CLIMATE CHANGE RECONSIDERED II – PHYSICAL SCIENCE

by

Martin Hertzberg

Reprinted from

ENERGY &
ENVIRONMENT

VOLUME 26 No. 3 2015

MULTI-SCIENCE PUBLISHING CO. LTD.
26 Eldon Way, Hockley, Essex SS5 4AD, United Kingdom

CLIMATE CHANGE RECONSIDERED II – PHYSICAL SCIENCE

Martin Hertzberg
ruthhertzberg@msn.com

When the theory of Anthropogenic Global Warming (AGW) was first presented to the scientific community several decades ago, S. Fred Singer was one of the earliest scientists to challenge it. The theory supposed that human emission of CO2 from fossil combustion was causing an increase in the atmospheric CO2 concentration and a concomitant increase in global temperature via the greenhouse effect. In recent decades however, even as the atmospheric CO2 increased, temperatures remained flat, or even decreased slightly. That observation appeared to contradict the AGW theory. In response, the AGW advocates shifted their focus to "climate change", arguing that human activity was causing "climate disruption" in the form of more hurricanes, blizzards, droughts, freezes, etc.

As he had earlier, Singer evaluated the available data, and with the cooperation of a distinguished group of scientists, prepared the report being reviewed here.

Findings

The report was recently issued by the Nongovernmental International Panel on Climate Change (NIPCC), and is available from the Heartland Institute. It was coauthored by Craig D. Idso, Robert M. Carter, and S. Fred Singer together with an equally distinguished group of scientists who served as lead authors, contributing authors, and reviewers. It is a well documented and thoroughly researched analysis of the hypothesis put forth by the Intergovernmental Panel on Climate Change (IPCC) that recent increases in atmospheric CO2 caused by human emissions from fossil fuel combustion is causing, or will cause, dangerous global warming and climate change. Warming was observed in the late twentieth century as atmospheric CO2 was measured to increase. According to the IPCC paradigm increases in atmospheric CO2 precede, and then cause, parallel increases in temperature.

A large number of governments, professional societies, scientific journals, journalists, the print media, the TV media, and even some corporations, generally accept the validity of that IPCC paradigm. Accordingly, there has been a concerted effort to reduce CO2 emissions, or to tax such emissions, or to replace fossil combustion sources by alternative energy sources. The NIPCC report being reviewed here documents the observations and measurements that contradict that paradigm.

While NIPCC concedes that CO2 is a "mild greenhouse gas" that might cause some mild heating, such heating far from representing a "climate crisis" would actually be beneficial to mankind. The Global Climate Models produced by the IPCC have

predicted drastic warming up to 6 C for decades to come. Those predictions have been falsified by the data. In fact, during the past 17 years, even as atmospheric CO2 concentrations have increased by 8% , the Earth's average temperature has not increased. While prior to 1995 there was a parallelism between the CO2 increase and temperature rise, such a parallelism does not prove causation, and in fact that parallelism has ceased since the mid- 1990's. In geologic time, the Earth's temperature has oscillated naturally between +4C and -6 C relative to current values. Those fluctuations are driven by glacial coolings and interglacial warmings caused mainly by changes in the ellipticity of the Earth's orbit. The Earth's overall warming since 1860 corresponds to its recovery from the Little Ice Age as modulated by ocean-atmosphere oscillations and variations in solar activity.

Even more telling is the CO2 data from the Vostok ice core measurements as obtained from air bubbles trapped in the ice [1]. They show a parallelism between CO2 and temperature with minima in CO2 occurring near the lowest temperatures of a glacial cooling. The maxima in CO2 occur near the highest temperatures of a glacial warming. But if one analyses the data carefully, one finds that the changes in temperature always precede the changes in CO2 by several hundred to a thousand years. The same precedence is observed during the most recent glacial warming cycle that we are currently experiencing. Those observations conclusively falsify the IPCC theory that CO2 is the primary forcing agent for temperature changes. Quite the contrary, it is the temperature changes that are the cause of the CO2 changes. Even shorter term variations in CO2 over the last several decades also display somewhat similar behavior with sea surface temperature changes inevitably leading to CO2 changes [2]. There is still more to be learned from such data and we will return to them again.

The NIPCC report justifiably criticizes the IPCC theory of climate change for its complete neglect of "solar forcing" caused by variations in solar activity. There are abundant examples of solar influence. The Little Ice Age occurred during a period of very low solar activity (the Maunder Minimum). The Medieval Warm Period corresponded to a period of enhanced solar activity. While the NIPCC report discusses this question mainly in terms of changes in the Total Solar Insolation, there is abundant data that shows that much more is involved. Currently, we are experiencing a very quiet Sun and solar physicists have predicted that such minimal solar activity will last for several decades into the future. It is expected to correlate with planetary cooling in the future.

Other observations that can be characterized as "climate change" involve changes in the structure of the Cryosphere, the Hydrosphere, and Extreme Weather Events.

As for the cryosphere, satellite measurements that first started in 1979 show a global sea ice area coverage that has been essentially unchanged for the last thirty years. Changes in temperature, snowfall extent, ice flow speed, glacial extent, and iceberg calving, all lie within the limits of natural climactic variability. Ice area shrinkage during the Arctic summers is offset by the growth in the Antarctic, and Arctic ice is rapidly restored during Arctic winter. Mountain glaciers around the world show a wide variety of responses to local climate changes and do not respond to global climate temperature changes in a simple way.

As for the hydrosphere, the average rate of sea level rise has been between 1 and 2 mm per year for the last century. That rate is considerably lower that it had been in the past as the Earth transitioned from the last glacial cooling to the current interglacial warming. Rates of global sea-level change vary in complex ways and show neither any recent acceleration nor any relationship to CO2 emissions.

There is little evidence of increased precipitation in recent decades, and monsoon precipitation did not become more intense during recent times. South American and Asian monsoons were more active in the Little Ice Age and less active during the Medieval Warm period. There is no linkage between the activity in the hydrosphere and CO2 emissions. The relationship between droughts and the late twentieth century warming is weak. Droughts were present in both the Little Ice Age and the Medieval Warm Period.

As to extreme weather events claimed to be occurring with greater intensity and frequency because of the increase in atmospheric CO2, the data do not support that claim. There has been no recent increase in the intensity or frequency of hurricanes or typhoons either globally or in any specific ocean area. Nor has there been any significant increase in stormy weather or precipitation frequency or magnitude.

The NIPCC report also contains an extensive review and evaluation of the Global Climate Models that the IPCC has used to forecast future conditions. Those simplified models do not adequately account for clouds, water vapor, precipitation, ocean currents, sea ice and permafrost. Their models predict large temperature increases that are not observed. The models also predict a thermal hot spot that should exist in the upper troposphere in tropical regions. No such hot spot is observed. The NIPPC report concludes:

> "……the current generation of Global Climate Models are unable to make accurate projections of climactic events even ten years ahead, let alone the 100-year period that has been adopted by policy planners. The output of such models should therefore not be used to guide public policy formulation until they have been validated and shown to have predictive value."

It is noteworthy to compare that NIPPC conclusion with this author's conclusion from the past. In a poster session paper [3] presented in 1994, it was argued that:

> *"…..water vapor plays such a dominant role that any greenhouse 'runaway' predicted for the Earth's temperature should already have occurred. But since the ocean's water vapor flux increases exponentially with temperature, the increase in cloud cover albedo, inevitably limits or 'buffers' the system.…..*
>
> *"It is implausible to expect that small changes in the concentration of any minor atmospheric constituent such as carbon dioxide, can significantly influence that radiative equilibrium (i. e. between the Earth and the Sun) despite the fact that CO2 plays a major role in the biosphere. The most significant component in the radiative equilibrium process is water: as a homogeneous absorbing and emitting vapor; in its heat transport by evaporation and condensation; as clouds, snow, and ice cover, which have a major effect on the albedo; and as the enormous circulating mass of liquid ocean, whose heat capacity, and mass/energy transport with the atmosphere dominate the Earth's weather…….…….*

> *"Many interacting regions, both homogeneous and heterogeneous, are involved in the complex radiative balance. Unverified models do not realistically represent that balance, and it would be absurd to base public policy decisions on them."*

While the NIPCC report states that the models should not be used for public policy decisions. this author argued that it would be absurd to do so.

Omissions

There are a few significant omissions in the NIPCC report. The report's first finding is that "Atmospheric carbon dioxide (CO2) is a mild greenhouse gas ..." That is taken as a "given" without any definition of the term "greenhouse gas" anywhere in the paper and without a clear description of the physical processes by which a greenhouse gas' presence in the atmosphere leads to warming. A recent listing of greenhouse gas definitions from various government agencies, scientific organizations, and universities shows 18 of them [4].

A greenhouse is a plastic or glass enclosure which is warmed naturally by sunlight and within which plants are grown. An erroneous theory about how it works, which is echoed in several of the 18 definitions, is that visible sunlight is transmitted into the enclosure through the transparent glass. As the ground is heated by absorption of sunlight, it warms and emits IR radiation.

The glass is opaque to that IR radiation, which cannot pass outward through the glass, and is thus retained within the enclosure and heats it further. Several definitions refer to the radiation as being "trapped". It is argued that atmospheric gases that absorb CO2 thus trap radiation within the Earth and its atmosphere analogous to the glass top of the greenhouse.

One problem with that proposed mechanism is that if one replaces the glass top of the enclosure with an IR transmitting window, the enclosure warms up to the same extent. It is the presence of the enclosure itself that causes the warming. It is the heat that is generated by absorbed sunlight that is trapped and not radiation. In the absence of the enclosure, the warmed air near the ground would rise by buoyancy to be replaced by cooler air from the surroundings thus cooling it. That natural convective cooling flow is suppressed by the enclosure. That is the same process that generates a cooling sea breeze on a beach as cooler air from the ocean replaces the rising warmer air over the land.

To argue, as some of those 18 definitions do, that the open gaseous atmosphere is confining like the top of an enclosure and that it retains heat, is absurd. It is that same gaseous atmosphere that is responsible for the convective cooling that occurs in the absence of an enclosure.

Another common theme among those 18 is that the greenhouse gases in the atmosphere "act as a blanket" that keeps the Earth warm. One can only suggest that those who really believe that should step out naked in a very cold evening and see how well the blanket of atmospheric greenhouse gases keeps them warm. The warm air near their bodies will rise by buoyancy and will be rapidly replaced by cold air from the surroundings as they freeze to death. The blanket is an insulating, flexible, portable enclosure that reduces the rate at which their body heat is lost to the surroundings. As

before, the gaseous atmosphere is not retaining heat but is an agent for cooling by natural convection.

The most prevalent definition or heating mechanism involves what is referred to as "back radiation". Greenhouse gases absorb some of the IR radiation that the Earth's surface radiates toward free space after it is heated by solar radiation. According to the Environmental Protection Agency, "reradiated energy in the IR portion of the spectrum is trapped within the atmosphere keeping the surface temperature warm." This mechanism has the colder atmosphere blithely and spontaneously emitting radiant energy toward the warmer surface. That energy is supposed to be absorbed by the Earth's surface and heat it further. Thus the warmer surface should get even warmer by absorbing energy from a colder source: in direct violation of the Second Law of Thermodynamics.

To counteract such objections, a new, creative definition of the greenhouse theory has been proposed. It argues that IR absorbing gases hinder radiative transfer from the earth surface upwards helping to keep the surface warmer, more than it would otherwise be in the absence of those absorbing gases. That definition ignores the fact that those gases themselves emit far more radiation to free space near O K than they receive from the surface. Overall the radiation losses to free space from the earth surface and its atmosphere are the same as they would be in the absence of the absorbing gas. In one case the cooling is a one step process, in the other it is a two step process.

The NIPCC report does not tell us which of the above greenhouse gas definitions it uses nor which warming mechanism it accepts.

The other important omission in the NIPCC report deals with the question of the origin of recent increases in CO2. Are they natural or human caused by fossil combustion? According to the IPCC paradigm, they are human caused, and they will result in dangerous global warming and climate change. What is the evidence for and against that thesis?

The Vostok ice-core data was used by NIPCC to show that temperature changes precede atmospheric CO2 changes and are thus the cause of CO2 increases and not their effect. At the maximum in glacial coolings atmospheric CO2 concentrations are as low as 190 ppm. At the peak of the glacial warmings that follow, CO2 is as high as 290 ppm. The logical question to ask is where did that additional 100 ppm come from at a time when human emission from fossil combustion was essentially nil. One must concede that many complex changes occur when CO2 is trapped in ice for centuries so that those absolute values may not be taken too seriously. But the relative values are probably more accurate and they reflect a near doubling of atmospheric CO2 during glacial warmings. Again, that CO2 increase could not have come from human emission. The most likely source is the Earth's oceans. Recent measurements have shown that the source of the current increase in CO2 is outgassing from the Southern Tropical Oceans and that human emission mainly at mid-latitudes dissolves rapidly in the colder oceans and circulates within all the oceans. The correlation in recent decades of the annual CO2 increases with changes in sea surface temperatures supports that argument [2].

Like the greenhouse gas question, this issue of whether the origin of atmospheric

CO2 is natural or man-made, is a make or break issue for the IPCC paradigm. It should not have been ignored.

Another area of neglect in the report deals with its treatment of solar forcing. While the report discusses the changes in total solar insolation that accompany variations in solar activity, such changes are not the major factor in how those changes influence weather and climate. Recent satellite data has shown that the Earth's cloud cover underwent a modulation in phase with the cosmic ray flux during recent solar cycles. A similar modulation is observed for the average temperature. Svensmark [5] has argued that the mechanism for those correlations involves a decrease in cosmic ray flux during periods of high solar activity when the "solar wind" and magnetic activity shield the earth from cosmic rays. The reduction in cosmic ray flux results in a reduction of nucleating agents for cloud formation, a decrease in the Earth's albedo, an increase in absorptivity of solar radiation, and a corresponding increase in the Earth's temperature. The opposite occurs during low solar activity, when the cosmic ray flux into the atmosphere is high, nucleating agents are plentiful, increased cloudiness increases the albedo, resulting in a cooling of the Earth. The effect is most significant for low clouds at atmospheric temperatures that are too high for the spontaneous nucleation of liquid droplets. Droplet and cloud formation is then rate limited by the concentration of nucleating agents.

In balance though, despite the above omissions, the NIPCC report is a major contribution to our understanding and can play a major role in finally ending the ignorant consensus that atmospheric CO2 is the prime mover of weather and climate.

Reality

Our common experience with hurricanes, tornadoes, thunderstorms, blizzards, floods, tsunamis, and volcanic eruptions should lead to the common sense conclusion that weather and climate are controlled by natural laws on an enormous scale that dwarf human activity. Those laws engender forces and motions in our atmosphere and oceans that are beyond human control. Weather and climate existed long before humans appeared on Earth, and will continue to exist in the same way long after we are gone.

Those forces and motions are driven by the following: First, the motions of the Earth relative to the Sun: the periodic changes in its elliptical orbit, its rotation about its polar axis, changes in the tilt of that axis, and the precession of that axis. Second, the variation in solar activity that influences the radiant energy reaching the Earth and modulates cosmic ray activity which controls cloudiness. Third, the distribution of land and water on the Earth's surface; which controls its temperature distribution, moisture availability, monsoon effects, hurricanes, and other storm tracks. Fourth, the topography of the Earth's surface which causes copious precipitation on the windward side of mountains and aridity on the leeward side. Fifth, the fluid motions within the Earth's oceans that determine moisture availability and ocean surface temperatures (El Nino and La Nina cycles). Sixth, volcanic eruptions that throw large amounts of dust into the atmosphere, increasing the Earth's albedo and periodically blocking portions of solar radiation from reaching the Earth's surface.

Water in all of its forms is a main agent through which those forces operate. It

provides vapor in the atmosphere, heat transport by evaporation and condensation, and the enormous, circulating mass of the ocean whose heat capacity dominates. And finally it provides the cloud, snow, and ice cover that control the radiative balance between the Sun, the Earth, and free space.

While the presence of 0.04 % of CO2 in our atmosphere is essential for life in the biosphere, the notion that such a minor constituent of the atmosphere can control the above forces and motions, is absurd. There is, in fact, not one iota of reliable evidence that it does.

REFERENCES

1. Petit, J. R. et al 1999 "Climate and Atmospheric History of the Past 420,000 years from the Vostok Ice Core, Antarctica". *Nature,* Vol. 399 pp 429 - 436
2. Humlum, E, Sturdahl, K, and Solheim, J. E. 2014 "The phase relationship between atmospheric carbon dioxide and global temperature", *private communication*.
3. Hertzberg, M. and Stott, J. B. 1994 "Greenhouse Warming of the Atmosphere: Constraints on Its Magniture" *25th International Symposium on Combustion, The Combustion Institute*
4. Ball, T., Johnson, C., Hertzberg, M., Olson, J. A., Siddons, A., Anderson, C., Schreuder, H., and O'Sullivan J., 2011 "Slaying the Sky Dragon: Death of the Greenhouse Gas Theory" *Stairway Press*
5. Svensmark, H. 2000 "Cosmic Rays and Earth's Climate" *Space Science Reviews,* Vol. 93, pp 155-166