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FOS RESPONSE TO ENVIRONMENT CANADA'S CO_2 EMISSIONS REDUCTION PLAN

"FOS is dedicated to providing the public with insight into Climate Change"

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Re: Canada Gazette, Part I, Vol. 145, No. 35 — August 27, 2011
Reduction of Carbon Dioxide Emissions from Coal-Fired Generation of Electricity Regulations

1. Introduction and Summary

The proposed *Reduction of Carbon Dioxide Emissions from Coal-Fired Generation of Electricity Regulations* is intended to reduce greenhouse gas (GHG) emissions by approximately 175 Mt CO_2e over the period 2015–2030. The regulations are described at:
http://www.gazette.gc.ca/rp-pr/p1/2011/2011-08-27/html/reg1-eng.html#contact

The present value of the costs of the proposed Regulations is estimated at $8.2 billion. The government estimates the benefit of the reduction in the social cost of carbon (SCC) is $4.3 billion. Canada's share of global CO_2 emissions is 1.8%. The proposed emission reduction represents 0.037% of global emissions averaged over the 16 year period considered by the regulations. The social cost is based on a SCC rate of $25/tonne of CO_2. This estimate is based on global climate change impacts and the projected reduction in SCC is shared globally, whereas the costs of the regulation are borne by Canadians only. The alleged benefits could only be realized if all countries took similar action, which will likely not happen. The actual SCC for Canadians is likely to be negative because there are large benefits of CO_2 emissions due to enhance plant growth and increased crop yields. Also, a slightly warming climate will benefit all Canadians by lower construction and transportation costs, and a more pleasant climate.

The SCC is estimated from alleged damages such as more intense floods and droughts, more extreme weather events and sea level rise. The estimates are based on projections from climate models tracked by the International Panel on Climate Change (IPCC). The central IPCC estimate of climate sensitivity is 3 ^oC for a doubling of the concentration of CO_2 in the atmosphere. The model projections of many key climate parameters do not even remotely correspond to climate observations. In fact, there has been no global warming since 1998, a period of 13 years. A review of the climate science literature suggests that the best estimate of climate sensitivity to a doubling of the CO_2 concentration is about 0.5 ^oC, which is one-sixth of the IPCC estimate.

The climate models utilized by the IPCC assume that recent climate change is caused almost exclusively by GHG emissions and do not include natural causes of climate change. The IPCC mandate is to examine anthropogenic climate change, and their reports ignore a huge body of scientific evidence of natural causes

of climate change. Studies of past climate and solar activity confirm that the Sun is the primary driver of climate. Short term climate is affected by ocean oscillations, which are in turn, driven by the Sun.

The idea that CO_2 emission would cause more hurricanes is based on the projection that the upper atmosphere would warm faster than the surface. But millions of weather balloon radiosonde measurements and satellite observations show that there is insignificant difference in the rate of temperature change of the lower and upper atmospheres, and current hurricane intensity at a 30-year low. Sea level rise has been occurring for thousands of years, with no noticeable cost to humans. Tropical coral islands can grow much faster than the sea level rise, so that the last century has not resulted in a reduction in the area or the number of tropical islands. Warmer temperatures are a major benefit to humans and animals alike. CO_2 is plant food, so CO_2 emissions increase crop yields significantly. The net social cost of a temperature increase is very likely to be negative, (beneficial) rather than positive.

Carbon dioxide emissions are a wonderful by-product of industrialization and energy use. It causes slightly warmer temperatures by about 0.5 ^{o}C at double CO_2, in about 200 years, which would benefit Canadians both by a small temperature effect and by CO_2 plant fertilization. Attempts to reduce CO_2 emissions are counterproductive.

2. Climate Sensitivity to GHG Emissions

Climate model results show that a doubling of CO_2 would cause about a 1.0 ^{o}C increase in global temperatures if clouds, albedo, water vapour and evaporation are held constant. This is the no-feedback temperature response to GHG emissions. Climate models apply large positive feedbacks, mostly due to water vapour and clouds to multiply the no-feedback temperature change three fold, to give an average climate sensitivity of 3.0 ^{o}C. But there is NO EVIDENCE that the feedbacks are positive – on the contrary - there is strong evidence that the feedbacks are negative. This means that an initial temperature change by CO_2 emissions would cause the water vapour distribution, evaporation and clouds to change in a way to reduce the temperature change by allowing more heat to escape to space.

Water vapour is the most important greenhouse gas. Radiative transfer computations show that a uniform 3% increase in water vapour has the same greenhouse effect as a doubling of CO_2.[1]

Climate models do not contain any natural causes of climate change (other than by including slight changes in the solar constant) even though over 1,000 climatologists[2] document significant changes in climate since the last ice age, including the Roman Climate Optimum, the Medieval Warm Period and the Little Ice Age. The warm periods are characterized by increasing human population and developing civilization while the cold periods are characterized by declining populations, famine, disease, and great human suffering. The IPCC models were programmed with large positive feedbacks in an attempt to match 20th century climate change without including natural causes.

The large positive feedbacks programmed into climate models are due to three blunders: too little evaporation response, increasing rather than decreasing water vapour in the upper atmosphere, and positive rather than negative cloud feedback.

Evaporation Response

As temperatures rise, evaporation rates increase. A more vigorous water cycle is a very powerful negative feedback. The evaporation transports surface heat to the upper atmosphere. Satellite-based observations suggest that the response of global evaporation to Earth's warming is near the Clausius-Clapeyron relationship, which is the rate of increase of saturated vapour pressure with temperature. However computer models that are the basis for predictions of dangerous anthropogenic global warming have an evaporation response that is only about one-third the Clausius-Clapeyron relationship.[3]

Water Vapour Response

Climate models are programmed to keep the water vapour amount at a constant fraction of its saturated value (close to unchanged relative humidity) at each level in the atmosphere. This results in the largest contribution to the water vapour feedback occurring in the upper troposphere. But both satellite data and radiosonde databases show that water vapour declines in the upper atmosphere. The amount of water vapour (specific humidity) in the upper atmosphere has declined by 13% since 1950 according to radiosonde measurements. Data are from the NOAA Earth System Research Laboratory. Water vapour declines in the upper atmosphere as temperatures increase, allowing heat to escape to space as longwave radiation.

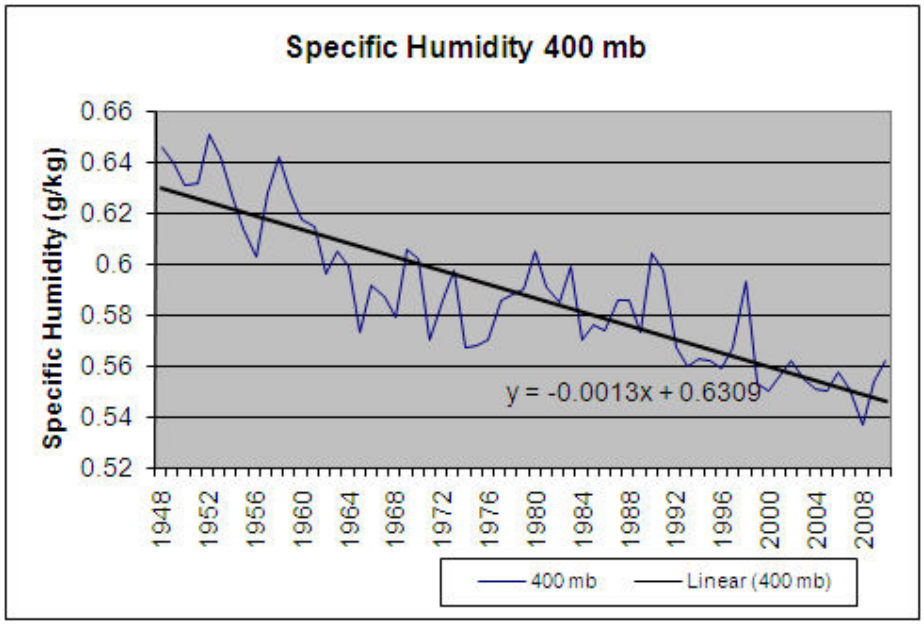


Figure 1.
Specific humidity at the 400 mbar pressure level (about 8 km altitude).

The NASA water vapour project (NVAP) uses multiple satellite sensors to create a standard climate dataset to measure long-term variability of global water vapour. The satellite data also shows declining water vapour. The chart below shows a significant decline in global water vapour in the atmosphere layer from 300 to 500 hPa, about 6 to 9 km altitude.[4]

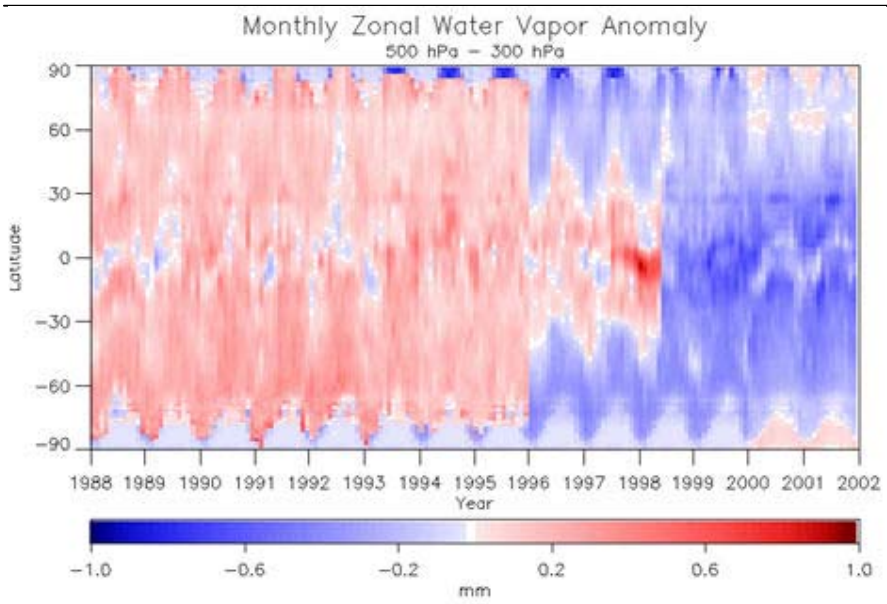


Figure 2.
Global water vapour anomaly in the atmosphere layer from 300 to 500 hPa, about 6 to 9 km altitude.

Model-projected increasing water vapour in the upper atmosphere must necessarily result in an enhanced warming trend in the upper atmosphere over the tropics. But an August 2010 technical paper shows that climate model temperature trends of the mid-troposphere, using 57 runs from 23 climate models, are four times larger than observations from satellites and weather balloons. [5]

The direct humidity measurements, the satellite water vapour measurements and temperature from weather balloons and satellites all confirm that the water vapour content of the upper troposphere does not increase with global warming, so the water vapour feedback is not positive.

Cloud Response

Climate modellers assume that global cloud cover changes only due to a temperature change, called cloud feedback. But cloud changes also cause temperature changes. Clouds can change for many reasons, such as changes to the amount of aerosol particles, which is strongly affected by cosmic rays, weather fronts and ocean circulation changes. The conventional analysis of cloud feedback compares net top-of-atmosphere radiation loss to surface temperatures while falsely assuming only temperature can cause cloud changes. Clouds causing temperature change gives the ***illusion*** of positive cloud feedback, even if negative cloud feedback really exists. These two effects can be identified by the speed of the response. The atmosphere adjusts very rapidly (in a few days) to a temperature change that causes clouds to change. But cloud changes (caused by ocean circulation changes for example) resulting in temperature changes involve time lags of several months due to the large heat capacity of the oceans. A reduction of cloud cover results in more sunlight warming the oceans, which takes a significant lapse of time.

Dr. Roy Spencer has shown that the two effects can be viewed by time lag regression or by phase space plot. Time lag regression analysis shows a huge discrepancy between climate models and satellite data. The observations show that the heat loss to space at three months after a temperature maximum is about four times greater than predicted by the average of 14 climate models.[6]

The figure below is a phase space plot of earth radiation energy balance versus sea surface temperature. The conventional analysis is a best fit line through all the data giving the shallow slope, which assumes all cloud changes are caused by temperature. The correct feedback response is the slope of the linear striations, which shows large energy loss to space per degree temperature change, a strong negative feedback.

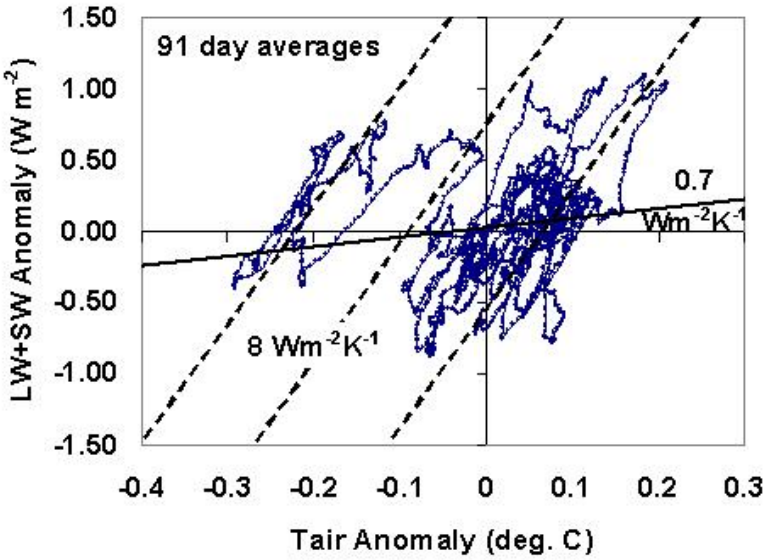


Figure 3.
Temperature-Radiation plot from NASA Terra satellite data.[7]

The large evaporation response, the reduction of water vapour in the upper atmosphere and the cloud response allow heat to escape to space which reduces the small warming effect of CO_2 emissions. The Earth's climate is dominated by negative feedbacks! Dr. Spencer has estimated a climate sensitivity of 0.5 ^{o}C based on phase space plots.

The upward surface radiation is greater than the out-going longwave radiation at the top of the atmosphere due to the greenhouse gases in the atmosphere. Using radiosonde data from 1960 and a line-by-line radiation code, the difference between the surface and out-going radiation was calculated to have increased by 0.19% over 49 years, which is not significant. Climate sensitivity at doubled CO_2 concentration is estimated to be 0.4 ^{o}C. This is about 13% of the 3.0 ^{o}C estimate by the IPCC.[8]

Dr. Lindzen and Dr. Choi estimated climate sensitivity to doubling CO_2 at 0.7 ^{o}C. The estimate is based on short term changes in sea surface temperatures and the corresponding changes in out-going longwave radiation determined from satellite data.[9] Even these short term temperature changes are affected by cloud

forcings which gives the illusion of positive feedback. As Lindzen and Choi did not fully eliminate this effect, their estimate of climate sensitivity should be considered an upper limit.

Considering several methods of estimating climate sensitivity, the best estimate is about 0.5 ^{o}C for a doubling of CO_2. This is one-sixth of the IPCC best estimate.

3. Causes of Climate Change

The Sun

The Sun is the primary cause of climate change. The small changes in the total solar irradiance (TSI) are not enough to significantly affect Earth's climate and the IPCC has repeatedly dismissed solar forcing for this reason. However, hundreds of studies show strong correlations between solar changes and global temperatures. Figure 4 shows the solar impact on the Northern Hemisphere temperatures since 1600. There is good correspondence between temperature and solar irradiance proxy reconstructions.[10] The small divergence since 1920 can be explained by ocean cycles and black carbon aerosols as discussed later, and a small anthropogenic GHG effect.

Northern Hemisphere Temperature vs Solar Irradiance 400 years

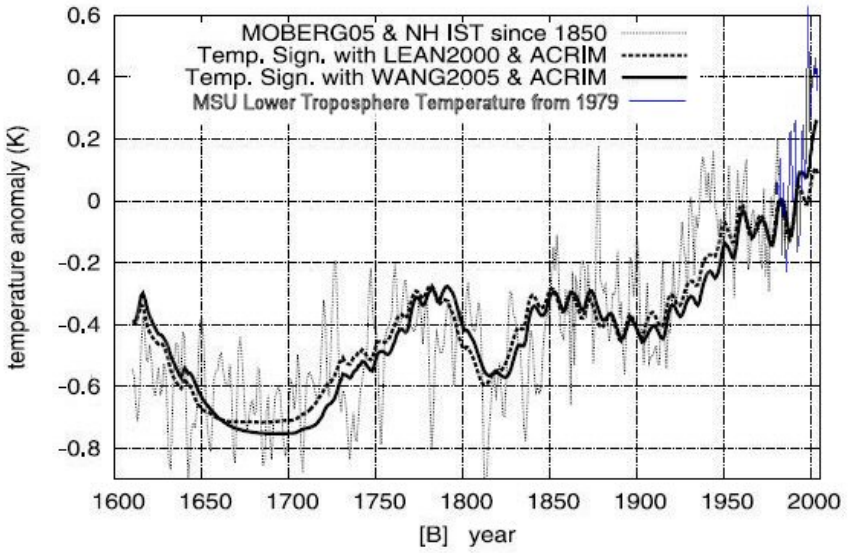


Figure 4.
The Northern Hemisphere temperature record is compared to two solar irradiance proxy reconstructions. The jagged light line is the temperature from proxy record by Moberg (2005). Satellite temperatures are used from 1979. The darker dotted and solid lines are TSI proxy reconstructions.

Dr. Nir Shaviv shows that the solar forcing associated with the eleven year solar cycle is about seven times larger than that caused by the TSI variations.[11] Shaviv uses three independent records to estimate the heat flux into the oceans: ocean heat content, sea level rise changes from tide gauges and sea surface temperature.

These three records vary with the solar cycle and show that there *must* be an amplification mechanism of the solar irradiance to explain the large heat flux associated with the oceans.

Dr. Henrik Svensmark proposed in 1998 that changes in cosmic rays, which are high energy particles from space, can promote the formation of aerosols which seed clouds. Variations in the solar magnetic flux act to modify the cosmic ray flux reaching the earth. Higher solar activity results in fewer cosmic rays, less aerosols for cloud formation, less clouds, and more sunlight to warm the Earth's surface. Dr. Svensmark has shown that cosmic rays highly correlate to low cloud formation.

Danish scientists reported in May 2011 that an artificial atmosphere was irradiated with fast electrons from ASTRID – Denmark's largest particle accelerator. The experiments show that increased radiation from cosmic rays leads to more aerosols.[12]

A team of 63 scientists published results in August 2011 of a much more sophisticated experiment which investigated the effects of cosmic rays on cloud formation. The CLOUD (Cosmics Leaving OUtdoor Droplets) experiment at CERN (European Organization for Nuclear Research) in Geneva show big effects of pions from an accelerator, which simulate the cosmic rays and ionize the air in the experimental chamber. The CLOUD experiment is the most rigorous test of the Cosmic Ray hypothesis yet devised. The experiments show that cosmic rays strongly enhance the formation rate of aerosols by up to ten fold, and confirm the earlier results from the Danish experiment.[13]

Coronal mass ejections from the sun cause a large decrease in the cosmic ray count, which are called Forbush decreases. These dramatic, short term cosmic ray decreases can be used to confirm the cosmic ray effects on clouds. The magnetic plasma clouds from solar coronal mass ejections provide a temporary shield against galactic cosmic rays.

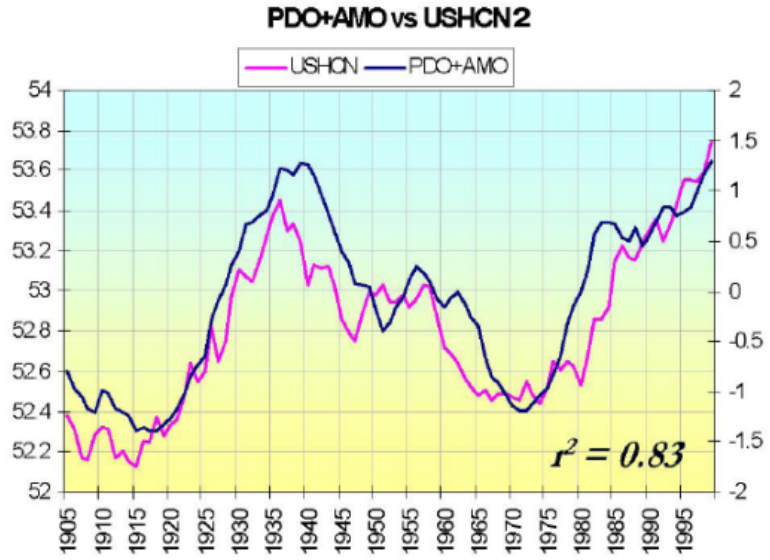
A study by Svensmark et al in 2009 shows that the decrease in cosmic rays have a large effect on the amount of aerosols, cloud cover and the liquid water content of clouds. The response in cloud water content for the larger events is about 7%. The authors conclude "From solar activity to cosmic ray ionization to aerosols and liquid-water clouds, a causal chain appears to operate on a global scale."[14]

Dr. U.R. Rao shows that galactic cosmic rays, using ^{10}Be measurements in deep polar ice as the proxy, have decreased by 9% during the last 150 years. The decrease in cosmic rays cause a 2.0% decrease in low cloud cover resulting in a radiative forcing of 1.1 W/m^2, which is about 60% of that due to the CO_2 increase during the same period.[15]

Ocean Oscillations

Ocean oscillations such as the Pacific Decadal Oscillation (PDO) and the Atlantic Multi-decadal Oscillation (AMO) can affect climate over several decades. The Pacific and Atlantic undergo multi-decadal cycles on the order of 50 to 70 years. The PDO is an index of the pattern of the North Pacific (north of N20) sea surface temperature change, where the linear warming trend has been removed. The AMO signal is the patterns of sea surface temperature variability in the North Atlantic, where the linear trend has been removed. These natural modes of climate variability may result in climate forcing by changing the amount

of cloud cover. It has not been suggested that CO_2 has any influence on oceanic oscillations. The PDO and AMO indexes correlate very well with USA land temperature change as shown in the graph below.



Note this data set started in 1905 because the PDO and AMO was only available from 1900.

Figure 5.
The sum of the PDO and AMO are compared to the US Historical Climate Network temperature.[16]

A large part of the global warming since 1975 that the IPCC has attributed to GHG emissions may be due to natural ocean cycle variability.

Aerosol Forcing

A study by Martin Wild shows that changes in the amount of aerosols in the atmosphere over the 20th century have had a much larger impact on global temperatures than they are given credit for in the climate computer models. Wild shows that the increase of sulphate aerosols from fossil fuels caused a global solar dimming effect from the 1950's to the 1980's and contributed to global cooling. Air pollution control measures have reduced sulphate aerosols from the 1980's to the 2000's, resulting is solar brightening which significantly contributed to global warming. Air pollution controls allowed more solar radiation to warm the surface. However, on a global basis the effect of aerosols has been stable since 2000 and there has been no global warming this century.[17]

Research by NASA scientists show that decreasing amounts of sulphates and increasing amounts of black carbon aerosols likely account for 45% or more of the warming that has occurred in the Arctic during the thirty years up to 2005.[18] Black carbon is soot particles from burning diesel, wood and biofuels.

The warming of the last century can easily be explained by natural climate variability from the Sun, ocean cycles and aerosol changes, with a minor warming effect from GHG emissions. The IPCC says climate

models without CO_2 forcing do not match the 20th century warming, so the warming must be caused by CO_2. But that is just because they left out the natural causes of climate change! In fact, most of the warming was caused by natural causes, with some human-caused black carbon warming of the Arctic.

4. Climate Model Projections Fail

Section 3 presented the three major reasons why climate models are too sensitive to GHG emissions. The increasing evaporation and precipitation rate, the declining water vapour content of the upper atmosphere, and the cloud response to warming all tend to reduce the temperature change caused by GHG emissions. This section presents further evidence that the predictions of climate models bear little resemblance to observations.

While air temperature may fluctuate from year to year as heat is transferred between the air and oceans, if CO_2 is causing global warming as per the IPCC hypothesis, the ocean heat content (OHC) must increase monotonically provided there are no major volcanic eruptions. OHC is a much more robust metric than surface air temperature for assessing global climate change because the ocean's heat capacity is greater than that of the atmosphere by many orders of magnitude. For any given area on the ocean's surface, the upper 2.6 m of water has the same heat capacity as the entire atmosphere above it!

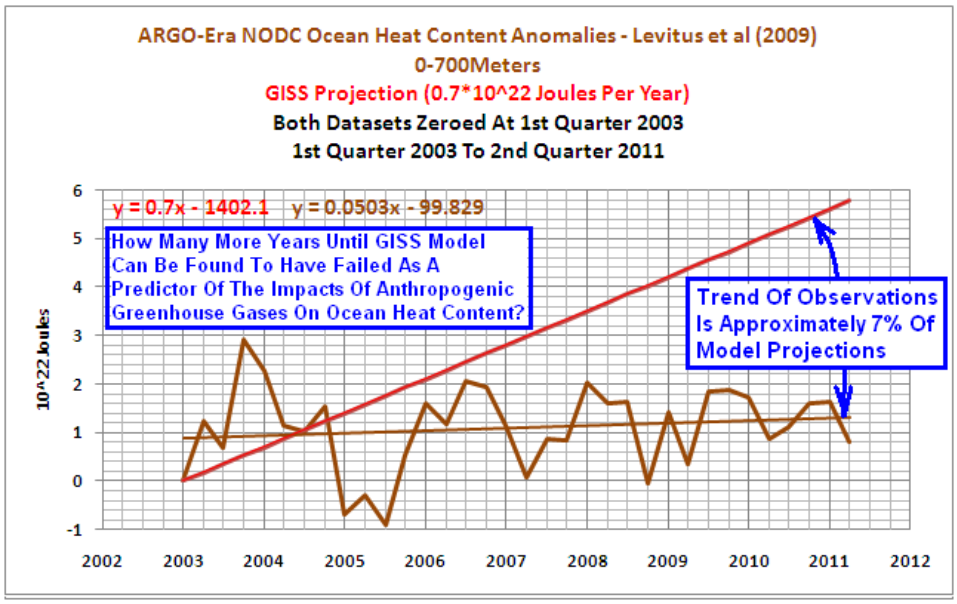


Figure 6.
ARGO era ocean heat content (0 to 700 m) and the GISS climate model projection.[19]

Heat accumulating in the climate system can be accurately measured on a global scale from 2003 by the ARGO array of 3,341 free-drifting floats that measure temperature and salinity in the upper 2000 m of ocean. Figure 6 compares the ARGO era (2003 to Q2 of 2011) ocean heat content of the top 700 m from the National Oceanographic Data Center (NODC) to the projections of the GISS climate model. The NODC OHC dataset is based on the Levitus et al (2009) paper which describes various adjustments and corrections

to the data. The NODC data includes the ARGO data as described above and data from expendable bathythermographs. Note the enormous discrepancy between the measurements and the climate model projections.

The NASA GISS climate model predicted that the global temperature would increase from 1970 to 2011 by 1.1 ^{o}C with continued CO_2 emissions, scenario "A" business-as-usual. The GISS temperature index shows that temperatures increased by only 0.6 ^{o}C, which is exactly at the predicted temperature if CO2 emissions had rapidly declined after the year 2000. The HadCRUT3 temperature index is 0.15 ^{o}C below that estimate.

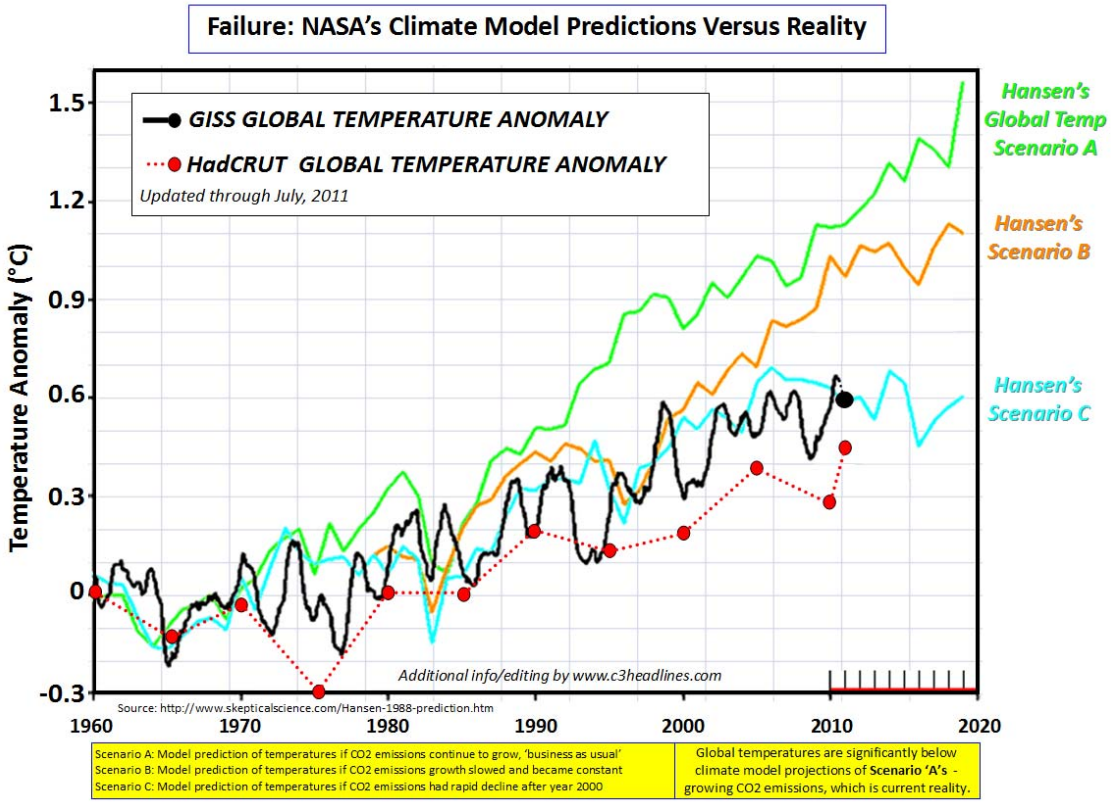


Figure 7.
NASA's GISS climate model predictions versus observation. Global temperatures are about at the predicted temperatures if CO_2 emissions had rapidly declined after year 2000 (Scenario C). Temperatures are much lower than the predicted temperatures of the continued CO_2 emissions case (Scenario A).

Satellite data show there has been no warming of the lower atmosphere since 2001.

The models predict a distinctive pattern of warming - a "hot-spot" of enhanced warming in the upper troposphere over the tropics, shown as the large red spot in Figure 8. The temperature at this "hot-spot" is projected to increase at a rate of two to three times faster than at the surface. However, the Hadley Centre's real-world plot of radiosonde temperature observations from weather balloons shown below does not show

the projected hot-spot at all. The predicted hot-spot is entirely absent from the observational record. If it was there it would have been easily detected.

The climate models show a hot-spot because they predict the humidity to increase in the upper atmosphere in response to surface warming. The extra water vapour produces two thirds of the climate model projected warming. But we have already seen by direct measurements that water vapour is declining in the upper atmosphere in response to warming, so there is no hot-spot, and no amplification of the small CO_2 warming effect.

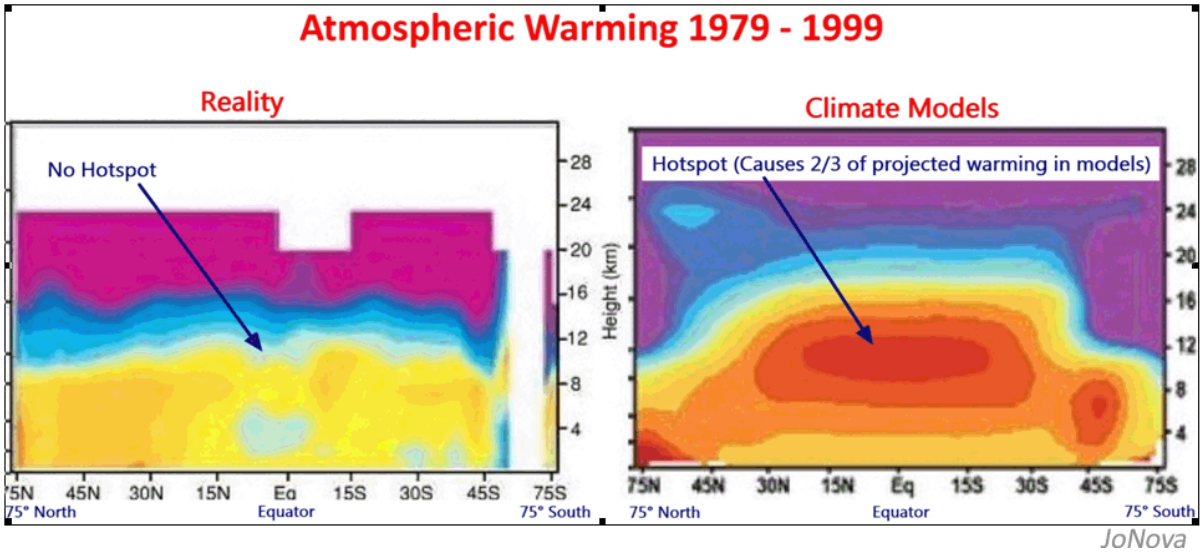


Figure 8.
Climate models predict a "hot spot" of enhanced warming at 8 to 12 km altitude over the tropics, which is absent from the radiosonde observations. http://joannenova.com.au

If outgoing radiation from the atmosphere to space is reduced to less than the incoming radiation from the Sun, heat energy will accumulate in the climate system causing rising temperatures.

The climate models assume CO_2 emissions will cause water vapour to increase in the upper atmosphere and clouds will change to reduce the out-going radiation. But satellite data shows just the opposite of the climate model predictions.

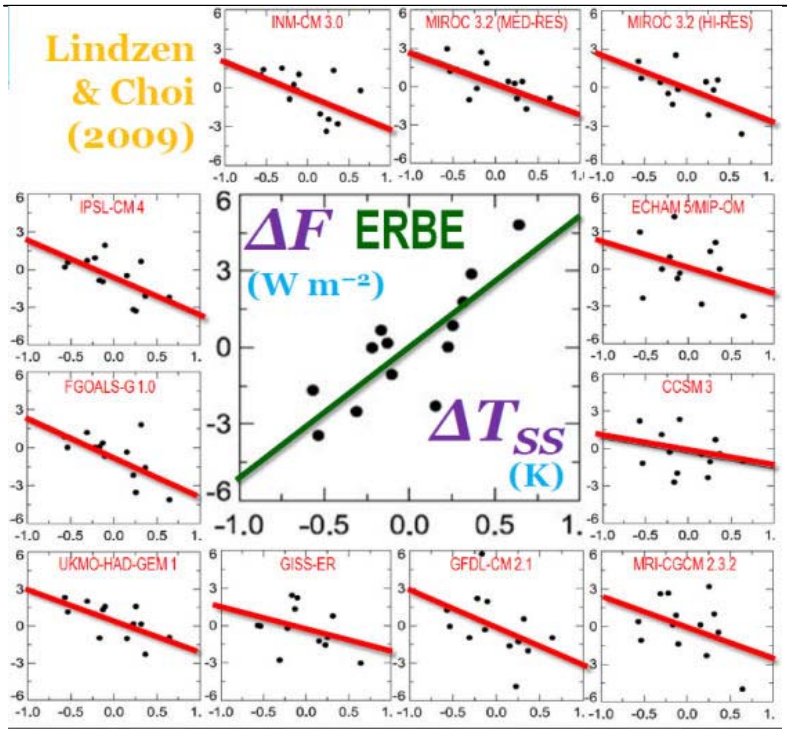


Figure 9.
The predicted change of outgoing radiation from 11 climate models are compared to the actual ERBE satellite measured change of outgoing radiation, both in response to changing sea surface temperatures.[20]

The red lines of Figure 9 show the eleven climate models' predictions of decreasing outgoing radiation as temperatures rise. The green line in the middle of the chart shows the Earth Radiation Budget Experiment Satellite (ERBE) observed response. It shows that more outgoing radiation escapes to space as temperatures rise, rather than being trapped as the computer modellers believe.

Climate models predict that the soil moisture content will decrease with global warming. However, a large study of 600 stations in the year 2000 show upward trends in soil moisture content.[21] Another study of 141 stations on cereal crop fields with 45 years of data from 1958 to 2002 shows "a positive soil moisture trend for the entire period of observation, with the trend levelling off in the last two decades."[22]

Climate models were designed with the fundamental assumption that all climate change is due to anthropogenic GHG emission. The climate has been warming since the depth of the Little Ice Age in 1680, largely due to increasing solar activity which reached a peak magnetic flux in 1992. The peak temperature response is expected to be delayed 10 years to about 2002 due to the large heat capacity of the oceans. The fact of global warming to 2002 tells us nothing about the cause because both solar forcing and CO_2 were increasing in this period. Now that the solar forcing has stopped increasing, and may decline, the huge discrepancy between predicted and actual temperature change since 2002 exposes the erroneous climate model assumptions.

The temperature indexes the modellers use to represent 20th century warming are strongly contaminated by the urban heat island (UHI) effect. The UHI effect exaggerates the global temperature rise and contributes to the grossly overestimated warming projections. The HadCRUT temperature index makes no correction for the UHI, and the GISS temperature index makes an UHI correction in the wrong direction in 45% of the adjustments. Instead of reducing the warming trends due to urbanization, these wrong-way corrections increase the warming trends.[23]

McKitrick and Michaels showed that the spatial pattern of warming trends is tightly correlated with indicators of economic activity. Correcting the surface temperature record for the effects of urban development would reduce the warming trend over land from 1980 by half.[24]

5. Effects of Warming

The SCC is based on the IPCC climate model projections, which exaggerate climate sensitivity by six fold. The costs are based on the assumption of more severe storms, especially hurricanes, sea level rise, and other imagined effects.

Severe Storms

The IPCC claims that global warming will result in more severe weather. This does not make any sense, as most storms are caused by a difference in temperatures of colliding air masses. Climate models predict that surface warming will be greatest in the Polar Regions because there is very little water vapour in these areas due to the cold temperatures. If CO_2 warms the Polar Regions there will be smaller temperature differences, and less severe storms. All other things being equal, a warmer world should have fewer, not more, severe storms.

Researchers analyzed 7,000 years of data from sediment cores from southern France's coastal region and found that severe storms were more frequent during global cooling, including The Little Ice Age, than during global warming periods, such as the Medieval Warming Period.[25]

Unlike most storms, hurricanes are caused by the difference in temperatures between the sea surface and the storm top. The IPCC predicts more severe hurricanes due to the belief that the upper atmosphere in the tropics will warm faster than the surface – the “hot-spot” discussed in the previous section. However, since we know by measurements that the “hot-spot” does not exist, there is no reason to expect more hurricanes.

Global hurricane activity has decreased to the lowest level in 32 years. The Accumulated Cyclone Energy (ACE) is the combination of a storm's intensity and longevity.

Figure 10 shows the last four decades of Global and Northern Hemisphere ACE through June 30, 2011. Global hurricane activity has continued to sink to levels not seen since the 1970s. Note that the year indicated represents the value of ACE through the previous 24-months for the Northern Hemisphere (bottom line/gray boxes) and the entire globe (top line/blue boxes). The area in between represents the Southern Hemisphere total ACE.

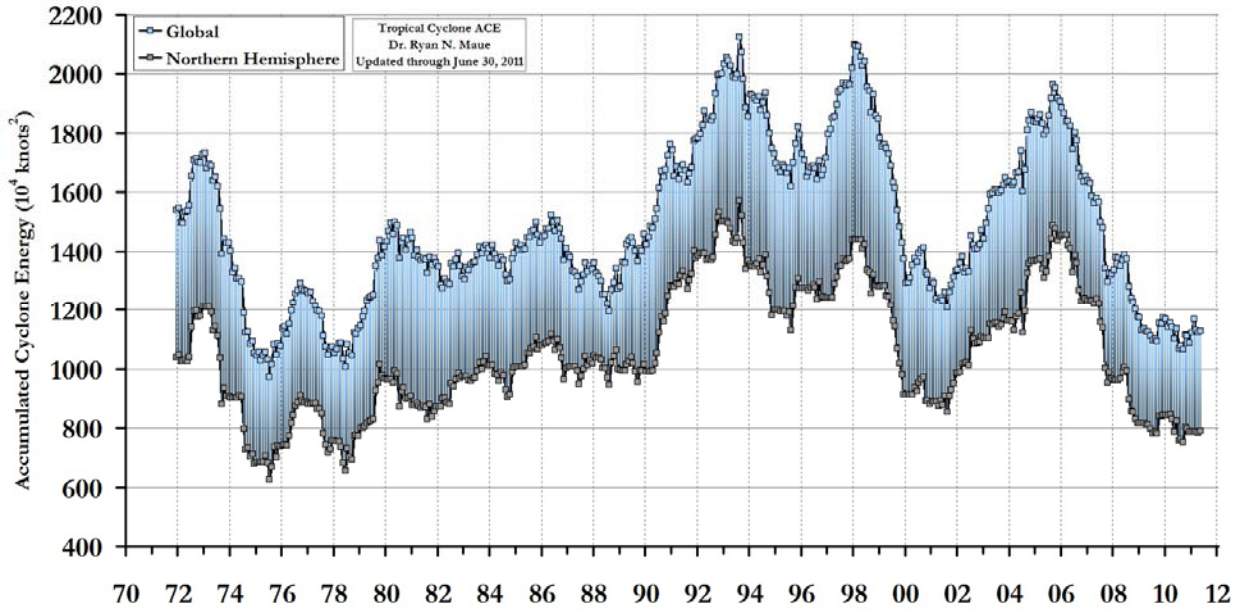


Figure 10.
The Accumulated Cyclone Energy is the combination of a storm's intensity and longevity.[26]

The falling ACE is further evidence that water vapour is not increasing in the upper atmosphere, that there is no enhanced warming at the predicted "hot-spot" and that the climate is dominated by negative feedbacks, which reduce the small warming effect of GHG emissions. Hurricanes rarely affect Canadians significantly, other than those on vacation to escape our cold climate. The severe storm component of the SCC should be reduced to zero.

Sea Level Rise

Global sea level is measured by tide gauges and by satellite altimeters calibrated to a selected set of tide gauges. The global sea level has risen about 3 mm/year from 1994 to December 2003. The best fit trend from January 2004 to July 2011 is 1.6 mm/year, which is half of the prior trend.

Graphs of the Pacific and Atlantic oceans' sea levels are presented as Figures 11 and 12. The University of Colorado at Boulder provides an analysis of data from a number of satellites.

Much of the global warming scare is based on predictions that accelerating sea level rise will inundate low-lying islands of the Pacific Ocean. The UN predicted in 2005 that there would be "50 million climate refugees" by 2010. In fact, there have been no refugees due to climate and sea level change. Many of the areas identified as likely source of refugees due to sea level rise have some of the fastest growing populations in the world.[27]

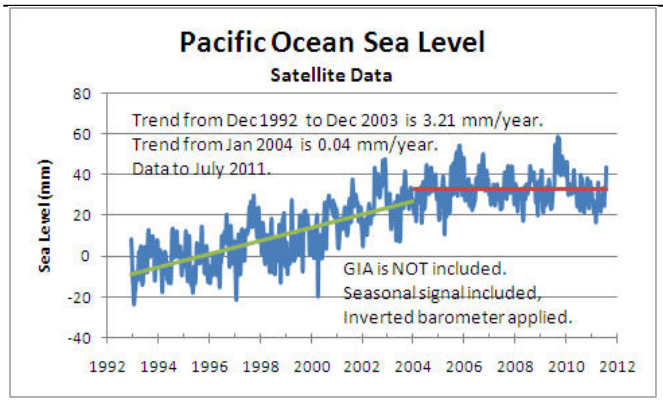


Figure 11.
Pacific Ocean sea level stopped rising in 2004.

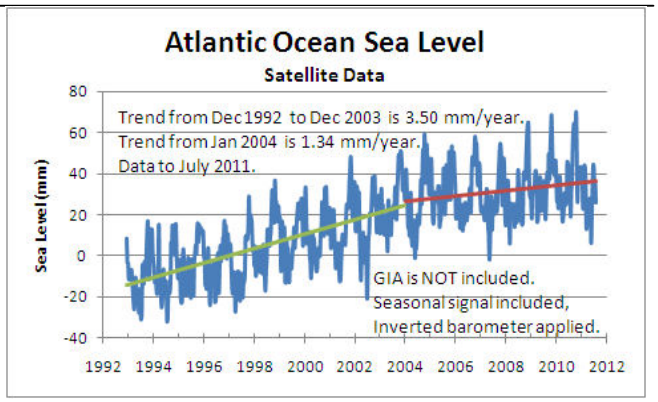


Figure 12.
Atlantic Ocean sea level rise has decelerated.

A team of scientists used historical aerial photographs and high-resolution satellite images to study changes in the land area of 27 islands where local sea levels have risen an average of 2 mm/year over the past 60 years. They found that just four had diminished in size, 12 islands had grown bigger and the rest have remained stable with no net change in area.[28]

The islands are mostly comprised of coral debris eroded from encircling reefs that is pushed up onto the islands by winds and waves. As the sea level rises, more sand and coral debris accumulates on the islands with the result that the islands rise with the sea level. The coral itself continues to grow upwards to match the sea level rise. Island atolls can grow much faster than recent rates of sea level rise. Sea level rise does not endanger low-lying coral islands.

In Canada, our major rivers bring sediments from the mountains which are deposited in deltas, increasing the land area. Sea levels rise will continue to decelerate due to the lack of global warming, and may soon fall if the Sun remains in an inactive state. The sea level rise component of the SCC should be reduced to zero.

Other Effects

Many other effects of global warming have been proposed to support CO_2 reduction policies. These have all been shown to be without merit. A brief description of some of these imagined effects is given here.

The SCC estimates include stress on crop yields due to reduced soil moisture content. As indicated in section 4, the trends of actual moisture content are opposite to the model predictions. The estimates also assume that farmers in warm climates do not respond to changing climatic conditions. Farmers actually respond to warming temperatures by switching to crop strains that are optimized to the conditions such that even in warm climates, global warming will not reduce crop yields.

In Canada, crop yields are strongly sensitive to temperature, and an increase in temperature would significantly increase crop yields and increase the arable area.

Climate alarmists suggest that a warming world will cause both more floods and drought, but there is no reason to expect a slight warming would cause floods in some regions yet drought in other regions. Climate models have shown no skill in projecting regional climate, and different models project vastly different future climates for the same region. These projected changes are simply an artefact of unstable models.

A warming world would cause the timing of floods to occur slightly earlier in the year, but there is no reason to suppose that the intensity of floods would increase. Canadian scientists analysed data from 141 stations of the Reference Hydrometric Basin Network established by Environment Canada over the period 1974 to 2003. They found that the magnitude of the annual maximum floods has been decreasing over the last three decades.[29]

Droughts world-wide are not becoming more frequent, more severe, or longer despite pronouncements by the IPCC. The droughts in North America during the 1930s and the 1950s were much longer, more extensive and more severe than any drought experience since then. Four of the longest droughts in North America of the last 1,000 years occurred before 1860. Droughts are due to natural climate variations.[30]

The health benefits of a warmer planet are many times greater than any harmful effects. The positive health effects of warmth have been well documented over the past quarter century. Many studies have demonstrated that when temperatures ***rise***, death rates ***fall***, while when temperatures ***fall***, death rates ***rise***.

The "Nongovernmental International Panel on Climate Change" reported that rising temperatures lead to a greater reduction in winter deaths than the increase they cause in summer deaths, resulting in a large net decrease in human mortality.[31] An analysis of the U.K. Office of National Statistics death registration data for men and women 50 years of age or older in England and Wales for the period 1976–2005 shows an increase of only 0.7 deaths per million people per year due to warming in the hottest part of the year, but a decrease of fully 85 deaths per million people per year due to warming in the coldest part of the year, for a lives-saved to life-lost ratio of 121. There is overwhelming evidence for a positive effect of global warming on human health.[32]

Speculations on the potential impact of continued warming on human health often focus on mosquito-borne diseases. Elementary models suggest that higher global temperatures will enhance their transmission rates and extend their geographic ranges. However the histories of three such diseases - malaria, yellow fever, and dengue - reveal that climate has rarely been the principal determinant of their prevalence or range. Human activities and their impact on local ecology have generally been much more significant. Scientists who studied the occurrence of dengue infections report that the major contributing factors are urbanization, deforestation, new dams, poor housing, poor sewage and waste management systems, and lack of reliable water systems. The most important factor for the spread of disease is the impact of international travel.[33]

Dr. Paul Reiter, a leading expert in mosquito-borne disease, testified in 2006 before a US Senate committee that temperature is not a significant factor in the incidence of malaria. He points out that the largest malaria epidemic was in Siberia of the Soviet Union in the 1920s, and that malaria was prevalent in Europe and the USA during the Little Ice Age.[34]

In total, warmer temperatures result in a significant benefit, not a social cost.

6. Carbon Dioxide Fertilization Effects on Plant Growth

A major failing of the IPCC reports is their lack of discussion of the significant fertilization effect of elevated CO_2 concentrations on plant growth. CO_2 is a major plant fertilizer. There are over 1,300 peer-reviewed scientific articles that show the increase in CO_2 emissions has caused increased crop yields and faster growing plants and forests, thereby greening the planet. Estimates vary, but the increase in global food crop yields due to aerial fertilization with increased carbon dioxide since 1950 is about 15%. This increase has preserved or returned enormous tracts of marginal land as wildlife habitat that would otherwise have had to be put under the plow in an attempt to feed the growing global population.

Commercial growers deliberately generate CO_2 and increase its levels in agricultural greenhouses to between 700 ppm and 1,000 ppm to increase productivity and improve the water efficiency of food crops far beyond those in the somewhat CO_2 starved atmosphere. CO_2 feeds the forests, grows more usable lumber in timber lots meaning there is less pressure to cut old growth or push into "natural" wildlife habitat, makes plants more water efficient helping to beat back the encroaching deserts in Africa and Asia and generally increases bio-productivity.

Since atmospheric CO_2 is the basic "food" of nearly all plants, the more of it there is in the air, the better they function and the more productive they become. For a 300 ppm increase in the atmosphere's CO_2 concentration above the planet's current base level of slightly less than 400 ppm, for example, the productivity of earth's herbaceous plants rises by about of 30% [35], while the productivity of its woody plants rises by about 50%.[36] A study shows that after two years of growth in a controlled experiment, trees in an ambient plus 300 ppm CO_2 enriched environment were 2.8 times larger than the trees without CO_2 enrichment.[37]

Wheat Yield Response to CO_2 Fertilization

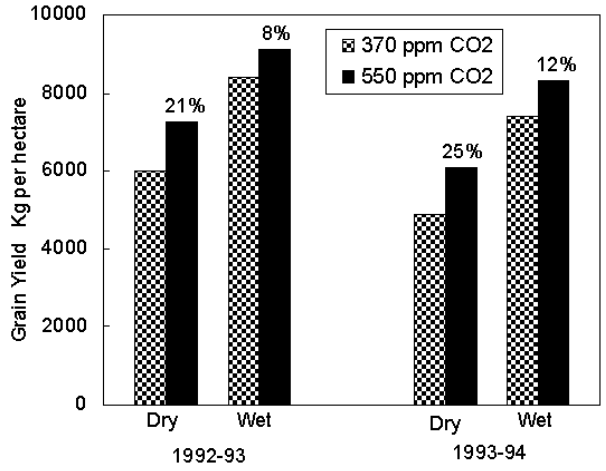


Figure 13.
Wheat yield response to increased CO_2 under dry and wet conditions.

Figure 13 shows the response of wheat grown under wet conditions and when the wheat was stressed by lack of water. These were open-field experiments. Wheat was grown in the usual way, but the atmospheric CO_2 concentrations of circular sections of the fields were increased by means of arrays of computer-controlled equipment that released CO_2 into the air to hold the levels as specified. Average CO_2-induced increases for the two years were 10% for wet and 23% for dry conditions.[38]

A study by Chinese scientists found that a 51% increase in atmospheric CO_2 concentration increased the final grain yield of rice crop by 32%.[39]

A 2003 study using 18 years (1982 to 1999) of satellite observations shows that global net primary plant production increased 6% over 18 years. The largest increase was in tropical ecosystems. Amazon rain forests accounted for 42% of the global increase in net primary production.[40]

We estimate that the CO_2 enrichment of 300 ppm would add $7.2 billion to the value of Canada's major crops' production. The weighted average increase in Canadian crop yields is forecast at 39% for 300 ppm CO_2 increase.[41]

7. Conclusions

The Canadian Government proposes to restrict CO_2 emissions from coal-fired electrical power plants. It estimates the present value cost of the regulations at $8.2 billion. It assumes that CO_2 emissions would result in a social cost of $25/tonne based on estimates that rely on projections of climate models that do not work.

- Section 2 presents three errors programmed into climate models which explain why their predictions are so different from observations; too little evaporation, declining upper atmosphere water vapour and assuming that clouds cannot cause a temperature change. Measurements show that water vapour, the most important GHG, has declined 13% at 8 km altitude allowing heat to escape to space. The models' average estimate of climate sensitivity to CO_2 emissions is six times higher than estimates based on observational evidence.

- Section 3 presented evidence that the Sun is the primary climate driver, modified by ocean oscillations and aerosols, with CO_2 playing a minor role. The Sun affects the climate by modifying the galactic cosmic ray flux which changes the amount of aerosols required for cloud formation.

- Section 4 presented evidence that the climate model projections have completely failed to match observations. Ocean heat content and air temperature has not increased as predicted. A predicted "hot-spot" over the tropics does not exist. Out-going radiation to space increases, not decreases, with rising temperatures.

- Section 5 shows that climate warming does not cause any significant harmful effects, but instead, will be beneficial, especially for countries with cold climates. Sea level rise has sharply decelerated since 2002 and hurricane activity is at a 30-year low. The projected benefit of the proposed regulations of $4.3 billion for the SCC should be reduced to zero or less. The benefit to health and

well-being due to a slightly warmer climate make the actual SCC negative – that is, warming is beneficial, not harmful, even before considering CO_2 fertilization.

- Section 6 shows that CO_2 emission has caused a greening of the earth with increased crop yields to feed the growing population. The benefit to Canadians of CO_2 enrichment of crops is likely about $7.2 billion for a 300 ppm increase of CO_2 concentration. This is additional to the warming benefits.

The Canadian government should not be restricting GHG emissions. GHG emissions are a wonderful by-product of fossil fuel use.

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Many of the issues discussed in this submission are explained further in the Friends of Science "Climate Science Change" essay at http://www.friendsofscience.org/index.php?id=240
See the Climate Science section of the website at http://www.friendsofscience.org/index.php?id=194 for many of the technical papers referenced herein.

The Friends of Science Society provides climate information to Canadians by our quarterly newsletters, FoS Extracts which are emailed to our members several times per month, presentations by leading climatologists, and other out-reach activities. Our website is at http://www.friendsofscience.org

This article is on the Friends of Science website in the "FoS Initiatives" section at;
http://www.friendsofscience.org/index.php?id=545.

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41. Estimate is calculated using the top 8 Canadian crops by weight sold. Annual revenue = $23 billion. Weighted average dry weight response to 300 ppm CO_2 increase = 39%. Crop response to CO_2 data is from the Plant Dry Weight Response to CO_2 page of the Study of Carbon Dioxide and Global Change at http://www.co2science.org/data/plant_growth/dry/dry_subject.php. Incremental cost of increased crop production is estimated at 20% of gross revenue.

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