

A Decade of Change?

We are well into 2010, and depending on how you count, the decade of the 2000's, the "oughts" is over. This is a time when climate scientists have been looking back over the decade in order to compare it to previous decades. We hear from some of these scientists that this decade was the warmest ever, even warmer than the 1990s [1]. This fact was proclaimed happily at the Copenhagen conference in December, and then it is often repeated by the media [2] and scientists who attended the meeting [3].

Also, the year 2009 is cited as being one of the top 10 warmest years ever [1]. Additionally, other studies cite the increase in the ratio of record warm days to cold days during the decade points to a human contribution [4]. Thus, the relative warmth of the "oughts" is cited in and of itself as proof of the human impact on climate.

Aside from the fact that these statements are making these observations only within the context of the instrumental record since 1850 [1], these proclamations are attempting to establish the correlation (warmth to increases in human numbers and activities) as a cause. This is something that we caution against in undergraduate statistics classes.

Often, these climatologists claim that it is highly unlikely from a statistical standpoint that the warmest years in a time series should be clustered at one end of the record or time series. A study [5] showed this to be the case whether you impose long or short term variations on the record and generate a random series from these data. This is true, but only if you assume that there is no general trend over the entire length of the time series.

It is relatively easy to demonstrate that one can construct a "time series" in which the "warmest" years are clustered at the end of the series without invoking a human cause. This "time series" will even look similar to the instrumental record. Keep in mind that this demonstration is purely linear (does not include non-linearity, which would be a part of any observed or natural time series).

A study by Suhler and O'Brien [6] postulated that most natural variations in climate occur on a time-scale of close to 2^n . While external climate forcing and non-linearity may make this assumption difficult to show conclusively, the formula itself provides us with the easy way to demonstrate that a simple "time series" can be constructed such that the "warmest" years occur late in the time series (Fig. 1 top). Here we take $n = 3, 6,$ and $8,$ representing cycles of 8, 64, and 256 years, respectively, and simply add them. It is even possible to demonstrate that the latest "decade" is warmer than the previous one. Note the similarity to the observed record (Fig. 1 bottom). The technique is similar to that used by Klyshtorin and Lybushkin (2007) [7].

Additionally, such a record should produce a higher ratio of warm "days" and record warm "days" as compared to cold "days" if you examine the distribution of temperatures in the latest 30 years in Fig. 1 (top) as compared to the previous 30 years. Again, this is regardless of the causation of the variations in Fig. 1 (top).

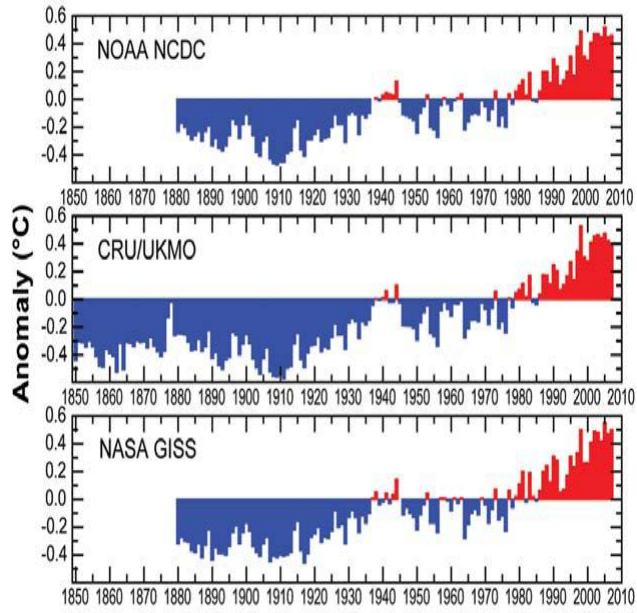
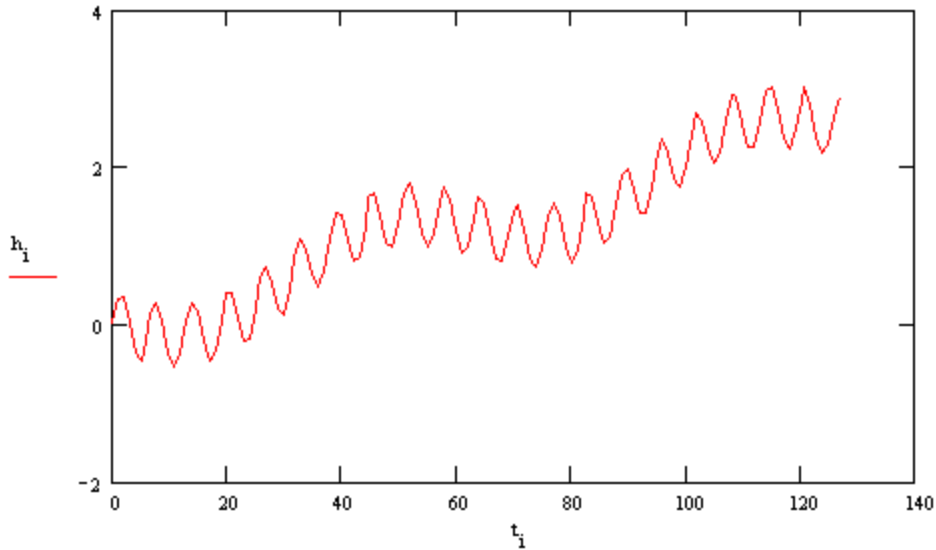


Figure 1. (top) A simple “time series” constructed using the techniques of [6] and from [8], the amplitudes used for period $2^n = 3, 6,$ and 8 were $1, 0.4,$ and 0.4 units, respectively, and starting from $0,$ (bottom) the global temperature anomalies $^{\circ}\text{C}$ from borrowed from [9].

Finally, it is worth reminding the reader that the temperature changes which occurred during the 20th century were not inconsistent with inferred changes during the last two millennia. An examination of the 20th century temperature records showed approximately a 1 degree Fahrenheit temperature rise overall, but with two distinct periods of temperature increases broken by a period of temperature decreases between 1940 and the late 1970s (Fig. 1 bottom and Fig 2).

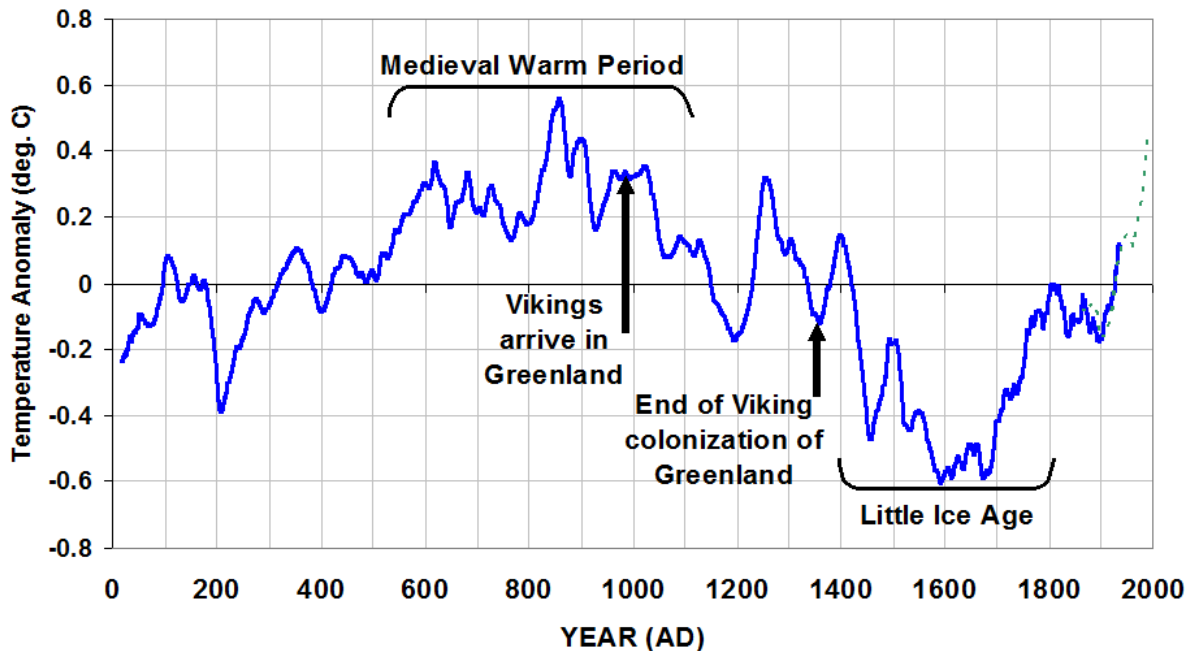


Figure 2. Global temperature anomaly reconstructions for the last 2000 years . Figure provided courtesy of Dr. Roy Spencer.

During both of these 20th century periods of global temperature increase, the total rise for each was about 0.5 degrees Fahrenheit or an average increase of about 0.2 degrees rise decade. Temperatures then reached a peak in the 1998-2000 time frame and have since leveled off, or even begun to fall [9]. This could be due to natural variations such as a quieter sun, and changes occurring in the Pacific Ocean temperatures. This temperature trend is projected to continue for about 5 – 20 years by reputable scientists, even some supporters of anthropogenic global warming.

So while it is fashionable to review the best and the worst of the decade that just ended (or will end, again depending on your count), the relative warmth of the “oughts” is not proof that humans are altering the climate.

[1] WMO Press Release no. 869, 2009: 2000-2009, *The Warmest Decade*. December 2009.

[2] Canon, S., 2010: *A frozen hotbed of change*. The Kansas City Star, 31 January

[3] Urban, M. and M.Cowell, 2010: *Negotiating Climate: Lessons from the global Climate Change Conference in Copenhagen*. A seminar presented to the faculty at the University of Missouri, 12 February.

[4] Hosansky, D., and R. Drummond, 2009: *Record high temperatures far outpace record lows across the US*. NCAR press release 12 November 2009.

[5] Zorita, E., T.F. Stocker, H. von Storch, 2008: How unusual is the recent series of warm years? *Geophys. Res. Lett.*, **35**, L24706, doi: 10.1029/2008GL036228.

[6] Suhler, G, and D. O'Brien, 2006: *El Nino Predictability Using a Top-down Approach*. American Association for the Advancement of Science (AAAS) 2006 Annual Meeting, St Louis, MO. Available from Dynamic Predictable (<http://www.dynapred.com>)

[7] Klyshotorin, L.B. and A.A. Lybushkin, 2007: *Cyclic Climate Changes and Fish Productivity*. VNIRO publishing, Moscow, 223 pp.

[8] Birk, K, 2006: *Interannual and interdecadal Variability in Midwestern Climate Since 1900*. A University of Missouri M.S. Thesis, 212 pp.

[9] AMS State of the Climate Report 2008. <http://www.ametsoc.org/AMS> see publications