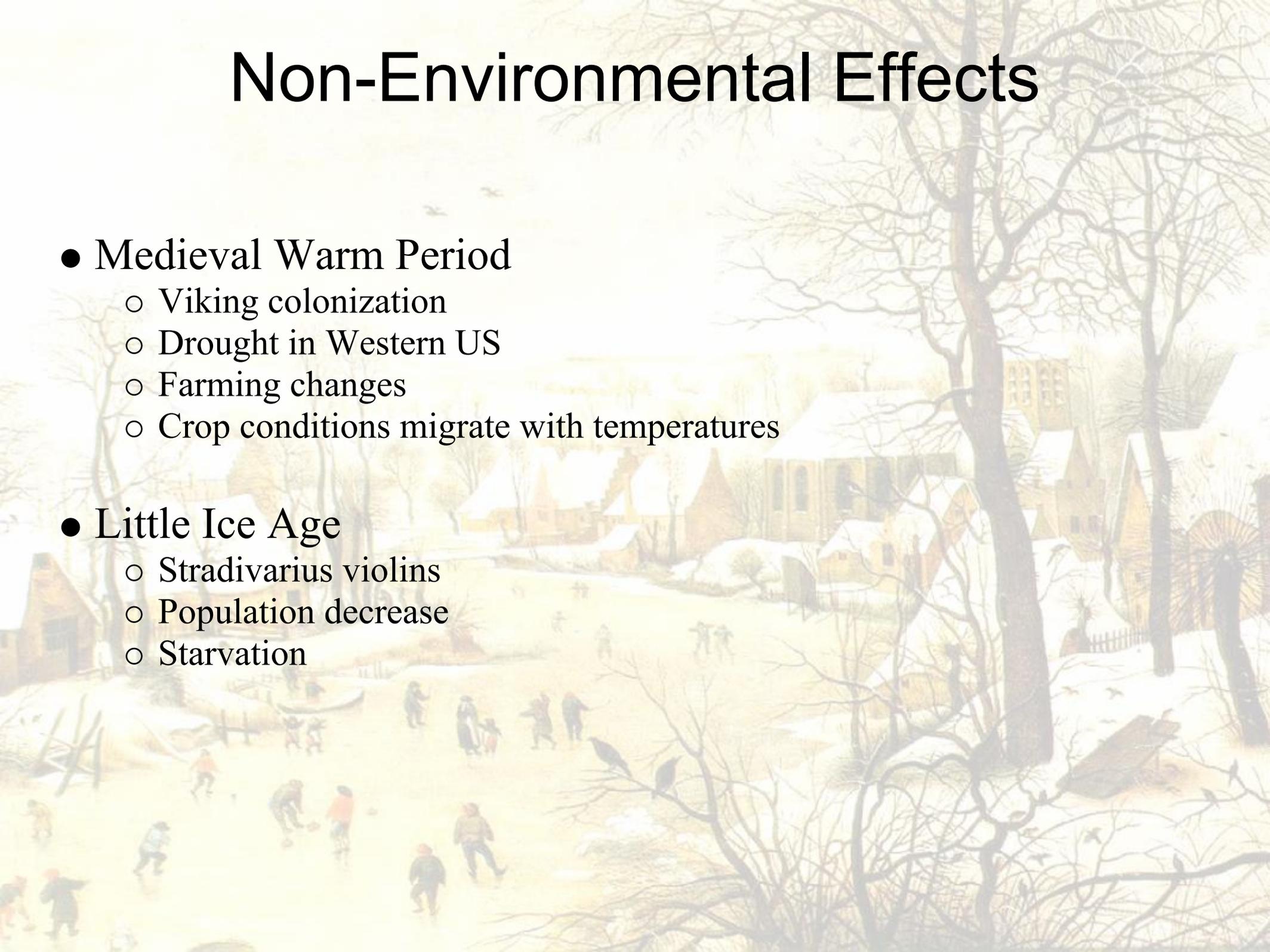
-Source 5: Little Ice Age, Wikipedia

http://en.wikipedia.org/wiki/Little_Ice_Age

-Source 6: Europe's chill linked to disease, Stanford

<http://news-service.stanford.edu/news/2009/january7/manvleaf-010709.html>

Non-Environmental Effects

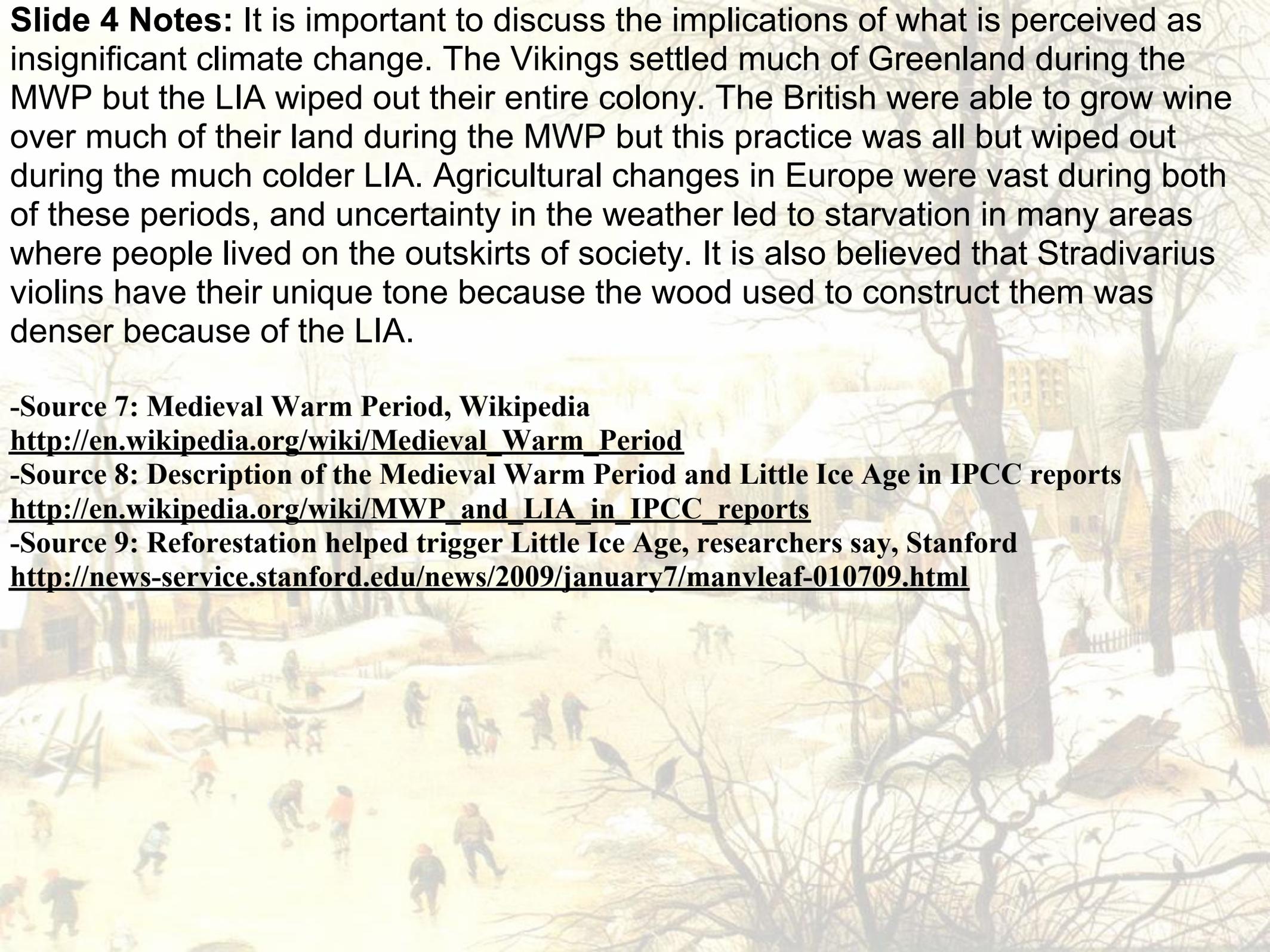


- Medieval Warm Period

- Viking colonization
- Drought in Western US
- Farming changes
- Crop conditions migrate with temperatures

- Little Ice Age

- Stradivarius violins
- Population decrease
- Starvation



Slide 4 Notes: It is important to discuss the implications of what is perceived as insignificant climate change. The Vikings settled much of Greenland during the MWP but the LIA wiped out their entire colony. The British were able to grow wine over much of their land during the MWP but this practice was all but wiped out during the much colder LIA. Agricultural changes in Europe were vast during both of these periods, and uncertainty in the weather led to starvation in many areas where people lived on the outskirts of society. It is also believed that Stradivarius violins have their unique tone because the wood used to construct them was denser because of the LIA.

-Source 7: Medieval Warm Period, Wikipedia

http://en.wikipedia.org/wiki/Medieval_Warm_Period

-Source 8: Description of the Medieval Warm Period and Little Ice Age in IPCC reports

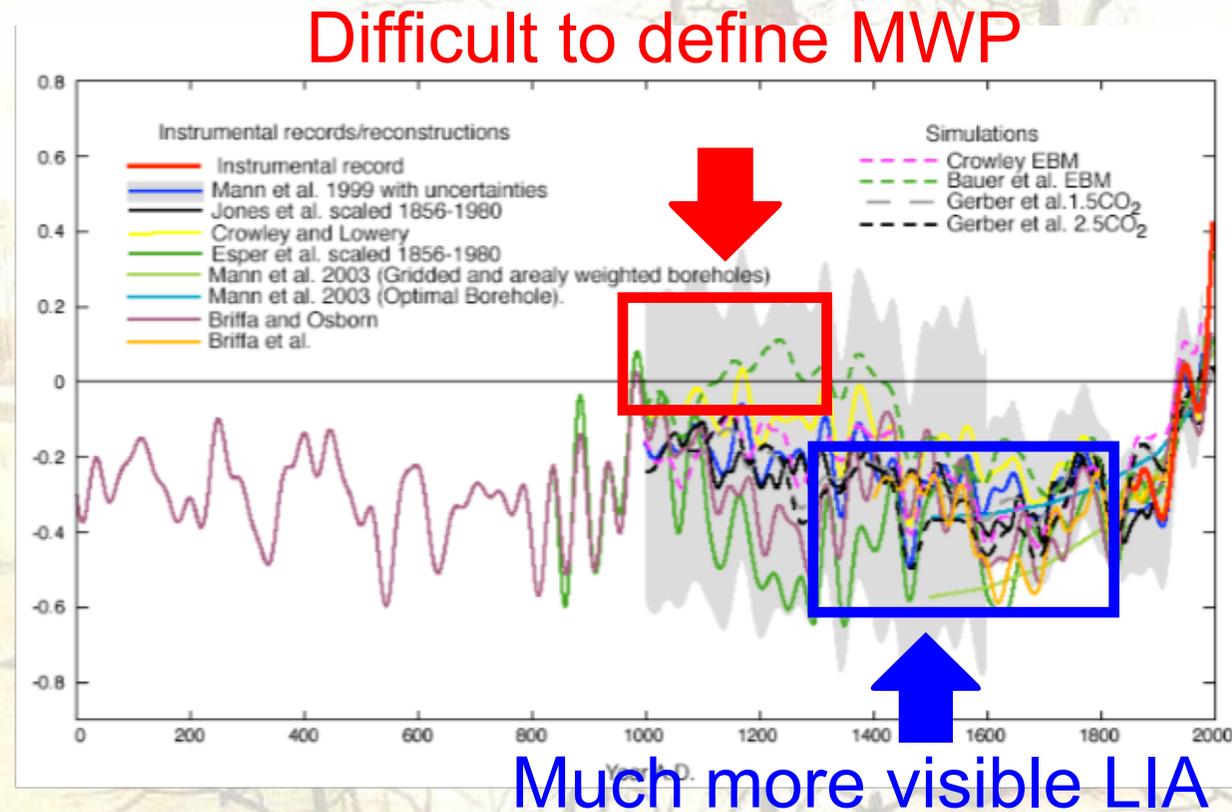
http://en.wikipedia.org/wiki/MWP_and_LIA_in_IPCC_reports

-Source 9: Reforestation helped trigger Little Ice Age, researchers say, Stanford

<http://news-service.stanford.edu/news/2009/january7/manvleaf-010709.html>

Perspectives on these Climate Anomalies

- Skeptic perspective
- Medieval Warm Period vs. today's climate
- Effects of small temperature variation
- Natural variation



Slide 6 Notes: Skeptics and global warming advocates alike have used the MWP and LIA as evidence to support their cause. Skeptics argue that these two climate anomalies show that the earth goes through natural climate variation. However, advocates use the famous Hockey Stick Graph to demonstrate that the variation between the MWP and LIA are unparalleled because of the current CO2 levels. It is also worth noting that, although the MWP and LIA only altered the climate a maximum of several degrees Celsius, the implications for agriculture and the population of Europe and the Americas was vast. If we are to use the impacts of the MWP as a basis, it appears as though, should temperatures today continue to rise, the implications for many living on the subsistence level would be dire. Also, during the MWP and the LIA, CO2 levels rose and fall depending on the temperatures, while in the present, it looks as though CO2 levels are causing the rise in temperatures.

In my opinion, the MWP was a very insignificant rise in climate, but its perceived rise in temperature is greater because of the ensuing LIA. However, what these small climate variations show us is that even imperceptible changes in climate can have drastic effects on the population. Although in modern times we are more knowledgeable and have the ability to prepare for climate change, ultimately, we are gambling with mother nature by emitting so many greenhouse gases into the atmosphere.

This visual is very similar to one already shown, and it further reiterates the assertion that the warming we see today is unprecedented in the recent history of the earth. All temperature reconstructions in this graph were scaled to the annual Northern Hemisphere mean from 1856-1980.

-Image/Source 10: http://stephenschneider.stanford.edu/Publications/PDF_Papers/Bradley.pdf