Anthropogenic Global Warming: Is it Real?

Victor Goldschmidt –creating2@earthlink.net

April 4, 2009

Abstract

The culpability of Anthropogenic CO2 as a "greenhouse gas" is addressed. The basis for assigning culpability, in great part the foundation for a recent assessment report from the International Panel of Climate Change, is first presented. The major components leading to the claim of global warming on the part of CO2 are two. One, the noted increases in concentration of CO2 accompanied by global temperature increases, and two, the predictions of sophisticated global climate models. The counter perspective first notes the lack of accuracy of the temperature measurements, and then raises doubt on the validation of the computer models. Other phenomena affecting global temperatures and the confusion between cause and effect lead to the conclusion that the jury is not out – and costly measures attempting to restrict the use of fossil fuels for electrical energy production do not have a firm basis.

A logical conclusion:

Arrhenius (1896) and Callendar (1938) might have been amongst the first to suggest that increases of CO2 in the atmosphere could be causes for global warming. Ultraviolet radiation from the sun would not be measurably blocked by CO2 while the infrared radiation from the warmed earth surface would in part be absorbed by the gas, and emitted at a different spectral distribution back to earth. It is worthy to note, that unlike common analogies, the phenomena is not similar to a greenhouse with heat "trapped" by an impervious glass surface. It is a simple case of absorption and emission of radiant energy.

Measurements of concentration of CO2 were formally started by Keeling in 1958. (Keeling C.D. and T.P. Whorf, 2005). First with a tower at Mauna Loa, Hawaii, and later with various stations around the world. Data published from all of these measurements showed the same average trends, with a notable increase as the industrial revolution progressed. Figure 1 (Tans.P, 2003) shows the most recent data for Mauna Loa.

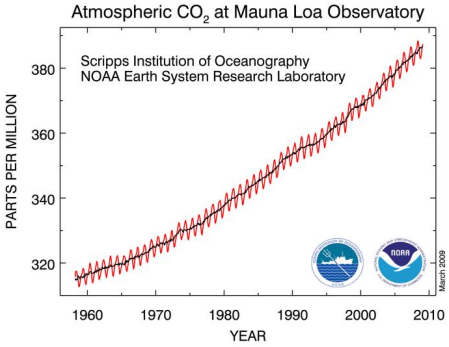

Figure 1, CO2 Concentrations Mauna Loa

A major effort to document surface temperatures at various locations and inferring from them an average difference (or anomalies) between those values and their corresponding values at a reference date was formalized circa 1950's. These are noted in Figure 2 (GISS, 2008) Included in the figure are anomalies estimated from sample measurements and older records preceding the availability of the more extensive surface data.

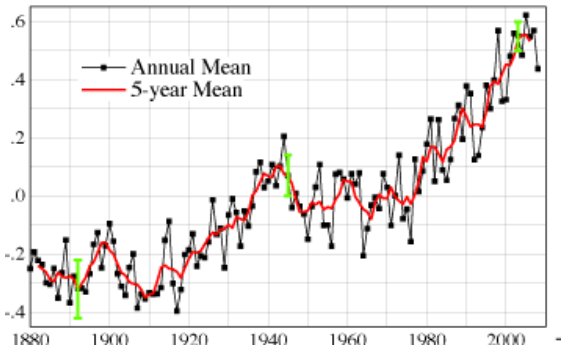

Figure 2: GISS Global Land-Ocean Temperature Anomaly (degrees C)

Figure 3 compares the temperature and CO2 concentrations data for the years 1958 through 2008. It shows a clear tracking between them, and validates the Callendar and Arrhenius expectations.

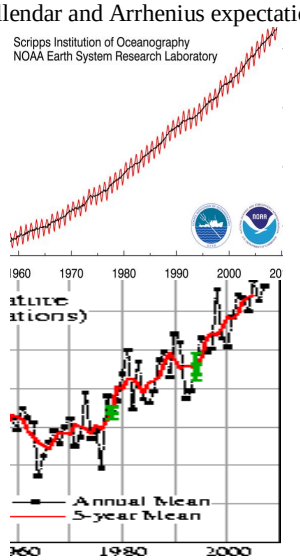

Figure 3: Comparison of CO2 and Temperature Trends

A special committee was convened by the (US) National Academy of Sciences and chaired by Charney (1979). Its purpose was to provide an estimate of the potential warming effect of CO2 due to the expected increase in anthropogenic CO2 in great part attributed to the increased use of fossil fuels. The input of two global climate modelers was available. One, Hansen's (Hansen et al. 1983), predicted a 4 C increase in temperature due to the doubling of CO2 concentration, while the other, Manabe's (Manabe and Wetherald 1975, Manabe and Stouffer 1980), predicted a 2 C increase. The committee reported a potential increase between 1.5 and 4.5 C due to the doubling of CO2 concentration. Models have since been improved, and numerous predictions are available (IPCC AR 4, 2007) with most of them showing similar increases in temperature, confirming the warming effect of anthropogenic CO2.

The comparable trends of temperature and CO2 concentrations have also been noted for times prior to the station measurements referred to above. The CO2 concentrations were obtained from measurements in ice cores (Figure 4). Temperature anomalies were determined by various researchers (Figure 5) from proxies from tree rings, measure of various isotopes in ice cores and similar sources (IPCC AR 4, 2007) .

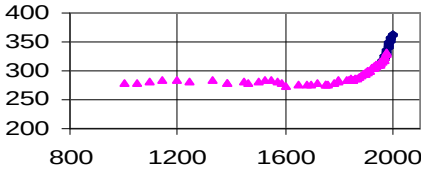

Figure 4: CO2 Concentration in ppm vs. Year

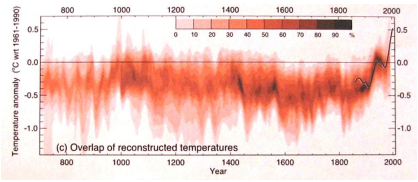

Figure 5: Reconstructed Temperatures – IPCC AR4

Figures 4 and 5 again exhibit tracking between CO2 and temperature as did Figure 3. These trends, supported by the computer models, have become the major and logical foundation for assigning culpability to anthropogenic CO2 for recent global warming

Questions and Concerns

If there is one unique characteristic of engineers it should be their love of problem solving accompanied by the questioning of data. A number of questions are now addressed. The two pivotal ones are the validity of the computer models and of the temperature data.

Validity of the Computer Models

The numerical simulation models are based on representative equations calling for considerable empiricism. Atmospheric flows are turbulent flows, whose equations describing conservation of mass, momentum and energy consist of an unclosed set. This means that there are terms in these equations (primarily the transport terms) that are not well defined. Similar equations in non-turbulent flows are limited to transport terms such as the viscosity, heat transfer coefficient, etc. which are measurable quantities and properties of the fluid itself. With them, the equations become closed. The unfortunate thing is that the corresponding transport terms in turbulent flows are not properties of the fluid, but functions of the flow. They are complex, and require measurements and iterative fits to construct them. And once they are constructed they only serve to simulate flows like the one from which they were constructed. In simple terms: turbulent flow equations are not predictive. They are "postdictive". We need to have the solution before we can construct it. Hence the uncertainty in the predictions has to be substantial, and validation is essential. And the simple fact is that these models have not been validated through a sufficiently long time to make them dependable instruments.

As a sideline, the fundamental equations of turbulence require a function relating two second order tensors. Generally, that "function" is simplified by being dependent on two parameters which are adjusted to yield agreement with the results. Solomon, 2007, quotes in part Freeman Dyson while considering the use of empirical parameters in a set of equations: "… Johnny von Neumann [the co-creator of game theory] used to say, with four parameters I can fit an elephant, and with five I can make him wiggle his trunk.' …"

Together with the above complication – which is inherent to the nature of atmospheric flows -climate prediction models also need inclusion of the effect of numerous components such as oceans, clouds, sun, forests, power plants, crops, transportation, etc. all of which can be approximated but only to some extent and some (like cloud formation, variation of the sun intensity) are not even included. See for instance Lahsen 2005; Tennekes 2009; Pielke 2008; Green and Armstrong 2008; Morahasy 2009; and Miskolczi 2007 amongst many for further exhibit of the limitations of these models. Mikoslczi 2007 considered a semi-infinite atmosphere (in lieu of a bounded atmosphere) obtaining quite different results. Lahsen 2005, presents a fresh perspective on "seductive simulations" a challenge for all us in the business of generating numerical simulations.

Validity of the Surface Temperature Data

Anthony Watts (www.surfacestations.org) has become the key investigator of the accuracy of the surface stations in the continental US. It must be realized that many of these have been relocated during their lifetime, some have had structures, parking lots, equipment or other objects added in their proximity compromising any estimates of trends. As a matter of interest, stations have been found to be near the exhaust of air conditioners, reflecting surfaces, aircraft exhaust, and even with a light bulb next to the thermometers. The stations surveyed have been graded according to their expected uncertainties. To date 854 of the 1221 stations in the USHCN network have been visited and almost all of them were available for rating. Of those rated, more than 2/3 have uncertainties above 2 C; and only 11 % have uncertainties under 1 C. This is not acceptable.

McKitrick 2004? made an interesting comparison between the global mean year surface temperature anomalies and the number of stations used in the sample.(Refer to McKitrick and Michaels 2007). Figure 6 shows a fascinating increase in temperature as the number of stations available decreased. Certainly, changing the sample could well be affecting the corresponding mean global anomalies, adding serious questions on the validity of the data.

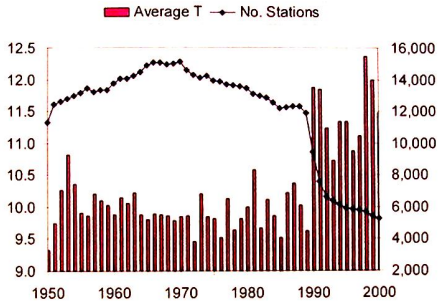

Figure 6: Global Temperature vs. Number of Stations

Goldstein 2002, might have been amongst the first comparing temperature trends for selected stations in rural and urban areas. In general the rural data showed no evidence of warming, while the urban did. McIntyre 2007 compared more recent data for clearly rural and major cities. Figure 7 shows the data. "Major" cities were those with identified stadiums or similar type of structure. Any anthropogenic global warming should be seen rather evenly throughout rural stations as well but the data do not demonstrate that. Interestingly Christy et al. 2006 compared the rate of temperature

increase in various counties in California. They found that the rates increased close to linearly with population number, also suggesting warming effects by other than anthropogenic CO2.

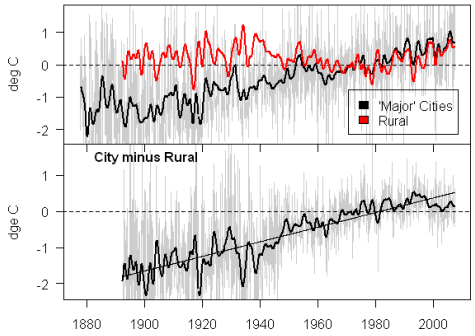

Figure 7: Rural and "Major" Cities Temperature

Temperatures have also been recorded in the atmosphere. The most reliable set is reported by Christy and colleagues at the University of Alabama. In the presence of warming due to CO2, there should also be an increase in temperature in the lower atmosphere. Figures 8 does not exhibit that, adding further question as to the reliability of the global warming inference of some of the surface temperature data.

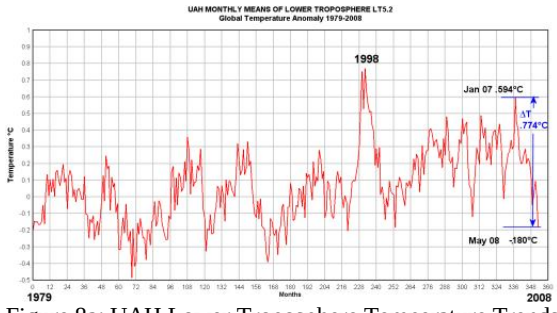

Figure 8a: UAH Lower Troposphere Temperature Trends

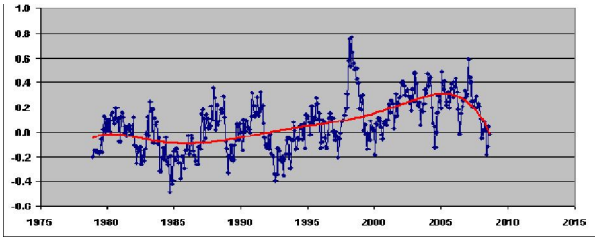

Figure 8b: UAH Lower Troposphere with Recent Cooling Trend as per Monckton 2008

It must be added that there is currently sufficient data demonstrating that indeed we are now in a cooling mode – of course unpredicted by CO2 global warming effect models. See for instance Figure 9, from Carter 2008

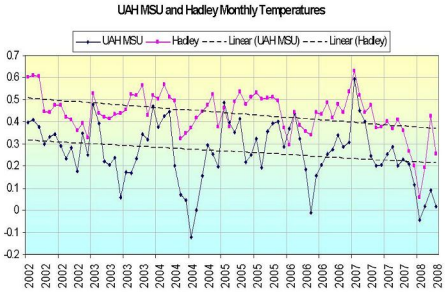

Figure 9: Comparison of Lower Troposphere and Surface Temperatures

Parentheticaly, Essex et al. 2007 are amongst those that very justifiably question the concept of using a single measure such as temperature to quantify warming. But even without addressing that there already are considerable uncertainties on the global temperatures reported.

Temperature and CO2 relationships

The trends shown in figure 5, based on various proxies, exhibit what has been called the "hockey stick" and have been used to validate the relationship between CO2 and temperature. There has been extreme controversy with the "hockey stick". It led to a congressional committee chaired by Wegman et al. 2006 reporting major concern with the integrity of the work leading to the "hockey stick". Essex and McKitrick 2002 had already clearly demonstrated the fallacy of using correlating functions based on a limited set of data with simultaneous temperature and proxy values as a means to extrapolate.

Figure 5 furthermore includes temperature proxies based on the dimensions of tree rings. Tree ring proxies introduce great uncertainty as tree growth is not solely dependent on temperature. Loehle and McCulloch 2008 used various proxies from eighteen 2000-year-long proxy temperature series from all around the world but excluded tree ring data. Their results are shown in figure 10, and show no correlation with the gradual increase in CO2 concentration during recent years. (The bottom and lower curves represent the data uncertainty.)

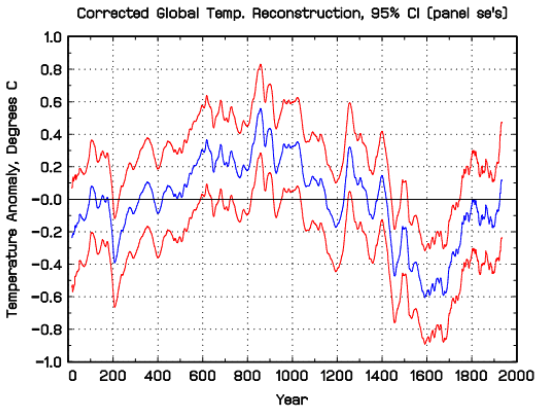

Figure 10: Reconstructed Data From 18 sets of Proxy Data Excluding Tree Rings

One thing that is obvious is that if increases in CO2 are to cause increases in temperature, then there should be at least some data demonstrating a corresponding time lag with changes in CO2 preceding changes in temperature. Such data appears to be missing. Instead there are quite a few examples of the opposite. Kuo et al. 1990 reported statistical correlations between temperature and CO2 concentration. Surprisingly they found a lag between them with temperature preceding CO2. Figure 11 shows proxies in ice cores for CO2 concentration and temperature (in the absence of a fictitious time shift to align the data) clearly demonstrates that changes in temperature occur prior to changes in CO2.

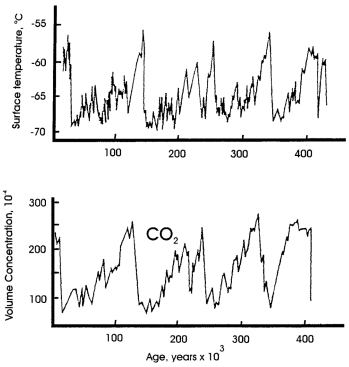

Figure 11: Lag between CO2 and Temperature (Khilyuk & Chilingar 2003)

Segalstad 1996, raised serious questions on the integrity of the CO2 concentration data such as shown in figures 1 and 4. He included references to measurements showing differing trends and values, and also inferring that some of "outliers" (i.e. data not agreeing with trends or expectations) might have been ignored.

Without a doubt amongst those taking on a more comprehensive review of actual (unreconstructed) CO2 data, is Beck 2007. He considered data from 43 different stations taken between 1812 and 2004 (over 90,000 direct chemical measurements). The collected data (Figure 12, from Jaworoski 2007) shows the 5-year averages for the direct chemical measurements. The lower lighter curve is from ice cores and the data points on the far right are for Mauna Loa.

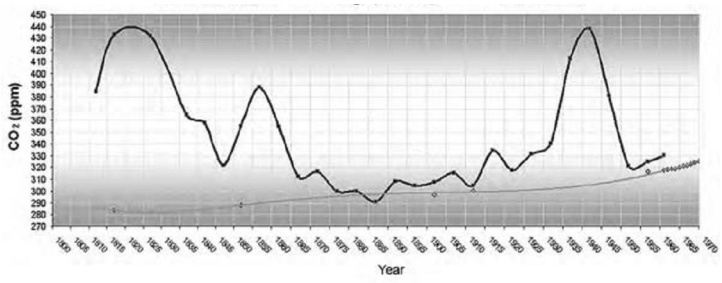

Figure 12: CO2 Concentration 5-year averages

The actual measured data raise great doubt on the credibility of figure 4; and in turn on the inference made on the culpability of anthropogenic CO2. Beck's data from 1900 to 1990, also shows a lag between CO2 concentration changes and temperature with the temperature leading. The revealing part of his plot is noted in Figure 13.

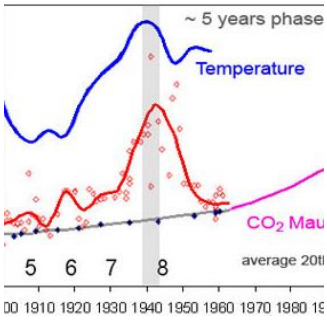

Figure 13: From Beck Exhibiting Temperature Leading CO2

These and other data consistently show CO2 increases following temperature increases. To-date this author has not seen any un-adjusted data demonstrating the reverse. This seriously questions the culpability of CO2 as an anthropogenic global warming element

Other potential causes

If anthropogenic increases in CO2 have not been causing global warming, what then could be potential driver(s)? Two are now proposed, one is short and the other long time scale. Both of these are sufficient to raise doubt on the premise that anthropogenic CO2 is the culpable party. as their effect is noted to be substantial.

Short-time scale Effects

Sunbursts have been recorded for more than three centuries SIDC 2009. There appears to be a periodicity of 20 to 25 years, and with that an accompanying change in solar intensity. The number of sunbursts shows a cycle of 10 to 12 years. There is a change in magnetic polarity as the count reaches zero, hence the actual periodicity is of twice that amount. Soon 2005 is amongst those showing a correlation between solar intensity and solar burst frequency on climate. Figure 14 (Gregory 2009) compares temperature anomalies with solar intensity cycle length (half of the periodicity due to a shift of magnetic polarity) and with CO2 concentration. Rather convincing on the relevance of solar activity on temperature; and the likely minor effect of CO2. (Robertson et al. 2007 also make comparison with world hydrocarbon use, again showing lack of correlation.)

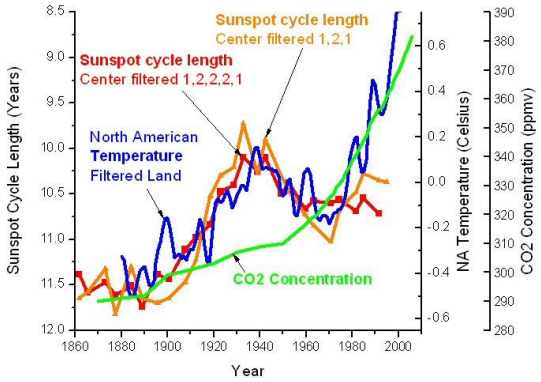

Figure 14: Comparison of Solar Cycle Length Temperature and CO2 Concentration

The 25 year periodicity is also found on the catch of fish in the arctic regions (Papineau 2002); on the floods in African rivers and lake Victoria levels (Alexander et al. 2007), ocean surface temperature and production of salmon (Manuta et al. 1997) and even in the media reaction to presumed ice ages and global warming eras. (Anderson and Gainor 2006)

The relationship of climate (and temperature) on solar activity is obvious. What is not clear is the mechanism that causes that. To date the models used to suggest CO2's culpability do not properly account for cloud formation or solar activity.

Svensmark, H. and N. Calder , 2007 provided a very realistic (but controversial to some) explanation for the relationship between solar intensity variations and climate. The link is the impact of the varying solar wind on the incoming cosmic radiation coming from outside the solar system. As solar intensity increases, the intensity of the incoming galactic cosmic rays decreases. The charged particles act as seeding agents for the lower level clouds, which in turn lead to warming trends. Svensmark and his colleagues have simulated some of these exchanges in laboratory experiments. (See also Shaviv 2003, Shaviv 2005, Svensmark and Friis-Christensen 1997). Figure 15 from Svensmark and Friis-Christensen 2007 exhibit the relationship between temperatures in the troposphere and cosmic rays. The lower plot eliminated effects from El Nino and other trends. They also present comparison of cosmic radiation and ocean temperatures. These exhibit even stronger correlation.

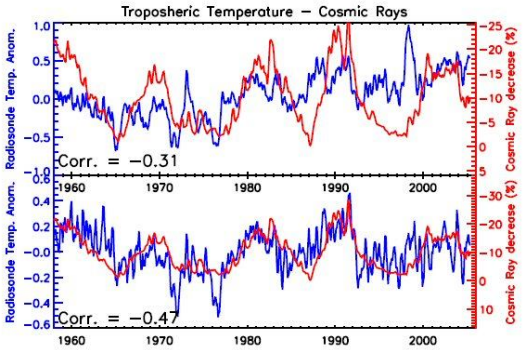

Figure 15: Temperatures in the Troposphere and Cosmic Ray Changes

Comparison of proxies of cosmic ray intensities and temperature for periods long before our recent industrial revolution give further credibility to the mechanism proposed. .

Perry 2007 proposes the following links: the solar irradiance (TSI) modulates the galactic cosmic rays (GCR); the GCRs ionize the atmosphere and increase cloud formation and its resulting albedo; when the TSI is low in its cycle the flux of GCR is high, cloudiness increases, and cooler ocean temperature anomalies result which then affect atmospheric flow patterns and ultimately precipitation inland with some notable time lags. Perry uses a geomagnetic index and compares it with the Mississippi river flow suggesting an approximate 34-year lag. He proposes that the ocean conveyor belts are the carriers of the solar signal, and hence the lag should be different in other locations of the world, which in turn he demonstrates.

Figure 16 shows parts of the latest sun cycle. The very low number now encountered suggests the potential of considerable cooling. This has been predicted for a few years, and now taking on a more acceptable position.

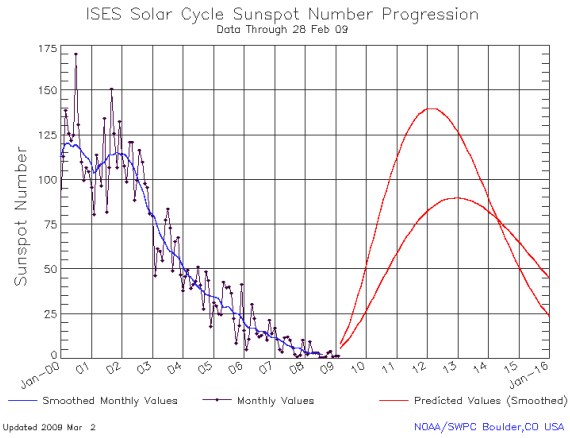

Figure 16: Recent Solar Cycle Sunspot Number

Archibald 2008 presents an excellent overview on the dependence of climate and temperature on solar activity, as well as notable predictions for extensive cooling in the future years. However, by the same logic that the increasing temperatures of a few years back gave incorrect "validation" to global warming effects one must recognize that the same limitations apply to conclusions about the present cooling trends. Unfortunately we as humans live short lives when compared to the larger astronomical scales. And they might also have a dramatic effect on climate.

Large time scale effects

Copernicus (mid 1500's), Kepler (early 1600's), Newton (1687), d'Alembert (1754), Le Verrier (late 1800's), and Pilgrim (early 1920's) collectively determined that-the earth has specific periodicities in its trajectory around the sun: 100K years in its eccentricity, 41K in the tilt of the axis of rotation, and 22K years for the precession of the axis. .Milankovitch as early as 1914 claimed he could predict ice ages through these periodicities. This was met with incredible controversy, but his work was finally published in 1941, giving rise to more criticism and gradually as time went on acquiring more credibility. For more detail see the descriptive text by Imbrie and Imbrie 1986.

These periodicities are clearly seen in the temperature proxies taken from cores in the Indian Ocean, figure 17. The plot consists of proxies of temperature for various depths, or years back. The 100thousand periodicity is self evident.

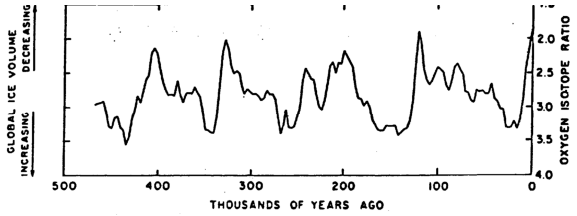

Figure 17: 500,000 year span isotopic measurements Indian Ocean Core

Muller and McDonald did a spectral analysis for the now classic Vostok ice core, as noted in Figure 18. The 100thousand and a 41thousand periodicities (Figure 19) are a clear demonstration of climate changes due to something quite different than anthropogenic CO2 global warming.

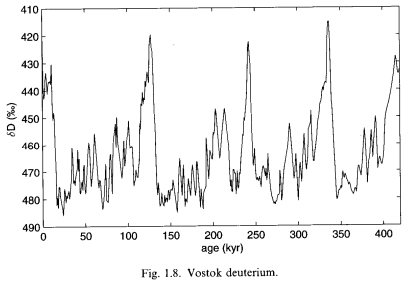

Fig. 1.8. Vostok deuterium.

Figure 18: Vostok ice core temperature proxies

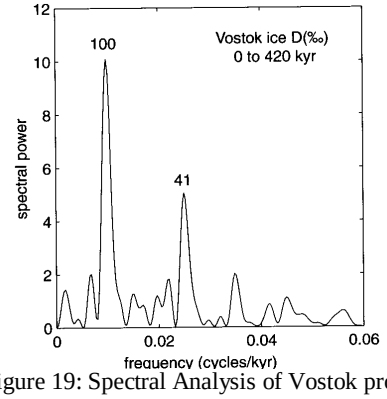

Figure 19: Spectral Analysis of Vostok proxies

Closure

There still is no convincing closure. Questions remain on phenomena which could affect our climate. Amongst these are the decreasing magnetic field of the earth; ocean storage and transport processes; the changes in the magnetic polarity of our sun and our earth; heat transfer from the core of our earth; and major astronomical dynamics (including the motion of our own solar system into and out of different locations within its own milky way galaxy)

What is clear is that:

- the predictive computer models have not passed the test of validation
- there are inherent uncertainties in surface temperature data
- the IPCC reconstructed temperatures have limited credibility
- there is limited credence of the CO2 concentrations derived from ice core measurements
- measured phase lags exhibit changes in temperature leading CO2 concentration changes
- most temperatures follow solar intensity more faithfully than CO2

It is logical to expect that natural phenomena most probably overwhelm any potential impact from the relatively small emissions of anthropogenic and life-giving CO2.

- The concentration of CO2 is for all practical insignificant. (380ppm is 0.038 %). It is as significant as advancing 2 ft. while attempting to go one mile.
- Most of the emissions of CO2 are through natural effects; less than 3.5% is anthropogenic
- Water vapor is responsible for close to 95% of the greenhouse effect; oceans, volcanoes, plants, animals for approximately 4.7%
- The effect of adding CO2 to the atmosphere has a diminishing impact, as noted in Figure 20 reported by Archibald 2008:

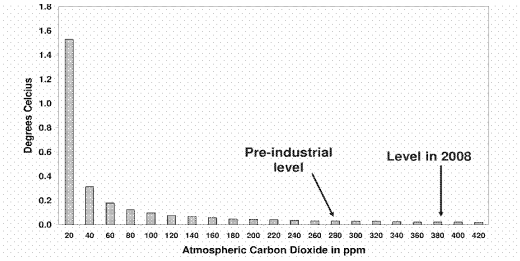

Figure 20: Diminishing Impact of Increasing CO2 Concentrations

When judging the culpability of anthropogenic CO2 as a global warming agent we find a hung jury; or that the jury is not yet out. How would the reader vote were he/she to now be sitting in the jurors' box?

Acknowledgements

The author with some tremor stands on the shoulders of giants. Some were participants in the IPCC, most have recognized expertise in the basic disciplines, and some – like the author – moved from believing on the warming potential of anthropogenic CO2 to the point of asking questions and challenging others to do likewise and avoiding to politicize science (instead to encourage politics to be affected by science). The author also has been serving as a volunteer lecturer under the ASHRAE DL program. He acknowledges with gratitude the many groups that elected the global warming presentation, and provided probing questions that led to mutual growth in knowledge.

References:

Alexander, W.J.R., F. Bailey, D.B. Bredenkamp, A. van der Merwe, and N. Willemse, 2007. "Linkages between solar activity, climate predictability and water resource development" J. of the South African Institution of Civil Engineering, V.49, No 2, pp 32-44

Anderson, R.W. and D. Gainor, 2006, "Fire and Ice" Business and Media Institute, May 17 Special Report www.businessandmedia.org/specialreports/2006/fireandice/FireandIce.pdf , pp 1-18, accessed April 2009

Archibald, D, 2008, "Solar Cycle 24: Implications for the United States" International Conference on Climate Change, March 2008

Arrhenius, Svante, 1896, "On the influence of carbonic acid in the air upon temperature in the ground" Philos. Magazine, 41, 237-276

Beck, E.G., 2007, "180 Years of atmospheric CO2 Gas Analysis by Chemical Methods", Energy and Environment, V. 18 No. 2, 2007

Callendar, Guy S., 1938, "The Artificial Production of Carbon Dioxide and its influence on temperature", Q.J.R. Meteorological Society, 64, 223-237

Carter,R.M., 2008, "Knock, Knock: Where is the Evidence for Dangerous Human-Caused Global Warming?", Economic Analysis & Policy, V. 38, No 2, pp 177 -202

Charney, J., 1979, chairman, Climate Research Board, 1979, "Carbon Dioxide and Climate: A Scientific Assessment", Washington, DC, National Academy of Science Press.

Christy, J.R.,W.B. Norris, K.Redmond, and K.P. Gallo, 2006, "Methodology and Results of Calculating Central California Surface Temperature Trends: Evidence of human-induced Climate Change?", Journal of Climate V.19, PP 548-563

D'Aleo, J., 2009, "United States and Global Data Integrity Issues" , March 30 2009, http://www.intellicast.com/Community/Content.aspx?a=174 accessed March 2009

Essex, C., B. Andersen and R. McKitrick, 2007, "Does a Global Temperature Exist?", Journal of Non-Equilibrium Thermodynamics, V. 32, No. 1

Essex, C. and R. McKitrick, 2002 Taken by Storm: The Troubled Science, Policy and Politics of Global Warming, Toronto, Key Porter Books

GISS, 2009, Goddard Institute fro Space Studies, data.giss.nasa.gov accessed March 2009

Goldstein, M., 2002, The Complete Idiot's Guide(R): to Weather, Second Edition, 2002

Green, K.C. and J.S. Armstrong, 2008 "Global Warming: Experts' Opinion versus Scientific Forecasts", NCPA Policy Report No. 308, February 2008, ISBN #1-56808-183-9, National Center for Policy Analysis, Dallas, TX

Gregory, K, 2009, "Climate Change Science", www.friendsofscience.org, March 10, accessed April 2009

Hansen, J.E., G. Russell, D. Rind, P. Stone, A. Lacis, S. Lebedeff, R. Ruedy, and L. Travis, "Efficient Three Dimensional Global Models for Climate Studies: Models I and II.", Monthly Weather Review III, 609-662

Imbrie, J.and K.P. Imbrie, 1986: Ice Ages: Solving the Mystery, Harvard University Press (First Edition, 1979)

IPCC SR 4, 2007, "Climate Change 2007: The Physical Science Basis" contributions of the Working Group I to the Fourth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press

Jaworowski, Z.,2007, "CO2: The Greatest Scientific Scandal of our Time" 21st Century Science & Technology, Spring/Summer 2007, pp 14 - 28

Keeling, C.D. and T.P. Whorf, 2005, "Atmospheric CO2 records from sites in the SIO air sampling network. In Trends: A compendium of Data on Global Change". Carbon Dioxide Information Analysis Center, Oak Ridge National Laboratory, U.S. Department of Energy, Oak Ridge, TN.

Khilyuk, L.F. and G.V. Chilingar, 2003, "Global Warming: Are we Confusing Cause and Effect?", Energy Sources, 25:357-370

Kuo, C, C. Lindberg, and D.J.Thomson, 1990, "Coherence established between carbon dioxide and global temperature" Nature v 343

Lahsen, M,,2005, "Seductive Simulations? Uncertainty Distribution Around Climate Models" Social Studies of Science, V. 35, No.6 December 2005, pp 895-922

Loehle,C. and J.H. McCulloch, 2008, " Correction to: A 2000-Year Global Temperature Reconstruction Based on Non-Tree Ring Proxies" Energy and Environment, v.19, No.1 2008

Manabe, S. and R.T. Wetherald, 1975, "The Effects of Doubling the CO2 concentrations on the Climate of a General Circulation Model", Journal Atmospheric Science, 32, 3-15

Manabe, S. and R.J. Stouffer, 1980, "Sensitivity of a Global Climate Model to an Increase of CO2 Concentration in the Atmosphere." Journal of Geophysical Research 85:5529-5554

Manuta, N.J., S.R. Hare, Y. Zhang, J.M. Wallace and R.C. Francis, 1997 "A Pacific decadal climate oscillation with impacts on salmon" Bulletin of the American Meteorological Society, Vol. 78, pp 1069-1079

Marsh, N.D. and H.Svensmark, "Low Cloud Properties Influenced by Cosmic Rays"

McIntyre, S., 2007, "Trends in Peterson 2003" August 4th, 2007, http://www.climateaudit.org/?p=1859, accessed March 2009

McKitrick, R., 2004? "The Graph of Temperature vs. Number of Stations" http://www.uoguelph.ca/~rmckitri/research/nvst.html, accessed March 2009

McKitrick, R.R. and P.J. Michaels (2007), Quantifying the influence of anthropogenic surface processes and inhomogeneities on gridded global climate data, J. Geophys. Res., 112, D24S09,

Milankovitch, M., 1941, "Canon of Insolation and the Ice-Age Problem" Israel Program for Scientific Translations, Jerusalem, 1969.

Miskolczi, F.M., 2007, "Greenhouse effect in semi-transparent planetary atmospheres" Quarterly Journal of the Hungarian Meteorological Service, V.111, No.1, January-March, pp 1-40

Monckton, C., 2008, "Global Warming Has Stopped". October 31, SPPI http://scienceandpublicpolicy.org/images/stories/papers/monckton/monckton-global_warming_has_stopped.pdf

Morahasy, J., 2009, "No Scientific Forecasts to Support Global Warming" http://jennifermarohasy.com/blog/2009/01/no-scientific-forecasts-to-support-global-warming/ accessed February 2009

Muller, R.A. and G.J. MacDonald, 2000 Ice Ages and Astronomical Causes Springer, 2000

Papineau, John, c2002, "Understanding Alaska's Climate Variation" NWS, Anchorage, AK

Perry, C.A., 2007, "Evidence for a physical linkage between galactic cosmic rays and regional climate time series" Science Direct, Advances in Space Research, Elsevier www.sciencedirect.com

Pielke, R., 2008, "Scientists Advocating for Action are Overselling the Predictive Capabilities of Climate Models" National Post, June 17, 2008 network.nationalpost.com/np/blogs/fpcomment/archive/2008/06/17/overheated-claims.aspx

Robinson, A.B., N.E. Robinson and W. Soon, 2007, "Environmental Effects of Increased Carbon Dioxide", Journal of American Physicians and Surgeons, 12, pp 79-90

Segalstad, T.V., 1996, "Carbon cycle modelling and the residence time of natural and anthropogenic atmospheric CO2:" www.phys.uu.nl/~nvdelden/Segalstad.pdf accessed March 2009

Shaviv, N. J., 2005. "Cosmic rays and climate". PhysicaPlus, no. 5

Shaviv, N.J., 2003 "The spiral structure of the Milky Way, cosmic rays, and ice age epochs on Earth", New Astronomy 8 pp 39–77

SIDC, 2009, Solar Influences Data Analysis Center, Royal Observatory of Belgium, www.sidc.be , accessed April 2009

Solomon, L., 2007, "Physicist Freeman Dyson knows from long experience that models containing numerous fudge factors are worthless", Financial Post, April 5, 2007 www.canada.com/nationalpost/news/story.html?id=985641c9-8594-43c2-802d-947d65555e8e; accessed 2008.

Soon, W., 2005, "Variable solar irradiance as a plausible agent for multidecadal variations in the Arctic-wide surface air temperature record of the past 130 years" Geophysical Research Letters, V32, L16712

Svensmark, H. and N. Calder , 2007 "The Chilling Stars – a New Theory of Climate Change", Ikon Books Ltd. Cambridge, UK (ISBN-10: 1-84046-815-7)

Svensmark, H., & E. Friis-Christensen, 1997. "Variation of cosmic ray flux and global cloud coverage – a missing link in solar-climate relationships.", Journal of Atmospheric and Solar-Terrestrial Physics, v. 59, p. 1225-32

Svensmark, H., & E.Friis-Christensen, 2007, "Reply to Lockwood and Fröhlich –The persistent role of the Sun in climate forcing", Danish National Space Center Scientific Report 3/2007, ISBN-10 87-91694-14-0, ISBN-13 978-87-91694-14-1, http://www.space.dtu.dk

Tans, Peter, 2009, in NOAAESRL (www.esrl.noaa.gov.gmdcggtrends), accessed March 2009

Tennekes, H.,2009, "Real Climate Suffers from Foggy Perception" http://climatesci.org/2009/01/29/real-climate-suffers-from-foggy-perception-by-henk-tennekes/

Wegman,E.J., D.W.Scott and Y.H. Said, 2006, "Ad Hoc Committee Report on the 'Hockey Stick' Global Climate Reconstruction" http://energycommerce.house.gov/108/home/07142006_Wegman_Report.pdf

Postcript

While the author has done research in turbulent flows, he has never received any funds to address the issue of global warming. The above comments are result careful asking of questions and contesting conclusions. And this exactly a message conveyed to engineering students: "always question the data". It is also proper to note that the author believes in creation by a creator God, and fully embraces the Genesis model. In time insight will be gained into the apparent discord with the 100 thousands of years implied by some of the core data.

LIST OF FIGURES;