

Paleoclimatic Data for the Last 2,000 years

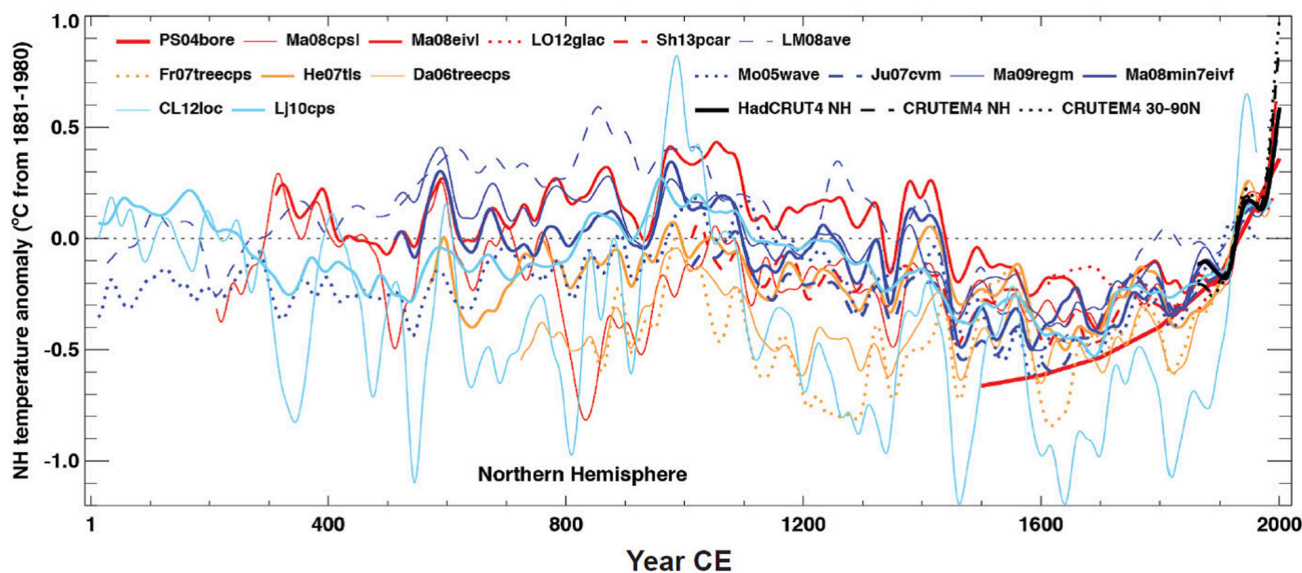
Paleoclimatic Data for the Last 2,000 Years

Beginning in the 1970s, paleoclimatologists began constructing a blueprint of how Earth's temperature changed over the centuries before the widespread use of thermometers. Over the last two decades, there has been a major breakthrough in our understanding of global temperature change over the last 2,000 years. Several different but important studies, published in peer-reviewed scientific journals, revolutionized what we know about the present day in the context of past centuries. The research of the late 1990s formed the foundation for a progression of studies that followed, incorporating advances in statistical techniques and information from a broad range of [proxy data](#) types.

Although there are differences between individual proxy temperature records, due in part to the diverse statistical methods utilized and sources of the proxy data, they all indicate similar patterns of temperature variability over the last 2,000 years. For example, it has become apparent that the "Medieval Climate Anomaly" temperatures from about 950 to 1250 AD were mostly warmer averaged over the Northern Hemisphere than during the subsequent "Little Ice Age" from roughly 1450 to 1850 AD. The timing and spatial structure of the Medieval Climate Anomaly and Little Ice Age are regionally complex, however. One region where these temperature variations played an important role in human history is the North Atlantic, where warmer temperatures during the Medieval Climate Anomaly allowed Norse seafaring and colonization of Greenland that began at the end of the 10th century and continued until cooler Little Ice Age conditions developed in the 15th century.

The similarity of characteristics among the different paleoclimate reconstructions of the last 2,000 years provides confidence in the following important conclusions, as reported in the [Intergovernmental Panel on Climate Change Fifth Assessment Report](#):

- Dramatic warming has occurred since the 19th century.
- For average annual Northern Hemisphere temperatures, the period 1983–2012 was very likely the warmest 30-year period of the last 800 years and likely the warmest 30-year period of the last 1,400 years.
- Warmer than average temperatures are more widespread over the Northern Hemisphere since the mid 20th century than in any previous time.



Reconstructed Northern Hemisphere annual temperature during the last 2,000 years. Individual reconstructions are grouped by color, red: land-only all latitudes, orange: land-only extratropical latitudes, light blue: land and sea extratropical latitudes, dark blue: land and sea all latitudes. Instrumental temperatures are shown in black. All series are anomalies from the 1881–1980 mean and have been smoothed with a filter that reduces variations on time scales less than about 50 years. Time series sources: PS04bore = Pollack and Smerdon (2004); Fr07treecps = Frank et al. (2007); CL12loc = [Christiansen and Ljungqvist \(2012\)](#); Ma08cpsl, Ma08eivl, Ma08eivf, Ma08min7eivf = [Mann et al. \(2008\)](#); He07tls = [Hegerl et al. \(2007\)](#); Lj10cps = [Ljungqvist \(2010\)](#); Da06treecps = [D’Arrigo et al. \(2006\)](#); LO12glac = [Leclercq and Oerlemans \(2012\)](#); Sh13pcar = [Shi et al. \(2013\)](#); LM08ave = Loehle and McCulloch (2008); Mo05wave = [Moberg et al. \(2005\)](#); Ju07cvm = Juckes et al. (2007); Ma09regm = [Mann et al. \(2009\)](#); HadCRUT4 = Hadley Center/Climatic Research Unit surface temperature over land and sea; CRUTEM4 = Climatic Research Unit near-surface air temperature over land. Graphic from the [Intergovernmental Panel on Climate Change Fifth Assessment Report](#).