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THE SKEPTIC'S CASE

22 Very Inconvenient Climate Truths

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Here are 22 good reasons not to believe the statements made by the Intergovernmental Panel on Climate Change (IPCC)



Guest essay by [Jean-Pierre Bardinet](#).

According to the official statements of the IPCC “*Science is clear*” and non-believers cannot be trusted.

Quick action is needed! For more than 30 years we have been told that we must act quickly and that after the next three or five years it will be too late (or even after the next 500 days according to the French Minister of foreign affairs speaking in 2014) and the Planet will be beyond salvation and become a frying pan -on fire- if we do not drastically reduce our emissions of CO₂, at any cost, even at the cost of economic decline, ruin and  misery.

But anyone with some scientific background who takes pains to study the topics at hand is quickly led to conclude that the arguments of the IPCC are inaccurate, for many reasons of which here is a non-exhaustive list.

The 22 Inconvenient Truths

1. The Mean Global Temperature has been stable since 1997, despite a continuous increase of the CO₂ content of the air: how could one say that the increase of the CO₂ content of the air is the cause of the increase of the temperature? (discussion: p. 4)

2. 57% of the cumulative anthropic emissions since the beginning of the Industrial revolution have been emitted since 1997, but the temperature has been stable. How to uphold that anthropic CO₂ emissions (or anthropic cumulative emissions) cause an increase of the **Mean Global Temperature**?

[Note 1: since 1880 the only one period where Global Mean Temperature and CO₂ content of the air increased simultaneously has been 1978-1997. From 1910 to 1940, the Global Mean Temperature increased at about the same rate as over 1978-1997, while CO₂ anthropic emissions were almost negligible. Over 1950-1978 while CO₂ anthropic emissions increased rapidly the Global Mean Temperature dropped. From Vostok and other ice cores we know that it's the increase of the temperature that drives the subsequent increase of the CO₂ content of the air, thanks to ocean out-gassing, and not the opposite. The same process is still at work nowadays] (discussion: p. 7)

3. The amount of CO₂ of the air from anthropic emissions is today no more than 6% of the total CO₂ in the air (as shown by the isotopic ratios 13C/12C) instead of the 25% to 30% said by IPCC. (discussion: p. 9)

4. The lifetime of CO₂ molecules in the atmosphere is about 5 years instead of the 100 years said by IPCC. (discussion: p. 10)

5. The changes of the Mean Global Temperature are more or less sinusoidal with a well defined 60 year period. We are at a maximum of the sinusoid(s) and hence the next years should be cooler as has been observed after 1950. (discussion: p. 12)

6. The absorption of the radiation from the surface by the CO₂ of the air is nearly saturated. Measuring with a spectrometer what is left from the radiation of a broadband infrared source (say a black body heated at 1000°C) after crossing the equivalent of some tens or hundreds of meters of the air, shows that the main CO₂ bands (4.3 µm and 15 µm) have been replaced by the emission spectrum of the CO₂ which is radiated at the temperature of the trace-gas. (discussion: p. 14)

7. In some geological periods the CO₂ content of the air has been up to 20 times today's content, and there has been no runaway temperature increase! Why would our CO₂ emissions have a cataclysmic impact? The laws of Nature are the same whatever the place and the time. (discussion: p. 17)

8. The sea level is increasing by about 1.3 mm/year according to the data of the tide-gauges (after correction of the emergence or subsidence of the rock to which the tide gauge is attached, nowadays precisely known thanks to high precision GPS instrumentation); no acceleration has been observed during the last decades; the raw measurements at Brest since 1846 and at Marseille since the 1880s are slightly less than 1.3 mm/year. (discussion: p. 18)

9. The "hot spot" in the inter-tropical high troposphere is, according to all "models" and to the IPCC reports, the indubitable proof of the water vapour feedback amplification of the warming: it has not been observed and does not exist. (discussion: p. 20)

10. The water vapour content of the air has been roughly constant since more than 50 years but the humidity of the upper layers of the troposphere has been decreasing: the IPCC foretold the opposite to assert its "positive water vapour feedback" with increasing CO₂. The observed "feedback" is negative. (discussion: p.22)

11. The maximum surface of the Antarctic ice-pack has been increasing every year since we have satellite observations. (discussion: p. 24)

12. The sum of the surfaces of the Arctic and Antarctic icepacks is about constant, their trends are phase-opposite; hence their total albedo is about constant. (discussion: p. 25)

13. The measurements from the 3000 oceanic ARGO buoys since 2003 may suggest a slight decrease of the oceanic heat content between the surface and a depth 700 m with very significant regional differences. (discussion: p. 27)

14. The observed outgoing longwave emission (or thermal infrared) of the globe is increasing, contrary to what models say on a would-be "radiative imbalance"; the "blanket" effect of CO₂ or CH₄ "greenhouse gases" is not seen. (discussion:p. 29)

15. The Stefan Boltzmann formula does not apply to gases, as they are neither black bodies, nor grey bodies: why does the IPCC community use it for gases ? (discussion: p. 30)

16. The trace gases absorb the radiation of the surface and radiate at the temperature of the air which is, at some height, most of the time slightly lower that of the surface. The trace-gases cannot "heat the surface", according to the second principle of thermodynamics which prohibits heat transfer from a cooler body to a warmer body. (discussion: p. 32)



- 17. The temperatures have always driven the CO₂ content of the air, never the reverse. Nowadays the net increment of the CO₂ content of the air follows very closely the inter-tropical temperature anomaly.** (discussion: [p. 33](#))
- 18. The CLOUD project at the European Center for Nuclear Research is probing the Svensmark-Shaviv hypothesis on the role of cosmic rays modulated by the solar magnetic field on the low cloud coverage; the first and encouraging results have been published in Nature.** (discussion: [p. 36](#))
- 19. Numerical “Climate models” are not consistent regarding cloud coverage which is the main driver of the surface temperatures. Project Earthshine (Earthshine is the ghostly glow of the dark side of the Moon) has been measuring changes of the terrestrial albedo in relation to cloud coverage data; according to cloud coverage data available since 1983, the albedo of the Earth has decreased from 1984 to 1998, then increased up to 2004 in sync with the Mean Global Temperature.** (discussion: [p. 37](#))
- 20. The forecasts of the “climate models” are diverging more and more from the observations.** A model is not a scientific proof of a fact and if proven false by observations (or falsified) it must be discarded, or audited and corrected. We are still waiting for the IPCC models to be discarded or revised; but alas IPCC uses the models financed by the taxpayers both to “prove” attributions to greenhouse gas and to support forecasts of doom. (discussion: [p. 40](#))
- 21. As said by IPCC in its TAR (2001) “we are dealing with a coupled non-linear chaotic system, and therefore the long-term prediction of future climate states is not possible.”** Has this state of affairs changed since 2001? Surely not for scientific reasons. (discussion: [p. 43](#))
- 22. Last but not least the IPCC is neither a scientific organization nor an independent organization: the summary for policy makers, the only part of the report read by international organizations, politicians and media is written under the very close supervision of the representative of the countries and of the non-governmental pressure groups.**
- The governing body of the IPCC is made of a minority of scientists almost all of them promoters of the environmentalist ideology, and a majority of state representatives and of non-governmental green organizations.** (discussion: [p. 46](#))
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Appendix

Jean Poitou and François-Marie Bréon are distinguished members of the climate establishment and redactors of parts of the IPCC fifth assessment report report (AR5).

Jean Poitou is a physicist and climatologist, graduated from Ecole Supérieure de Physique et Chimie (Physics and Chemistry engineering college) and is climatologist at the Laboratory of the climate and environment sciences at IPSL, a joint research lab from CEA, CNRS, and UVSQ (*). He has written a book on the Climate for the teachers of secondary schools

François-Marie Bréon at CEA since 1993, has published 85 articles, is Directeur de recherche at CNRS, and author of the IPCC report 2013; he has been scientific manager of the ICARE group (CNES, CNRS, University of Lille), and of the POLDER and MicroCarb Space missions

The somewhat abusive language of J. Poitou and F. M. Bréon (*“untruths that exasperate”, “an obvious attempt to deceive”, “the climate-skeptics who are trying to deceive the public”, “such an outrageous statement should completely disqualify its author”, “once more a gross nonsense”, “does the author say that the greenhouse effect does not exist ? The author of such statements should loose any credibility in the eyes of readers with some scientific background”, “again and again a string of nonsense”*) requires a careful examination of the arguments put forward by J.P. Bardinet and by the authors of the rebuttal, with all the relevant references and graphics.

We ask for the indulgence of the reader as there are some lengths and repetitions; the huge economic impact of the climate regulations and of the energy market distortions striking both the industries and the households require that no ambiguousness, no uncertainty be left.

This notice is made up of 22 almost independent “cards”.

(*)

ISPL – [Institut Pierre Simon Laplace des sciences de l’environnement](#)

CEA – [Commissariat à l’énergie atomique et aux énergies alternatives](#)

CNRS – [Centre national de la recherche scientifique](#)

UVSQ – [Université de Versailles Saint-Quentin-en-Yvelines](#)



CNES – Centre national d'études spatiales

Truth n°1 The Mean Global Temperature has been stable since 1997, despite a continuous increase of the CO₂ content of the air: how could one say that the increase of the CO₂ content of the air is *the cause* of the increase of the temperature?

[Poitou & Bréon] *The causality is built upon a physical basis. The greenhouse phenomenon is well understood since more than hundred years and can be grasped by anyone with some scientific background. It has been clearly proved that CO₂ is a greenhouse gas and that if its concentration in the atmosphere increases the temperature will increase. This increase is not instantaneous as there are many other drivers likes aerosols, sun, volcanic eruptions and also the natural variability of the climatic system. It is to be noted as well that due to the inertia of the system the heating of the lower atmosphere is by force delayed with respect to its cause, the same way heating a home takes some time to materialize after the central heating has been switched on*

To discard observations (like the “pause” of the global mean temperatures since 1997 shown on the appended figure 1-A) the IPCC folks put forward a hypothesis (“*the greenhouse effect well understood since more than hundred years*”) but do not provide any definition of their “greenhouse effect”. As if this word had magical properties that no one should be allowed to investigate.

Let's take a closer look and check whether it *is well understood since more than hundred years*. A handbook for university students co-written by the chairman^[1] of the French National Research Council explains it's the equivalent of a glass window transparent in the visible spectrum and opaque in the thermal infrared spectrum; but this “analogy” has been, in 1909, experimentally proven wrong by a famous specialist of optics, the professor Robert Wood of John Hopkins University^[2]. After 1909, the assumptions and computations made by Arrhenius have been considered erroneous by the physicists^[3] and forgotten until the forerunners of the IPCC resuscitated them without mentioning that this has no relation either with the real atmosphere or with the horticultural greenhouse where the glass panels keep the warm and humid air inside the greenhouse.

Two German professors of physics the Prof. Dr Gerlich^[4] and Tscheuschner have analyzed some tens of definitions of the greenhouse effect and found that all of them are contrary to basic physics. Their 115 pages long article in the International Journal Of Modern Physics has been left open to discussion during two years on the arXiv site^[5]; no one has been able to write a consistent definition of the greenhouse effect.

Two other physicists, specialists of the atmosphere^[6], have shown that the ideas of the radiative-convective equilibrium and the definitions of the greenhouse effect are absurd w.r.t elementary physics. Their conclusion is “*Based on our findings, we argue that 1) the so-called atmospheric greenhouse effect cannot be proved by the statistical description of fortuitous weather events that took place in a climate period, 2) the description by American Meteorological Society and by the World Meteorological Organization has to be discarded because of physical reasons, 3) energy flux budgets for the Earth-atmosphere system do not provide tangible evidence that the atmospheric greenhouse effect does exist. Because of this lack of tangible evidence it is time to acknowledge that the atmospheric greenhouse effect and especially its climatic impact are based on meritless conjectures*”.

As a matter of fact the radiation flow from the surface absorbed by the air is within a few percent equal to the radiation of the air impinging on the surface: that is very different of the greenhouse glass panel in the vacuum that absorbs all of the thermal infrared radiation from the surface and emits half of it upwards and half of it downwards back to the surface.

Hence all those greenhouse “pane of glass” analogies are baseless.

The radiative heat flow from a body A to a body B is: (radiation from A absorbed by B) minus (radiation of B absorbed by A).

It is about nil between the air and the surface; it would be exactly nil for an (hypothetical) isothermal atmosphere at the temperature of the surface.

There is no “*radiative heat trapping*” as the net heat flow is nil between surface and air. And air does not “*warm the surface*”!

As the air is very opaque (due to the water vapor optical thickness, except of course in the so called “water vapor window”) the radiation from the air impinging on the surface originates mostly from a very thin layer above the surface^[7].

The heat lost by the radiation from the top of the air toward the cosmos is not at all fed by the radiation from the surface, but by water vapor condensation and by the solar infrared (or UV) absorbed by trace gases.

The solar heating of the surface is mostly carried away by evaporation, with some convection and some radiation arriving to the cosmos after escaping absorption by water vapor and clouds, for a global average of about 20 W/m².

Hence all the radiative-convective “models” since Manabe (1967) which assume a “*radiative cooling of the surface*” and forget evaporation are baseless: 71% of the surface of globe is covered by oceans, and an additional 20% of the surface covered by vegetation, driving evapotranspiration.

A recent article (2011) written by Dufresne & Treiner ^[8] is titled “*the greenhouse effect is more subtle than generally believed*”; it states that the model of the greenhouse glass panel is “*doubly inexact and wrong*” and that the absorption by CO₂ is saturated.

Another “definition” ^[9] is quite different: it is $G = (\text{radiation from the surface}) - (\text{outgoing longwave radiation (OLR)})$.



That G is said to measure the “heat trapped by greenhouse gases”. Ramanathan explains [10] “Reduction on OLR : At a global average surface temperature of about 289 K the globally averaged emission by the surface is about $395 \pm 5 \text{ W/m}^2$ whereas the OLR (outgoing longwave radiation) is only $237 \pm 8 \text{ W/m}^2$. Thus the intervening atmosphere and clouds cause a reduction of $158 \pm 7 \text{ W/m}^2$ in the longwave emission which is the magnitude of the total greenhouse effect denoted **by G** in energy units. Without this effect the planet would be colder by as much as 33K [11].”

Why is this complete nonsense? Because, the heat transfer between surface and air is (radiation from the surface absorbed by the air) minus (radiation of the air absorbed by the surface); G **is not** a heat transfer surface to air; while at the top of the air the radiation received from the cosmos at 2.7 K is negligible, the radiation of the air impinging on the surface is equal to the radiation of the surface absorbed by the air, resulting in a zero W/m^2 net balance.

Radiation is a diagnostic of the temperatures! The temperature lapse rate of the troposphere $g/(C_p + |C_h|)$ is related to the gravitation ($g=9.81 \text{ m/s}^2$) and to the heating C_h of the top of the air by condensation of water vapor and by absorption of the solar infrared by water vapor and by liquid water (if any in clouds ...).

All the authors who say that G is a measure of “heat trapped”, Berger, Ramanathan, Rocca, and the IPCC, apparently do not know that the equations of ideal polytropic gases show that the lapse rate equation of the troposphere $T(z) = T_0 + g/(C_p + |C_h|) (z - z_0)$ is strictly equivalent to the relation between temperature and pressure $T(P)/T_0 = (P/P_0)^{(R/\mu) / (C_p + |C_h|)}$ whose exponent is 0.19 on Earth ($R=8.314$; $\mu=0.0289$ is the mass of a mole of air) and 0.17 on Venus. Referring $\{T_0, P_0\}$ to the upper layer of the air that radiates toward the cosmos $\{T_0, P_0\}$ is $\{255 \text{ K}, 0.53 \text{ atm}\}$ on Earth and is $\{230 \text{ K}, 0.1 \text{ atm}\}$ on Venus.

It is not the infrared emission that cools the surface as in the so-called *radiative equilibrium models* because the net radiative heat transfer surface to air is about nil, but the evaporation whose thermostatic effect cannot be overstated: increasing the surface temperature by $+1^\circ\text{C}$ increases the evaporation by 6%; where evaporation is 100 W/m^2 , this removes an additional 6 W/m^2 from the surface.

Hence we cannot accept that the “greenhouse phenomenon is well understood” as there is not a single physically consistent definition.

There is no ground to discard almost two decades of high quality satellite observation of the temperatures of the lower troposphere.

And if the “radiative forcing” is supposed to have been perfectly working over the 1975-1997 time span, with no delay, why did it stall afterwards?

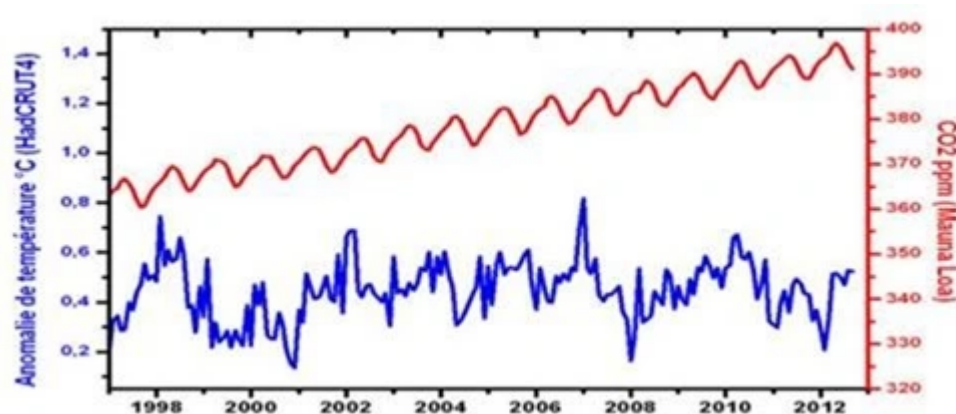
Let’s now take a closer look at the CO_2 content of the air on figure 1-A: the slope $d[\text{CO}_2]/dt$ is roughly constant; this hints to a relation like:

Slope of the CO_2 content of the air = $d(\text{CO}_2)/dt = k(T(t) - T_0)$ where t is the time.

Such a relation has been proved by several authors (Beenstock & Reingewertz, Salby, Park [12]) using quite different methods; notice n°17 will come back to this most important topic. The Henry law of degassing is well known to amateurs of sparkling drinks which are tastier when kept cool. The CO_2 content of the air is a consequence and a follow-up of the temperatures

Figure 1-A HadCRUT4 serie of the surface temperature anomalies and Mauna Loa CO_2 series 1997 to end 2012

from the web site www.pensee-unique.fr.



Conclusions:

The observations of a global mean temperature “flat” with no linear trend since 1997 cannot be discarded.

Those observations do contradict the conjecture of a “greenhouse effect” for which there is no physically admissible definition at hand: there is no “heat trapping” between surface and air as the net radiative heat flow between those bodies is about nil

The main features of the atmosphere both on Earth and on Venus are easily deduced from the basic polytropic equations of the ideal gases.

The observations show that in the last decades as in geological times the CO_2 content of the air is a consequence of the temperatures and cannot be their cause.

Truth n°2 57% of the cumulative anthropic emissions since the beginning of the Industrial revolution have been emitted since 1997, but the temperature has been stable. How to uphold that anthropic CO_2 emissions (or anthropic cumulative emissions) cause an increase of the Global Mean Temperature?

[Note 1: since 1880 the only one period where Global Mean Temperature and CO₂ content of the air increased simultaneously has been 1978-1997. From 1910 to 1940, the Global Mean Temperature increased at about the same rate as over 1978-1997, while CO₂ anthropic emissions were almost negligible. Over 1950-1978 while CO₂ anthropic emissions increased rapidly the Global Mean Temperature dropped. From Vostok and other ice cores we know that it's the increase of the temperature that drives the subsequent increase of the CO₂ content of the air, thanks to ocean out-gassing, and not the opposite. The same process is still at work nowadays]

[Poitou & Bréon] See previous point 1. Regarding the analysis of the Vostok ice cores it is quite obvious that anthropic CO₂ was not the driver of the climate changes. But it is well understood that the CO₂ has been amplifying the warming due to the changes of the orbital parameters of the Earth. Without this effect the contrast between glacial and interglacial periods would have been much smaller.

For the Vostok ice core is there really a “well understood” amplifying effect of CO₂ during deglaciation? The delay between temperature changes and CO₂ changes has been [13] found to be a few centuries: this is the minimum observable time in those ice cores because the closing time of air paths between ice crystals of the firn, several centuries, acts on the CO₂ record as a frequency low-pass filter whose time constant is some centuries.

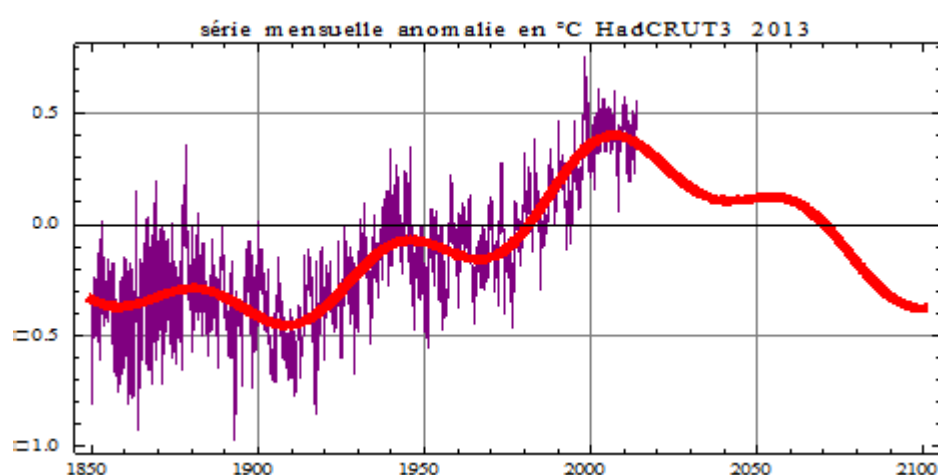
Oceanic cores show that the warming near the poles takes place before that of the inter-tropical surface [14]. Jeffrey Glassman [15] has found that the non-linear Henry law of degassing can be spotted on the Vostok deglaciation data, underlining again that the CO₂ in the air is a consequence of the temperatures, not their cause.

An explanation of the surprisingly quick deglaciation with respect to glaciations [16] has been provided by Prof. O. G Sorokhtin. [17]

Figure 2-A HadCRU T3 series of the monthly Global Mean Surface Temperature anomaly w.r.t. the mean over 1961-1990 and its best approximation by the sum of three sinusoids of periods 1000 years, 210 years and 60 years.

Note the great El Niños of 1878, 1939-40, 1941-42 and 1997-98 that started a change of sign of the slope.

Nota: 150 years of observations do not fully constrain the optimization and the red curve is a heuristic example



The truth n°2 is important because IPCC (AR5 summary for policy makers, 2013, page 15 § D2 figure SPM 10) states that the temperature increase is a simple function like $(2 \text{ CAE}/1000)^\circ\text{C}$ of the Cumulative Anthropic Emissions (CAE) that were 153 Gt-C end 1978 at the beginning of the global satellite lower troposphere temperature measurements, 257 Gt-C at the beginning of the “hiatus in the warming” and 402 Gt-C end 2014. This graphics SPM10 is supposed to “prove” that in order to keep the warming below 2°C w.r.t 1870 the cumulative anthropic emissions must be capped to about 1000 Gt-C. But if the temperature has been stable while the cumulative anthropic emissions increased by 57%, is the graphics SPM10 of IPCC AR5 believable?

Lets take a closer look at the temperature records: Figure 2-A suggests natural cycles of periods 60 years (found as well by Macias et al [18]), 210 years and 1000 years plus modulation by the El Niño events and by some volcanic events (Krakatoa 1883, Katmai 1912, ..). Figure 2-B suggests that since 1979 there has been a jump of at most 0.3°C during the great El Niño of 1997-98; (see figure 15-A showing that El Niño paces the global temperatures as the water of the warm pool is redistributed to the oceanic surface layer at higher latitudes). Those oscillations exist since millennia and are not related to CO₂.

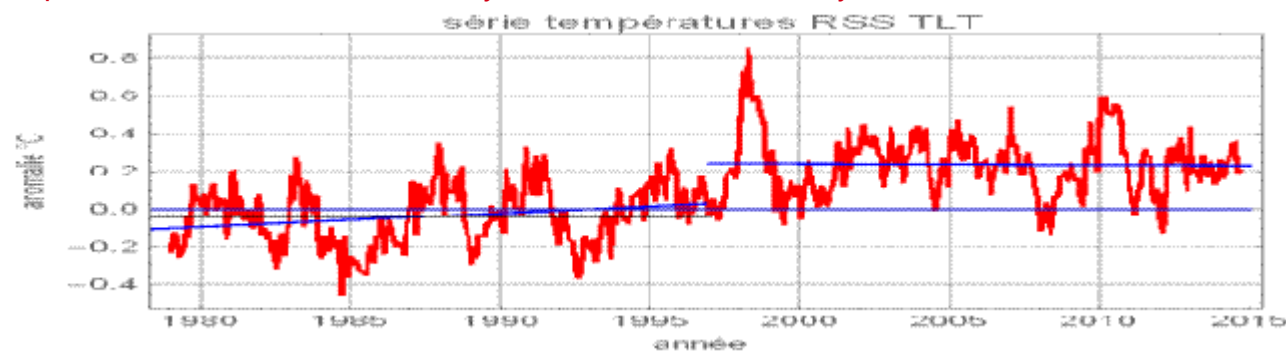
Hence we can say that no CO₂ effect on the temperatures has been observed since 1978 despite an increase of 263% of the cumulative anthropic emissions (263% = 402 Gt-C /153 Gt-C).

Figure 2-B: RSS MSU lower troposphere global average temperature January 1979 to Sept 2014.

Best Linear Fits: $0,029^\circ\text{C} + 0,007 (t - 1997)$ before January 1997 and $0.24^\circ\text{C} - 0,0006 (t - 1997)$ afterwards.



http://data.remss.com/msu/monthly_time_series/RSS_Monthly_MSU_AMSU_Channel_TLT_Anomalies_Land_and_Ocean_v03_3.txt



Moreover the life-time of a CO₂ molecule in the atmosphere is about 5 years because 5 years is the ratio of the stock of CO₂ in the air to the yearly absorption of CO₂ by the plants and the oceans[19].

Hence there were no more than 24 ppm = 5 years x 10 Gt-C / 2.12 (Gt-C/ppm) of anthropic emissions in the air at the end of 2014, and 5 ppm = 5 years x 2.1 Gt-C / 2.12 (Gt-C/ppm) at the end of 1958. Such a small anthropic content of the air cannot have any effect on the temperature even we believed in the Myrhe formula of IPCC : $T'' - T' = 5(^{\circ}\text{C}) \ln (CO_2'' / CO_2')$.

The most obvious tricks on the IPCC/2013/SPM10 figure are:

- * the averaging of the temperatures over ten calendar years (like 2001-2010) discards all evidence of natural cycles and makes the El Niño disappear as both the main pacemaker and the cause of temperature jumps
- * the Pinatubo dust veil effect (1992-1993) is, thanks to this averaging, morphed into a CO₂ related temperature increase
- * the small anthropic emissions of 1870-1950 are assumed to be the only cause of the significant temperature fluctuations since the end of the little ice age !
- * the very idea of a cumulative effect of anthropic emissions is (akin an infinite lifetime) not consistent with the evidence of a five year life time of CO₂ molecules in the air, equal to the ratio stock/(yearly absorption).

Truth n°3 The amount of CO₂ in the air from anthropic emissions is today no more than 6% of the total CO₂ in the air (as shown by the isotopic ratios 13C/12C) instead of the 25% to 30% said by IPCC

[Poitou & Bréon] *This statement is very obviously wrong as shown by the Vostok ice core and by other cores from the Antarctic. Indeed over the last 800 000 years the CO₂ content of the air never exceeded 300 ppm; today its 400 ppm. If the 100 ppm difference – a quarter of the present concentration- is not due to anthropic activities, which is its cause that never occurred over the last 800 000 years*

There is no need to fetch glimpses of a distant past from the Vostok ice core. Today's observations are unambiguous!

The delta¹³C is a linear function of the ratio of the number of atoms ¹³C to ¹²C; the delta¹³C of a mixture is the quantity-weighted average of the delta¹³C of the components of the mixture. The delta¹³C of the anthropic emissions has been changing with the proportion of coal, oil and natural gas in the energy mix and went from -26 pm (pm= per mil) for the mostly coal and oil economies of the 1950s to -29.5 pm near year 2000 and back to -28.5 pm with the revival of the coal since 2003-2005.

6% (-28.5 pm) +94% (-7 pm) = (-8.3 pm) which is the observed value (figure 3-A)

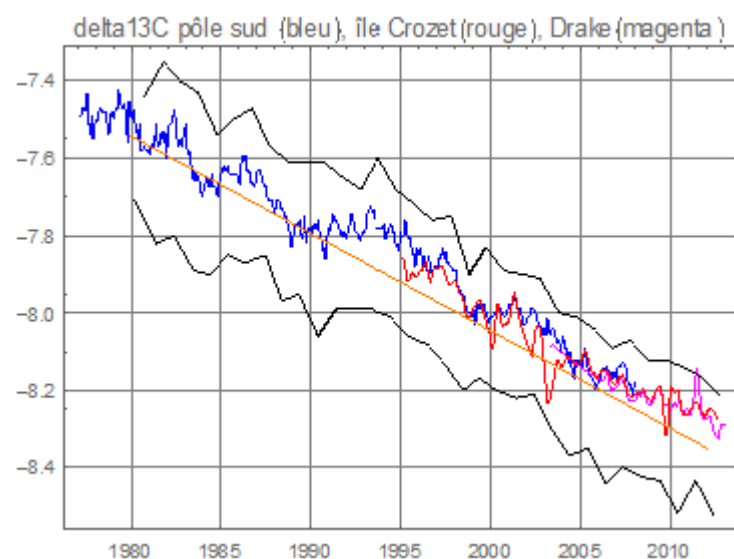
The 6% are: (lifetime 5 years) x (yearly anthropic emissions 10 Gt-C) /(total CO₂ in the air of 850 Gt-C)

IPCC writes page 10 § B.5 of the Summary for Policy Makers: *"From those cumulative anthropic emissions 240 [230 à 250] Gt-C have accumulated in the atmosphere"*

As (240 / 840) = 28% and as 28% (-28 pm) + 72% (-7 pm) = (-13 pm) the IPCC statement is grossly wrong: the observations are quite different of the (-13) per mil, as shown figure 3-A below.

Figure 3-A Monthly observations of the delta¹³C in per mil (pm) as a function of time at the south pole (blue), at Crozet Island (red), at the passage of Drake (magenta) and the envelope (yearly max and yearly min) of the observations at Mauna Loa (19°30N and 3400 m) (black)





Note that the non-anthropogenic (or natural) $\delta^{13}\text{C}$ becomes very slowly more negative (from -6.5 per mil preindustrial to about -7 per mil now) with the replacement of CO_2 molecules absorbed by the vegetation by molecules out-gassed from soils by the oxidation of the organic material of plants grown years to centuries before: the $\delta^{13}\text{C}$ of the air was then slightly less negative. The same long delays apply to the degassing from the oceanic upwellings that recycle carbon absorbed at higher latitudes tens of years before.

The comment by Poitou & Bréon assumes that the air inclusions recovered in the ice cores have the same CO_2 content as the air on the surface at the time of the closing of the last air paths between ice crystals: this is unlikely and debated.

Truth n°4 The lifetime of CO_2 in the atmosphere is about 5 years instead of the 100 years said by IPCC

[Poitou & Bréon] Where does IPCC say that in its 2013 report or in the AR4, about the lifetime in the air? No such thing has been said.

This is again the mark of an obvious misunderstanding of the atmospheric phenomena.

Can you explain what is the cause of the increase of the CO_2 content of the air that never occurred in the 800 000 years before.

Climate-sceptics who claim the lifetime of CO_2 in the atmosphere is less than 10 years built upon the ratio stock/ (yearly absorption). Such a computation is only valid for a given equilibrium. The 4 to 5 Gt-C that accumulate in the air kick the system out of equilibrium. The CO_2 lifetime then involves exchanges between surface ocean and deep oceans and residence times become much longer beyond a century.

IPCC “says it” in AR4 with the Bern formula page 213 note a, table 2-14.

The probability of survival of a molecule expressed as $\exp(-t/u)$ where u is the mean lifetime can be deduced from the identity

$$d[\text{CO}_2]/dt = f_{\text{outgassing}}(t) + f_{\text{anthropic}}(t) - f_{\text{absorbed}}(t)$$

Let's assume $u = [\text{CO}_2]/f_{\text{absorbed}}$ be constant, then

$$[\text{CO}_2](t) = \exp(-(t-t_0)/u) [\text{CO}_2](t_0) + \int_{t_0}^t (f_{\text{outgassing}}(t') + f_{\text{anthropic}}(t')) \exp(-(t-t')/u) dt'$$

This derivation of $[\text{CO}_2](t)$ does not assume any *given equilibrium* between ingress and egress; the only hypothesis made is that the absorption grows with $[\text{CO}_2]$ due to fertilization of the air by CO_2 : more food, bigger plants and quicker growth, more leafs and so on; see on notice n°2 in the footnotes the references of some observations made during the last fifty years.

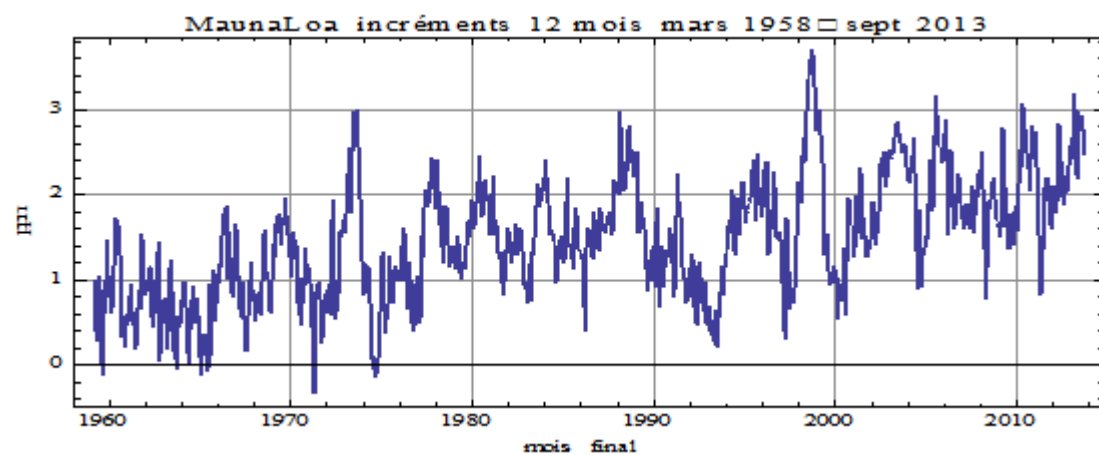
The monthly increments $d[\text{CO}_2]/dt$ computed for $dt = 12$ months from the Mauna Loa series of $[\text{CO}_2]$ are displayed on figure 4-A; they have no resemblance to the much smoother series of the anthropic emissions, but mimic very well the series of the inter-tropical temperature anomalies $T(t)$; indeed for the non anthropic part:

$$f_{\text{outgassing}}(t) - f_{\text{absorbed}}(t) = k (T(t) - T_0)$$

(see references on card n°1 and more details on card n°17).

Figure 4-A Monthly increments over the last 12 months of the CO_2 content in ppm measured at Mauna Loa observatory (altitude 3400 m; 19°30 N)





Can you explain what is the cause of the increase of the CO₂ content of the air? Indeed $f_{\text{outgassing}}(t) - f_{\text{absorbed}}(t) = k (T(t) - T_0)$

The year to year increase of the anthropic content of the air is

$$\partial_{t-1}^t f_{\text{anthropic}}(t') \exp(-(t-t')/u) dt' - \partial_{t-1}^{t-1} f_{\text{anthropic}}(t') \exp(-(t-1-t')/u) dt' =$$

$$\partial_{t-1}^t f_{\text{anthropic}}(t') \exp(-(t-t')/u) dt' - (1 - \exp(-1/u)) \partial_{t-1}^{t-1} f_{\text{anthropic}}(t') \exp(-(t-1-t')/u) dt'$$

that is the difference between the emissions of the last year and (1/u) times the cumulative weighted emissions of the previous years.

Please note that due to the 5 years lifetime, what is “accumulating in the air” is not the anthropic emissions themselves but roughly their increase over the last five years; for instance during the last years the yearly increase of the emissions was about 2%/year that is 2% 10 Gt-C = 0.2 Gt-C or 0.1 ppm; with u = 5 the increase of the anthropic content of the air was about 5 years x 0.1 ppm = +0.5 ppm/year as can be checked by a direct computation.

Can you explain what is the cause of the increase of the CO₂ content of the air that never occurred in the 800 000 years before.

The low pass frequency filtering due to the century long compaction time of the snow crystals in the firn and the effects of the pressure on the air inclusions (both during the closing of air-paths in the firn and during the withdrawal of the ice core) significantly change the amplitude and phase of the CO₂ content of the ice core with respect to the isotopic content of the surrounding ice.

Figure 4-B compares the Bern formulas that, according IPCC, say the part of the anthropic emissions still in the air after t years

$$(21.7 + 25.9 \exp(-t/172.9) + 33.8 \exp(-t/18.51) + 18.6 \exp(-t/1.186)) \% \text{ (in black) or}$$

$$(18 + 14 \exp(-t/420) + 18 \exp(-t/70) + 24 \exp(-t/21) + 26 \exp(-t/3.4)) \% \text{ (in red)}$$

Those expressions are obviously best fit transfer function between the series of anthropic emissions and the Mauna Loa series, with six or eight freely adjustable parameters.

IPCC AR5 2013 SPM § B.5 says that “240 [230 to 250] Gt-C from the anthropic emissions have accumulated in the atmosphere” from 1750 to 2011. This fits well with the Bern formulas but not at all with the isotopic delta¹³C ratios (card n°3).

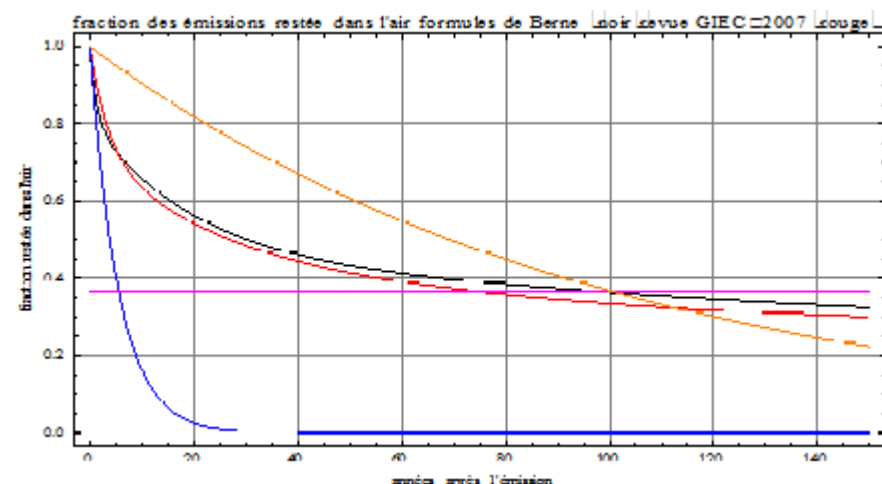
Figure 4-B Fraction of anthropic emissions remaining in the air for both Bern formulas (black and red)

The magenta line is at 1/e = 36,8%. The blue curve is $\exp(-t / 5.5 \text{ years})$

The orange curve is $\exp(-t / 100)$ and intersects the Bern curves at about t = 100 years

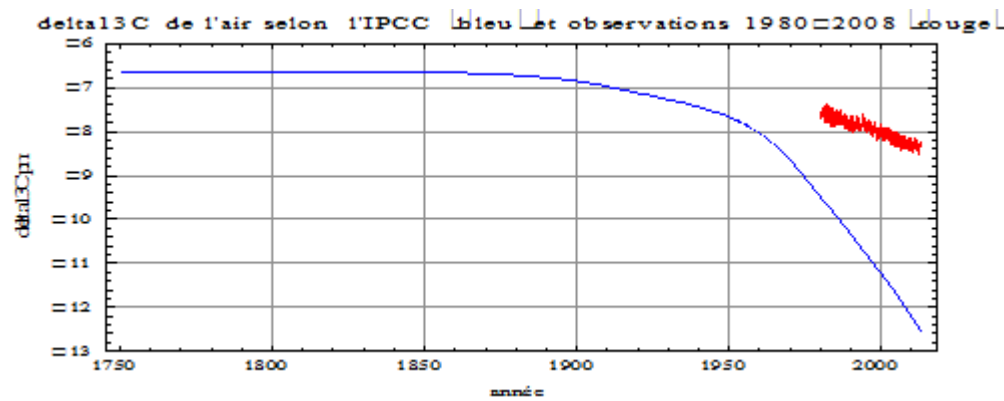
Formula 21.7% + 25.9% $\exp(-t/172.9)$ + ... in black: 36,4% remaining in the air after 100 years

Formula 18% + 14% $\exp(-t/420)$ + in red: 33.5% remaining in the air after 100 years



Applying the Bern formula to the series of the anthropic emissions of coal, oil and gas (plus cement factories) since 1750, with a rough estimate of the $\delta^{13}\text{C}$ of those emissions (from -26 pm for the mostly coal and oil economies to -29.5 pm near year 2000 and back to -28.5 pm with the revival of the coal between 2003 and 2012) leads to a $\delta^{13}\text{C}$ of the air drawn in blue on figure 4-C; the measured values are in red.

Figure 4-C) Blue: $\delta^{13}\text{C}$ of the air computed according to the Bern formula of IPCC (AR4 page 213) starting in 1750 from -6,5 pm and 277 ppm as “preindustrial” Red: observations (Mauna Loa)



Historical Note: The “much longer, beyond a century” residence times arose in papers by Bert Bolin, first chair and co-founder of the IPCC [20]. He assumed that the Revelle factor used to describe the ionic equilibrium inside the ocean between the total dissolved carbon and carbonic acid should apply as well between air and ocean, assuming the equality of the partial pressures in the air and in the ocean. There is no such thing! Out-gassing zones (mostly inter-tropical) and absorption zones (mostly high latitudes) of the ocean are different and distant (notice n°17).

The completely different decay times in the two Bern formulas (172.9 years or 420 years? , 1.186 or 3.4 years ? etc.) show that those tales about the transit into the depths of the oceans are pure obfuscation without physical meaning.

Addendum about the relation $d[\text{CO}_2]/dt = f_{\text{outgassing}}(t) + f_{\text{anthropic}}(t) - f_{\text{absorbed}}(t)$: the IPCC hypothesis is $f_{\text{outgassing}}(t) = f_{\text{absorbed}}(t)$ within a few percent with very little change since the little ice age; the observations suggest $f_{\text{absorbed}}(t) / [\text{CO}_2] = \text{constant} = 1/\text{lifetime}$.

Changes from IPCC AR4 (figure 7-3 p. 515) to IPCC AR5 (figure 6.1 page 471): the absorption by the oceans went down from

92.2 Gt-C = 70 (preindustrial) + 22.2 Gt-C to 80 Gt-C = 60 (preindustrial) + 20 Gt-C while the absorption by terrestrial vegetation went up from 122.6 Gt-C = 120 (preindustrial) + 2.6 Gt-C to 123 Gt-C = 108.9 (preindustrial) + 14.1 Gt-C; the change from 2.6 to 14.1 reflects a reassessment of the fertilization by the additional CO_2 in the air since the 277 ppm assumed for the “preindustrial”, but is still a factor 2 or 3 lower than the observations between 1960 and 2010 related by the papers of Graven & Keeling, Myneni, Donohue, Pretzsch, Hansen and Sun referenced at the end of card n°1 (footnote 19). The numbers for the oceans are roughly consistent with a constant lifetime since “preindustrial”, but the absorption by terrestrial vegetation should be corrected to about 120 Gt-C = 83 (preindustrial) + 37 Gt-C.

Truth n°5 ... The Global Mean Temperature curve displays a 60 years period that may be related to the motion of the sun around the centre of mass of the solar system. We are at a maximum of the sinusoid and the next years should be cooler, as it has been the case after 1950

[Poitou & Bréon] *We would like an explanation of the link between the position of the sun w.r.t the centre of mass of the solar system and the temperature on Earth. As the motion of the sun w.r.t the centre of mass is linked to the planetary motions, the author has just invented the climatic astrology*

Climatic cycles are well documented on all proxies of paleo-temperatures. The relation between the 60 years cycle and the position of the sun has been discussed by many authors (for instance professor Scafetta [21]) in tens of books and papers.

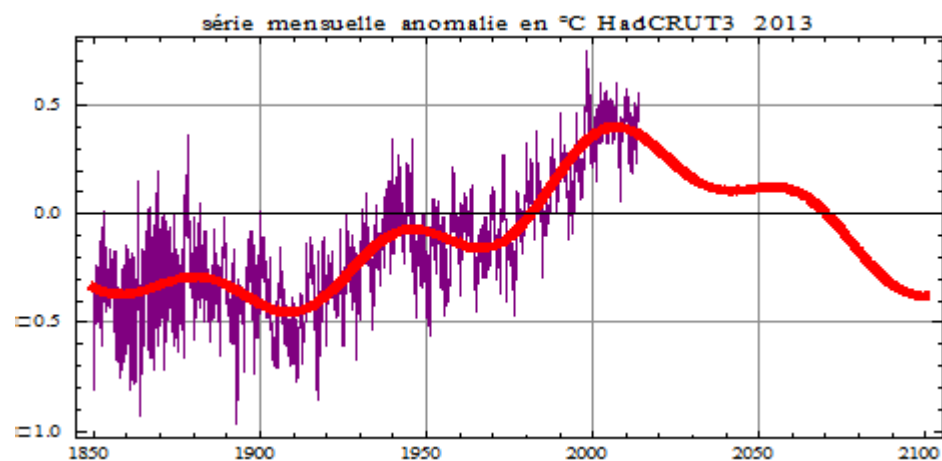
Assuming that the Earth moves around the centre of mass of the solar system, the insolation in January and July may change in opposition by up to more than 1% [22]

Those 60 years cycles are prominent on the HadCRUT (figure 5-A) curve used by IPCC as they are in the reconstructions of the Pacific Decadal Oscillation for the past millennium.

Figure 5-A HadCRU T3 series of the monthly Global Mean Surface Temperature anomaly w.r.t. 1961-1990 average anomaly and its best approximation by three sinusoids of periods 1000 years, 210 years and 60 years. Note the great El Niños of 1878, 1939-40, 1941-42 and 1997-98 that started a change of sign of the slope.

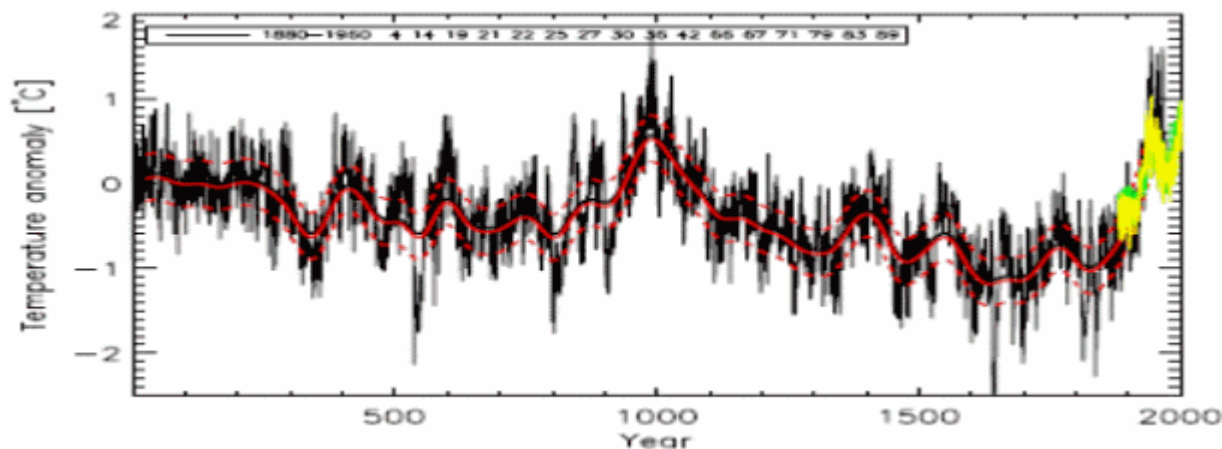
150 years of observations do not fully constrain the optimization and the red curve is an heuristic example





The physical explanation of 1000 year cycles of the paleo-temperatures may be an open question: they are prominent on figures 5-B and 5-C.

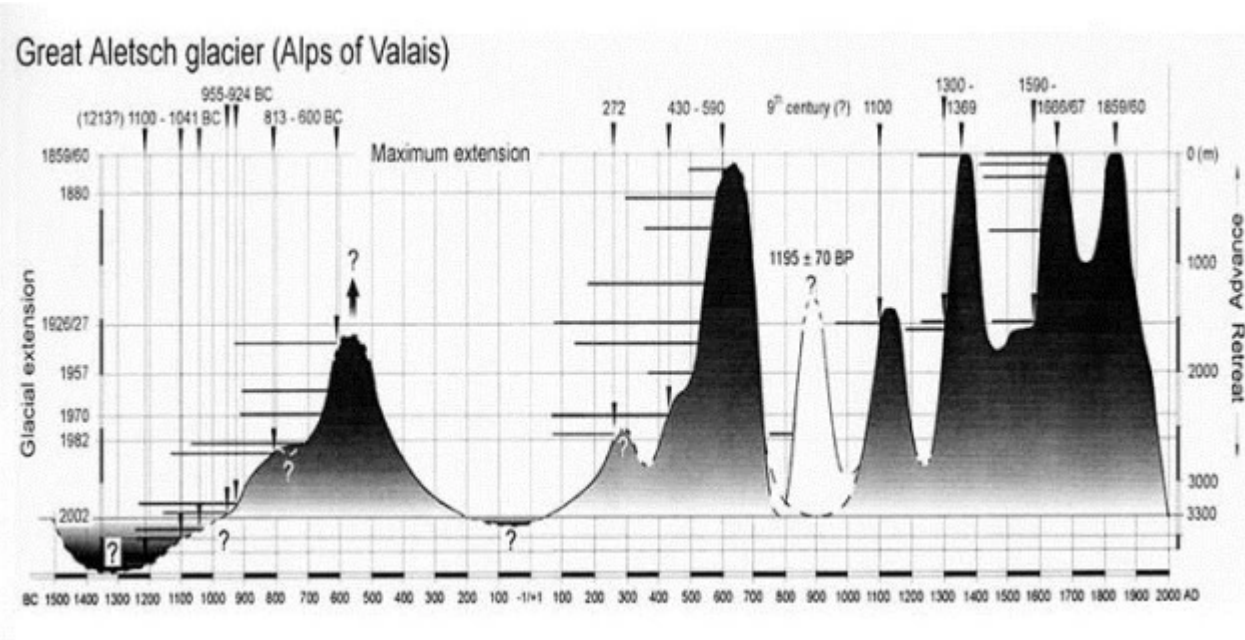
Figure 5-B [23] Reconstruction [Christiansen & Ljungqvist; 2013] of the extratropical temperatures of the Northern Hemisphere in °C, as anomaly w.r.t. the 1880-1960 average. The thin black curve is from the annual values; the smoothed red curve is a 50 year average with the 2.5% probability quantiles as dashed lines. The yellow curve is the instrumental temperature averaged only over those cells (5° latitude 5° longitude) which have at least one proxy



The little ice age (1360-1860) is exemplified by many observations in China, and on figure 5-C by the advances and retreats of the longest European glacier: there are about 1000 years between the Minoan (1300 BC) , Roman (100 BC), Medieval (950 AD) and Contemporary optima. Most (about 2/3) of the recent recession of the glacier occurred between 1860 and 1957 and cannot be ascribed to the anthropic emissions of CO₂ which were then insignificant: 0,083 Gt-C in 1859, 1,3 Gt-C in 1940 and 2,2 Gt-C in 1956 with an assumed CO₂ content of the air -from Law Dome ice core- of 286 ppm in 1859, 310 ppm in 1940 and 314 ppm in 1956.

Figure 5-C Lower limit of the great glacier of Aletsch (Switzerland) (length 23 km) from 1500 BC to 2000 AD (from Holzhauser)

On the left years 1859 to 2002, on the right meters w.r.t. the maximum extension of the glacier during the little ice age



Truth n°6 **The absorption of the radiation from the surface by the CO₂ of the air is nearly saturated. Measuring what is left from the radiation of a broadband IR source (like a 1000°C black body) after crossing the equivalent of the CO₂ content of the air (6 kg/m²) shows that the strong bands of absorption by CO₂ near 4.3 and 15 microns have been absorbed and replaced by the emission of the trace gas at its own temperature.**

[Poitou & Bréon] *This kind of statement proves that the author has not understood the basis of the greenhouse effect. It is because the air has a vertical temperature lapse rate and a thickness much above the average infrared photon path length that the greenhouse effect exists and increases with the concentration of the greenhouse gases: see "The atmospheric greenhouse effect is more subtle than you believe" in La Météorologie (n°72 February 2011)*



Almost the same text as in *La Météorologie* ("... more subtle than you believe") has been published by the same authors in the periodical *La Découverte*^[24]. There, it is written that the absorption of surface radiation by CO₂ is saturated and that the decrease in the global outgoing longwave emission due to more CO₂ in the air is only due to the "higher and cooler" emission level of tropospheric CO₂ radiating to the cosmos.

Let us look at those radiative effects. The cm⁻¹ is a unit of frequency used in optics which is 29.9792 GHz (GHz = giga Hertz).

The transmission of diffuse infrared radiation by a layer of optical thickness t is the special function $2E_3(t)$ which is approximately $\exp(-t)/(1+0.65t)$; transmission is 20% for $t=1.07$, 1.8% for $t=3$ and $7 \cdot 10^{-6}$ for $t=10$.

If the temperature of the air as function of the optical thickness is smooth, then 80% of the photons radiated by the air and reaching the cosmos originate from a layer of thickness 1.07 near the "top of the air".

And 80% of the photons radiated by the air to the surface come from a layer of optical thickness 1.07 near the surface.

Figure 6-A shows that the water vapour of the air is very opaque over almost all the thermal infrared spectrum, from radiofrequencies at some cm⁻¹ up to 2220 cm⁻¹, except in the 350 cm⁻¹ wide "water vapour window" from 770 cm⁻¹ to 1180 cm⁻¹.

CO₂ is opaque from say 580 cm⁻¹ to 750 cm⁻¹, over 170 cm⁻¹, about a tenth of the spectrum where water vapour is opaque.

Figure 6-A Optical thickness t of the atmosphere as function of the optical frequency for the two main trace gases: water vapour (blue) and carbon dioxide (red)

25 kg/m² is about the global average of water vapour on the air that goes from 1 or 2 kg/m² (extreme winter polar conditions) up to 80 kg/m² (near the equatorial convective "chimney" at the confluence of the trade winds)

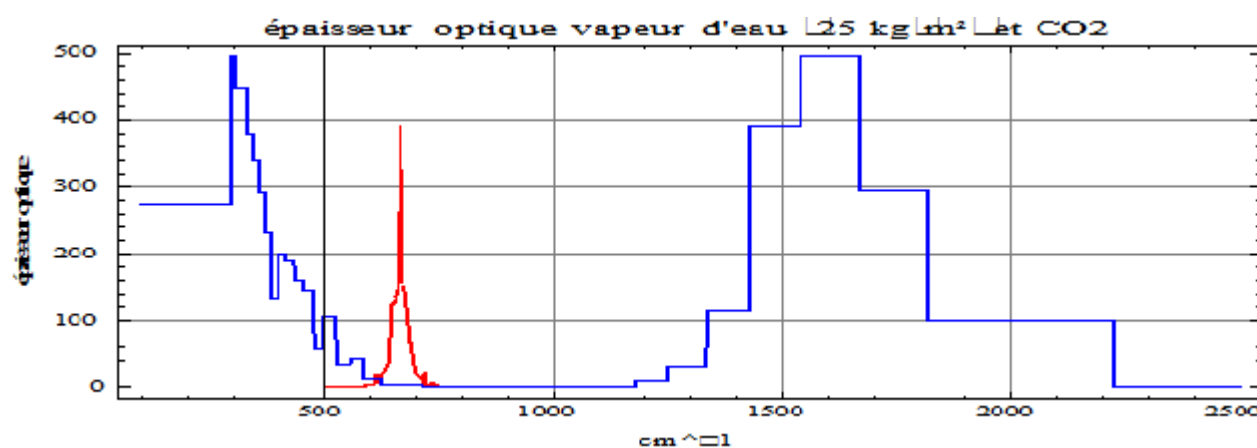


Figure 6-B is a zoom on the spectrum relevant for CO₂: the water vapour content of the air is very sensitive to the temperatures^[25] and is concentrated in the lowest layers: 80% of it is in the first 250 mbar, below 2.3 km; the CO₂ is "well mixed" and its bulk does not see the surface radiation that has already been absorbed by water vapour and by the low clouds.

What would be the effect of doubling the CO₂ content of the air?

Transmission will be reduced from $2E_3(t_{\text{water vapor}} + t_{\text{clouds}} + t_{\text{CO}_2})$ to $2E_3(t_{\text{water vapor}} + t_{\text{clouds}} + 2 t_{\text{CO}_2})$ that is about

$$2E_3(t_{\text{water vapor}} + t_{\text{clouds}}) f(t_{\text{CO}_2})$$

where $f(t_{\text{CO}_2})$ is maximum at $(1/4)$ for $t_{\text{CO}_2} = 0.42$ and is negligible if t_{CO_2} is small or large (say $t_{\text{CO}_2} > 2$).

Hence some additional absorption of the surface radiation may occur between 750 cm⁻¹ and 800 cm⁻¹ if $(t_{\text{water vapor}} + t_{\text{clouds}}) < 2$.

For a mid latitude summer reference profile this additional absorption is about 0.8 W/m² and of course the radiation of the air to the surface increases by about the same amount (or even somewhat more): the radiative heat transfer between surface and air becomes then even more negligible.

Hence less than 0.8 W/m² radiated from the surface do no longer reach the cosmos^[26] and are carried away by the evaporation associated with a minuscule temperature increase of the surface: for evaporation at +6W/m²/°C, the required temperature increase would be 0.13°C spread over the 200 years it would take to double the CO₂ content of the air at the rate of +2 ppm/year.

The global outgoing longwave radiation will not be changed as this latent heat will feed the radiation to the cosmos of the water vapour ... where the condensation takes place.

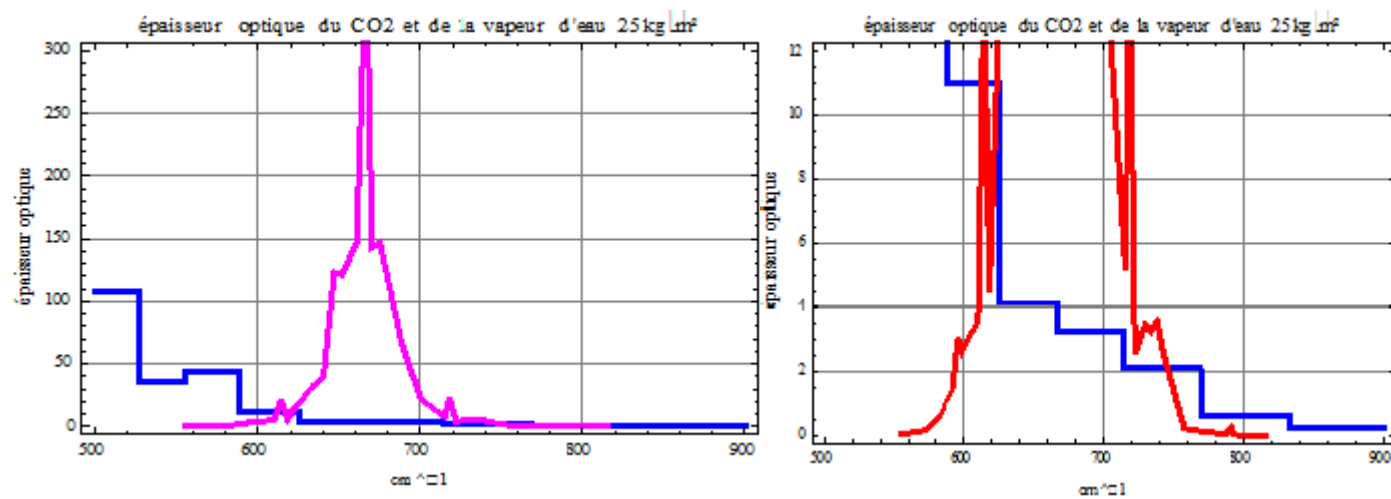
The saturation of the absorption can be said because $0.8 \text{ (W/m}^2\text{)} / 400 \text{ (W/m}^2\text{)} = 0.002$, two thousandths!

The article quoted ("... more subtle ...") says: "... the result is unexpected and raises a crucial interrogation... for carbon dioxide the absorption by the atmosphere of the infrared radiation [from the surface] does practically does not change." Indeed!

Figure 6-B Zoom on the optical thickness t of the air near 15 μm or 666 cm⁻¹ (left magenta, right red) and of water vapour (in blue)

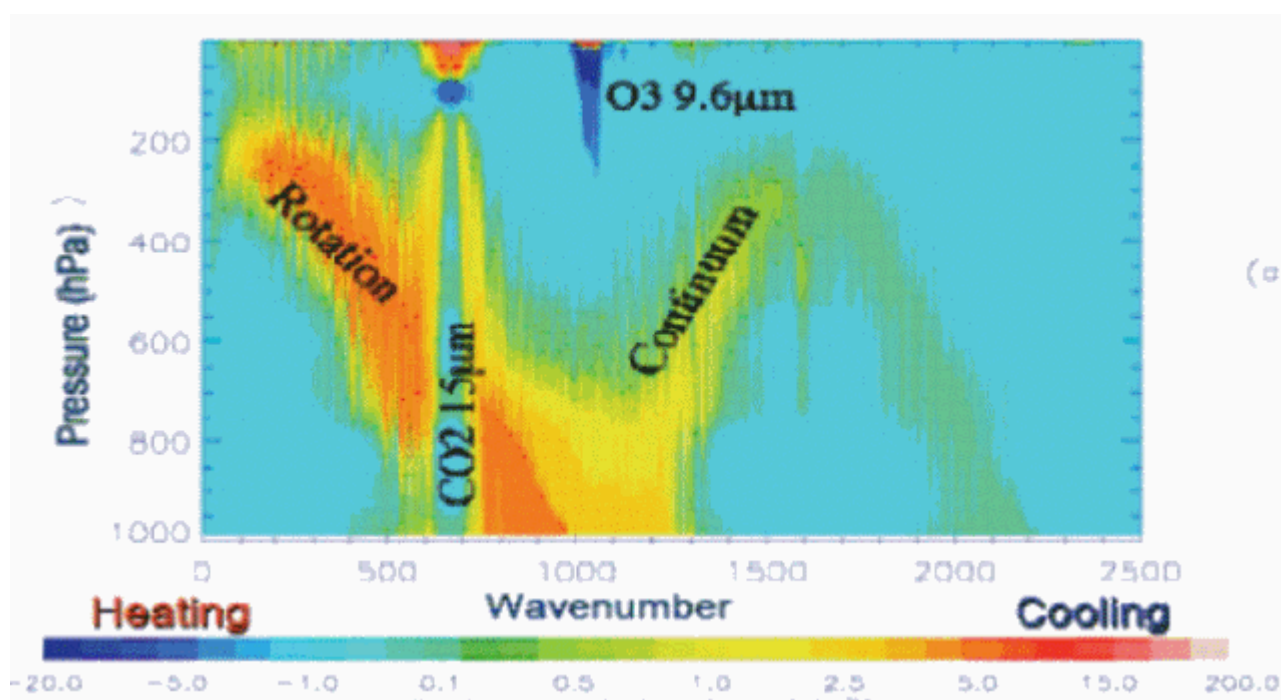


The level corresponding to an optical thickness 1 from the top of the air is for CO₂ at about $P(\text{atm}) = (1/t_{\text{CO}_2})^{(1/1.45)}$ that is at or above the tropopause (0.2 atm) for $t_{\text{CO}_2} = 10$



The altitude where the radiation to the cosmos takes place with the associated cooling of the top of the air is near $t=1$ from the top of the air, that is at a pressure $(1/t_{\text{max H}_2\text{O}})^{(1/4.5)}$ or $(1/t_{\text{max CO}_2})^{(1/1.45)}$; the line by line computation of figure 6-C is a morphing from figure 6-A.

Figure 6-C Heating and cooling of the air in **milli-K/day/cm⁻¹** as a function of pressure and of optical frequency; tropical case with a tropopause at about 100 mbar; pale blue is where the cooling is negligible (from Brindley & Harries 1998, Sparc 2000: see Andrew Gettelman *Observations from AIRS and applications to climate and climate modeling*)

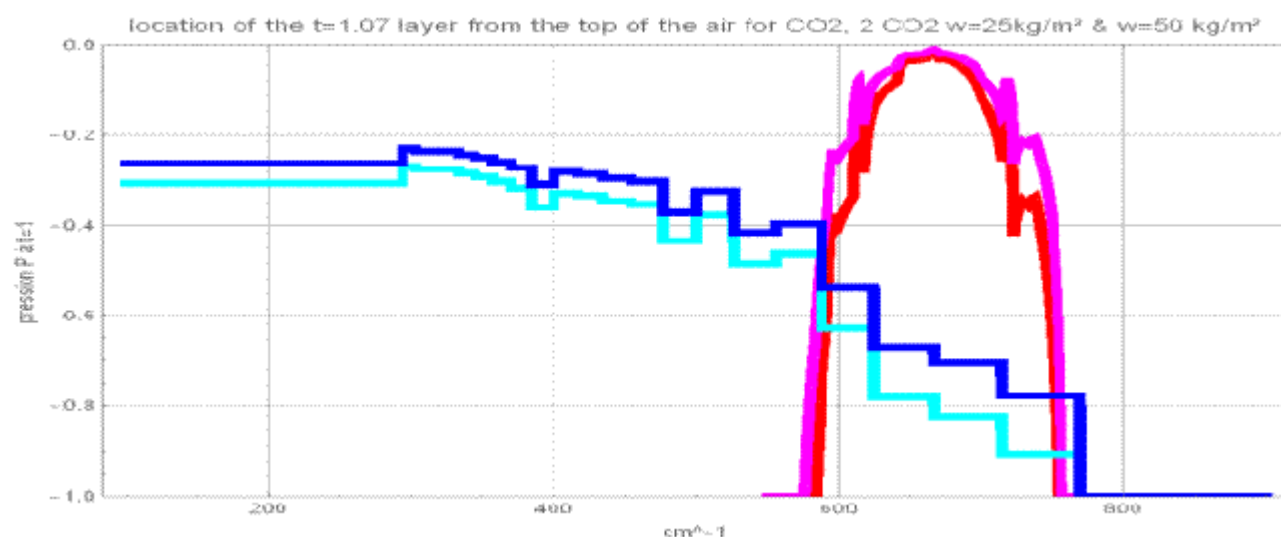


Let us now consider the “higher and cooler” argument. According to Ramanathan et al. (1987) and Hansen et al. (2011) [27]: »*The basic physics underlying this global warming, the greenhouse effect, is simple. An increase of gases such as CO₂ makes the atmosphere more opaque at infrared wavelengths. This added opacity causes the planet’s heat radiation to space to arise from higher, colder levels in the atmosphere, thus reducing emission of heat energy to space. The temporary imbalance between the energy absorbed from the Sun and heat emission to space, causes the planet to warm until planetary energy balance is restored.*«

The level $P_{1.07}$ of the optical thickness $t=1.07$ from the top of the air, is the lower limit of the layer sourcing 80% of the photons lost to the cosmos; this level is the solution of $1 = t_{\text{max H}_2\text{O}} P_{1.07 \text{ H}_2\text{O}}^{4.5}$ or $1 = t_{\text{max CO}_2} P_{1.07 \text{ CO}_2}^{1.45}$; see figure 6-C and the more sketchy figure 6-D. Doubling $t_{\text{max CO}_2}$ uppers the CO₂ level from $P_{1.07 \text{ CO}_2}$ to $P' = 0.62 P_{1.07 \text{ CO}_2}$ as shown on figure 6-D. There are about 40 cm⁻¹ near 610 cm⁻¹ and near 730 cm⁻¹ where CO₂ would radiate from a cooler and higher layer after an instantaneous CO₂ doubling with all temperature and humidity of the troposphere kept FIXED.

Figure 6-D) Pressure (in atm) of the level above which 80% of the photons radiated by the air and reaching the cosmos are produced

Solutions of $t_{\text{H}_2\text{Omax}} P^{4.5} = 1.07$ (for $w = 25 \text{ kg/m}^2$ and 50 kg/m^2) and of $t_{\text{CO}_2\text{max}} P^{1.45} = 1.07$ and $2 t_{\text{CO}_2\text{max}} P^{1.45} = 1.07$



Let’s now see the man-traps of the “higher and cooler” argument

* CO₂ doubling is not instantaneous but, at +2 ppm/year, would take about 200 years; hence there is plenty of time for convection and water vapour to restore the “*emission of heat energy to space*” as they do every day and night

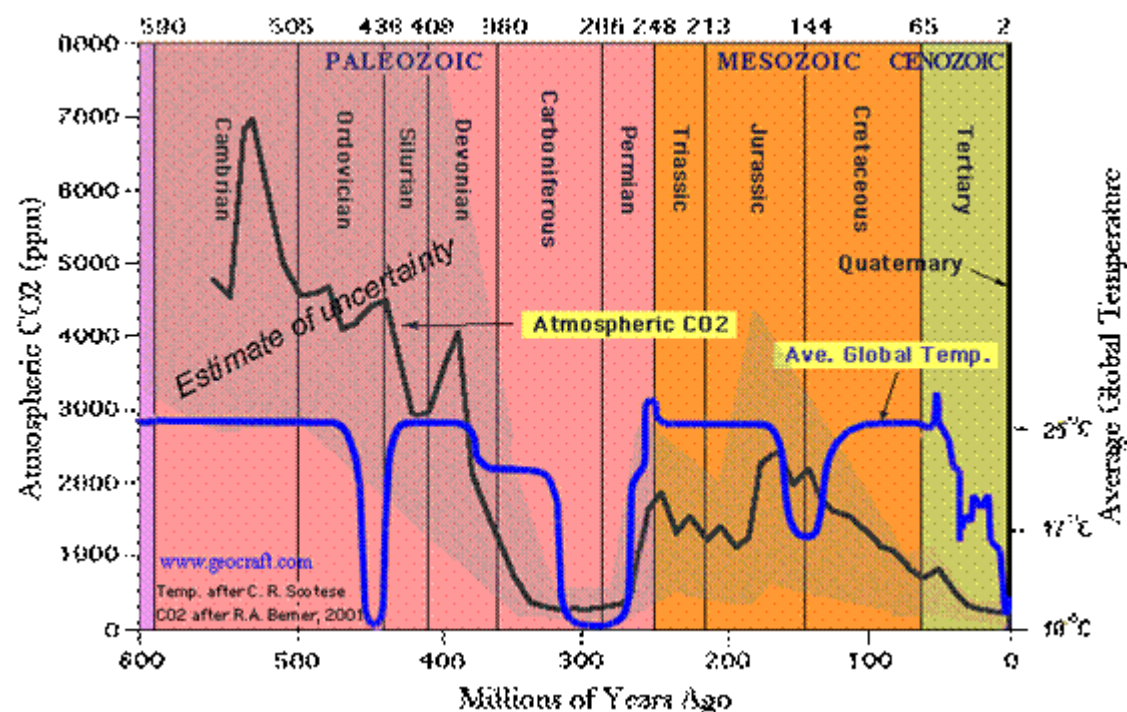
* If CO₂ radiates from higher and cooler (In the troposphere only !) there will be more cooling of the 250 mbar layer (near 610 cm⁻¹ and near 730 cm⁻¹) and less cooling at 350 mbar: this is likely to be erased by convection

* the water vapour content of upper layer of the air (in blue figure 6-D) will change by about 12%/K near the tropopause and is reduced by the enhanced cooling of the 250 mbar layer; hence the water vapour radiation will be from a “lower and warmer” level, with a very significant spectral leverage of a factor of ten (400 cm⁻¹ for the water vapour w.r.t to 40 cm⁻¹ for the CO₂).

The above quoted statement by Ramanathan et al. ignores the difference between CO₂ and the phase changing water vapour and the inherent instability of the “*more cooling above, more heating below*”.

Truth n°7 In some geological periods the CO₂ content of the air has been up to 20 times today's content and there has been no runaway temperature increase! Why would our CO₂ emissions have a cataclysmic impact? The laws of Nature are the same whatever the place and the time.

[Poitou & Bréon] *At the Carboniferous the CO₂ content was much less than 25 times today's and the solar radiation was significantly lower. At the end of the Carboniferous the temperature was very low at high latitudes (glaciations), warm in the tropics and the CO₂ content was comparable to today's as see on the figure below*



Glaciations with some ice caps occur every 140 million years: this has been related to the crossing of a galactic arm by the solar system, with the hypothesis connecting strong cosmic rays impinging the Earth and enhanced low cloud coverage.

See:

N. Shaviv, “Cosmic Ray Diffusion from the Galactic Spiral Arms, Iron Meteorites, and a Possible Climatic Connection”, [Physical Review Letters 89, 051102, \(2002\)](#).

N. Shaviv, “The spiral structure of the Milky Way, cosmic rays, and ice age epochs on Earth”, [New Astronomy 8, 39 \(2003\)](#).

Veizer, Ján “Celestial Climate Driver: A Perspective from Four Billion Years of the Carbon Cycle” *Geoscience Canada* volume 32 Number 1 March 2005 pp -13-28

Shaviv, N.J. and Veizer, J., 2003, “Celestial driver of Phanerozoic climate?” : *GSA Today*, v. 13/7, p. 4-10

Svensmark, Henrik *Evidence of nearby supernovae affecting life on Earth* *Mon. Not. R. Astron. Soc* April 2012

Sorokhtin O. G., G.V.Chilingar, L.F. Khilyuk “*Global Warming and Global Cooling Evolution of the Climate of the Earth*” Elsevier 2007, 313 pages

Truth n°8 The sea level is increasing by about 1.3 mm/year according to the data of the tide-gauges (after correction of the emergence or subsidence of the rock to which the tide gauge is attached, nowadays precisely known thanks to high precision GPS instrumentation); no acceleration has been observed during the last decades; the raw measurements at Brest since 1846 and at Marseille since the 1880s are slightly less than 1.3 mm/year.



[Poitou & Bréon] *The reader will see there an obvious attempt to deceive. Why use the Brest tide gauge as representative of the world's oceans, the sea level is very well measured by satellite, and those measurements show unambiguously a rise by 3 mm/year. Compiling data from tide gauges around the globe clearly suggest an accelerating trend. The sea level rise is by no means uniform: sea is not flat. Currents play an important role in the geographical distribution of the sea level rise. The French measurements are related to a minute share of the oceans.*

A “clean” International Terrestrial Reference Frame recalibration of the GPS data [28] leaves +1.3 mm/year for a representative set of tide gauges over the world. For the protection of the coasts it is the tide-gauges and the highest sea level during tempests and high tides that are relevant!

For France the tide-gauges of Brest (n°1 of the psml.org database) and Marseilles are relevant: figure 8-A from a recent thesis [29] show yearly averages of the levels of the mean high water and mean low water (1846-2007). The 18.6 years lunar cycles are prominent and have sometimes been mistaken for short-time accelerations of the mean sea level.

Figure 8-A (Nicolas Pouvreau) Yearly average levels of the mean high water and mean low water (1846-2007) at Brest. The vertical lines are the time of the minimum declination of the Moon while the dotted vertical lines are those of the maximum declination of the Moon (from Pugh 2004)

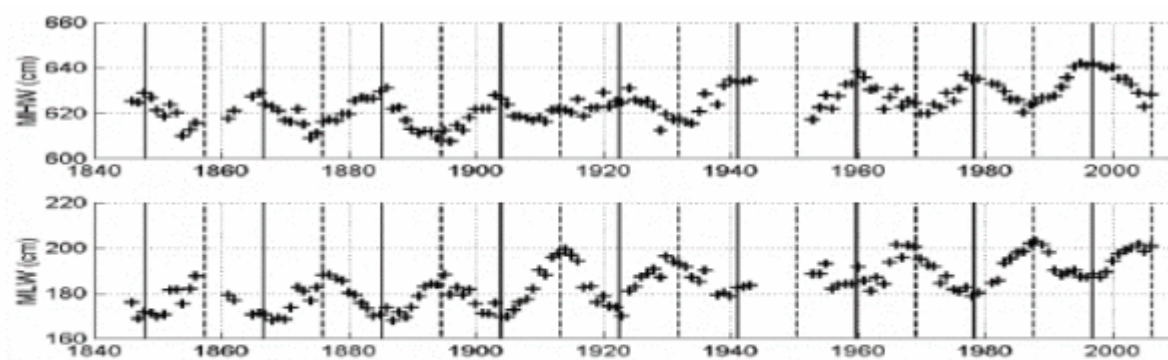
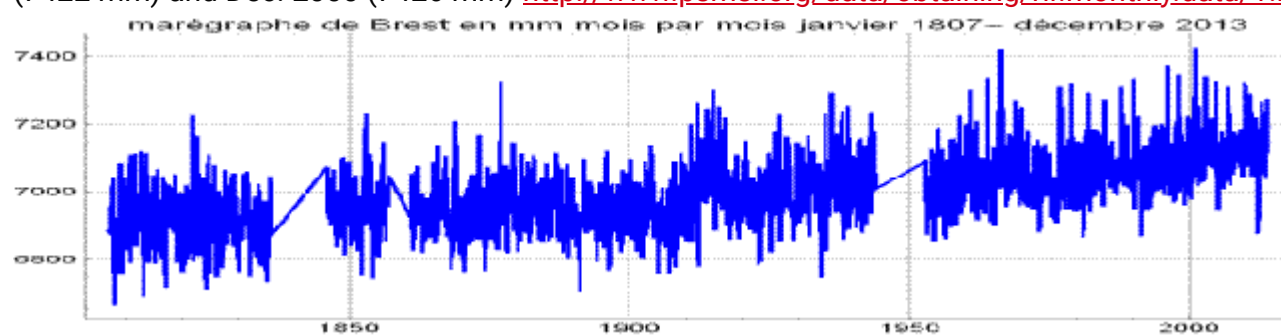


Fig. 1.5 – Niveau moyen annuel de la pleine mer (MHW) et niveau moyen annuel de la basse mer (MLW) à Brest entre 1846 et 2007. Les lignes verticales continues et les lignes verticales en pointillés correspondent au moment du minimum (respectivement du maximum) de la déclinaison de la Lune. Valeurs des minimums et maximums de la déclinaison de la Lune d'après Pugh (2004).

The monthly averaged sea levels since 1807 (figure 8-B) show +19 cm over two centuries (difference of the averages of the 120 first months of data and of the 120 last months of data). The highest monthly average peaks, all in winter, are likely due to storms: 12 hours of strong wind (80 km/h) mean +1 m at the coast in addition to the 1 cm/mbar effect of the depression.

Figure 8-B Monthly levels at Brest since 1807: main maxima are Dec. 1821 (7225 mm), Nov. 1852 (7233 mm), Dec. 1876 (7322 mm), Feb. 1966 (7422 mm) and Dec. 2000 (7426 mm) <http://www.psml.org/data/obtaining/rlr.monthly.data/1.rlrdata>



In August 1986 the German weekly Der Spiegel pictured on its cover the cathedral of Cologne half under water, under the title “Klimakatastrophe”, while in 1998 James Hansen warned about a sea level rise of + 3m in New-York in 2030.

The satellites teams (Topex-Poseidon and following experiments) have manufactured a surprising change of the slope since 1993 from 1.3 mm/year to 3 mm/year and more, which has been shown to be entirely due to recalibrations [30] in the processing of the raw data!

May be, this has been done to give consistence to the myths of the accelerated melting (or calving) of the Greenland ice cap [31] or of Antarctica and of a noticeable thermal expansion of the depth of the ocean.

360 Gt water are needed to uplift the global sea level by 1 mm; there are “reconciled (averaged) estimates” [32] over 2000-2011 of yearly losses of 211 Gt for Greenland and of 87 Gt for the Antarctica contradicting reliable observations of an average yearly mass gain of 49 Gt for Antarctica [33].

The non sense forecasts collated and edited by the IPCC have been debunked in many books and posts.

On the “very surprising” recalibrations of the ENVISAT data which were morphed from being flat over 2004-2011 into a sea level rise of 2.3 mm/year see the post [34].

Of the +1.3 mm/year some 0.5 mm/year or more may in the last decade have come from the net depletion of groundwater that in some countries are pumped in excess of their refilling [35]; the rest comes from glaciers (mostly the arctic glacier) and from Greenland.

“Compiling data from tide gauges around the globe clearly suggest an accelerating trend” **Not at all!** For the Pacific islands to the northeast and east of Australia said to be “drowning” the observed (tide gauge) levels have been “flat” since 1992 (see figure 10 of http://www.bom.gov.au/ntc/IDO60102/IDO60102.2011_1.pdf) [36] and the year to year changes are within +20 cm.

For some more interesting forecasts see <http://climatechangepredictions.org/category/sea-level>

Truth n°9 The “hot spot” in the inter-tropical high troposphere is, according to all “models” and to the IPCC reports, the indubitable proof of the water vapour feedback amplification of the warming: it has not been observed and does not exist.

[Poitou & Bréon] *Who is supposed to forecast what? This point put forward by the Climate Sceptics has been proved wrong since more than ten years*

The question “*Who is supposed to forecast what?*” has well documented answers. The hot spot is, since the beginning of the 3D models 35 years ago, quite prominent in all the forecasts: it has been described at length in the IPCC 2007 report (pp. 674-676 and figures 9-1, 9-2). It was prominent in the publications of Hansen since 1981, as on figure 9-A of http://www.agu.org/books/gm/v029/of_1984

Figure 9-A Effect of the doubling of the carbon dioxide content of the air: note on the lowest graphic the 7°C hot spot at 250 mbar and on the middle graphic +12°C in winter on the rim of Antarctica and on the arctic polar cycle, +5°C over the Sahara, +4°C over the whole Pacific ocean.
source: Hansen 1981 & 1984

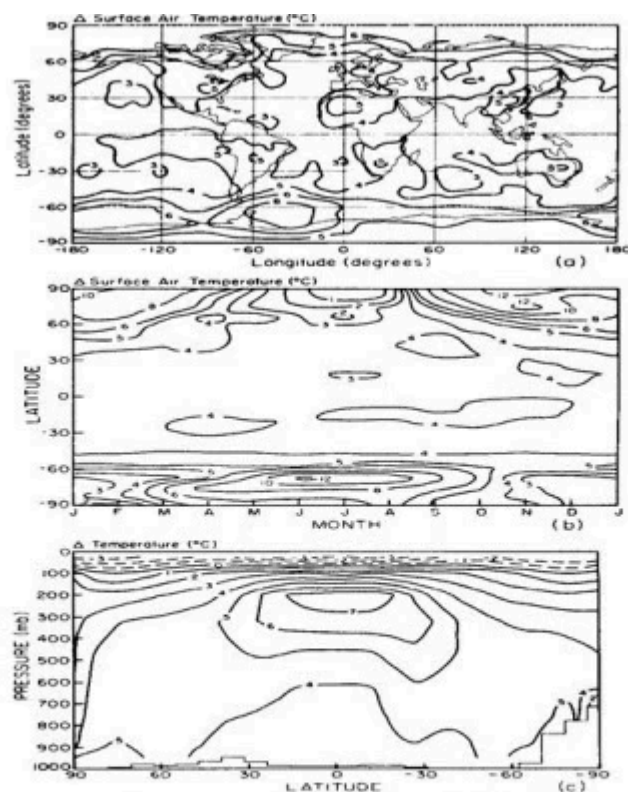


Figure 2-2. Warming of air temperature due to doubled CO₂ in the 3-D global climate model of Hansen et al. (a) shows the geographical distribution of annual mean surface air warming; (b) shows the seasonal variation of the surface air warming averaged over longitude; and (c) shows the altitude distribution of the warming averaged over season and longitude. (After J. Hansen, A. Lacis, D. Rind, G. Russell, P. Stone, I. Fung, R. Ruedy, and J. Lerner, 1984. “Climate Sensitivity: Analysis of Feedback Mechanisms.” in *Climate Processes and Climate Sensitivity*, J. E. Hansen and T. Takahashi, eds., Washington, D.C.: American Geophysical Union, pp. 130-163.)

The hot spot is the key component of the supposed water vapour feedback amplification of the warming; hence a closer examination is well deserved: figure 9-B compares models (with a warming of up to +4°C/century at 10 km that is supposed to propagate down to the surface with the almost constant lapse rate) and observations. The lack of hot spot is shown [37] by figures 9-B and 9-D.

Figure 9-B Left Comparison of observations and of models (IPCC 2007) in °C/decades (from Douglas et al 2008)

Right a modern picture of the “hot spot”

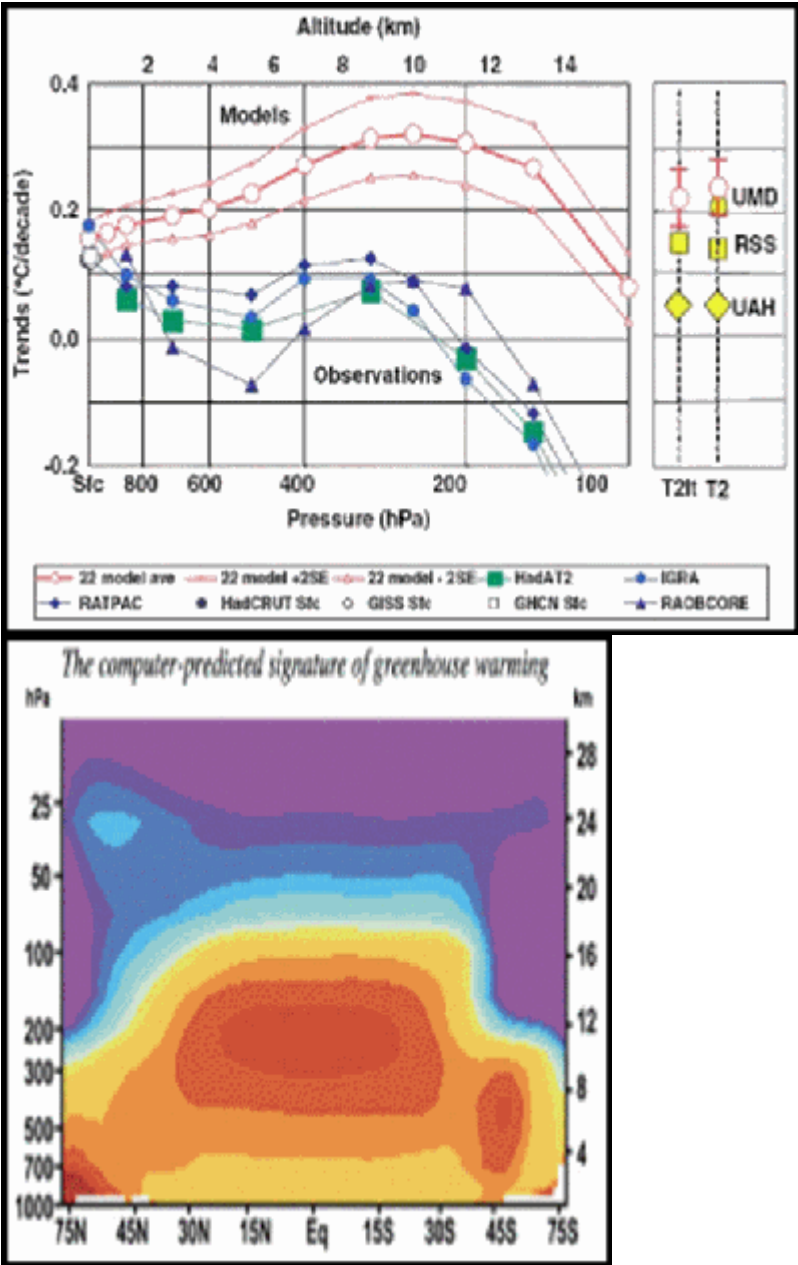
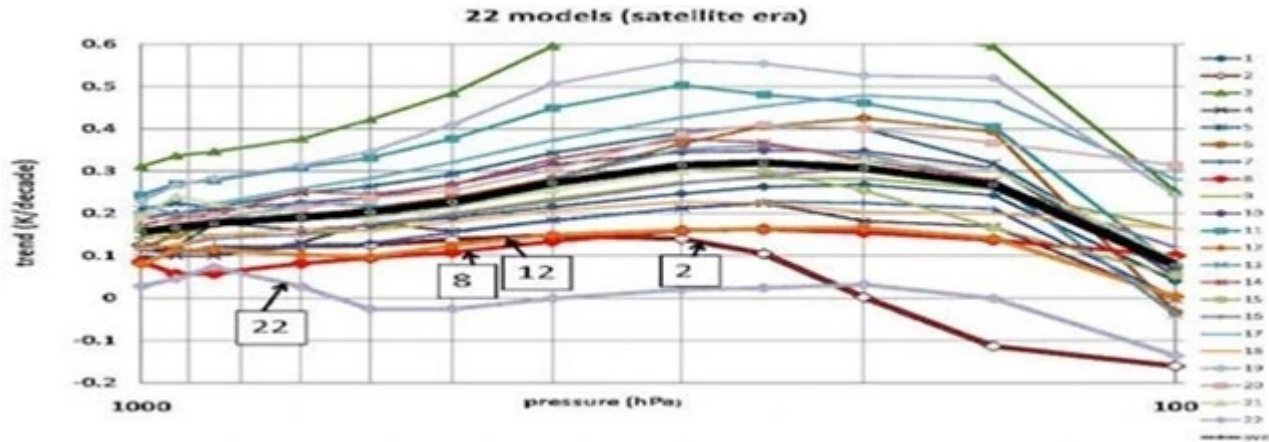


Figure 9-C Comparison of the trends in °C/decades according to 22 so called “models” between surface and 100 hPa 1979-2005



A refined statistical analysis has been performed in 2010 [38] shown on figure 9-D.

Figure 9-D Comparison of the trends in °C/decade of the models with the temperatures series of the high troposphere from satellite microwave units as assembled by UAH and by RSS and with radio-sondes (Mc Kritrick et al. 2010)

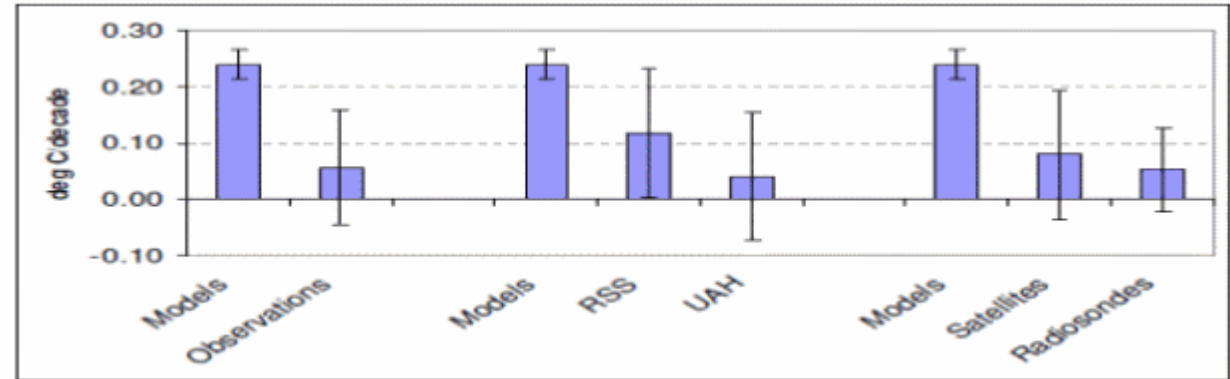


Figure 3: Modeled and estimated trends (1979-2009, °C decade⁻¹) in the tropics, mid-troposphere (MT) layer

Truth n° 10 The water vapour content of the air has been roughly constant since more than 50 years but the humidity of the upper layers of the troposphere has been decreasing: the IPCC foretold the opposite to assert its “positive water vapour feedback” with increasing CO2. The observed “feedback” is negative.

[Poitou & Bréon] IPCC has foreseen an increase of the water vapor content of the air and this has been observed. Climate Sceptics who are trying to deceive the public often show the water content of the high troposphere as if it was the whole atmosphere. The trend in the high atmosphere which is very dry is of course different of the trend for the whole atmosphere

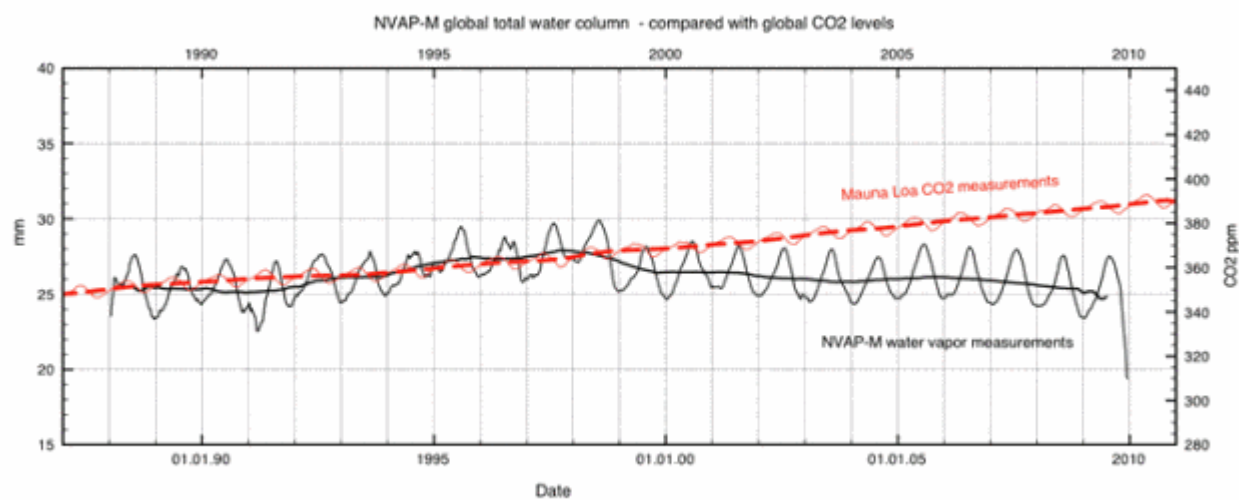


The outgoing longwave radiation (OLR) of the globe to the cosmos is about 233 W/m² (figure 14-A below) sum of 20 W/m² from the surface [39], 20W/m² from the stratospheric ozone and carbon dioxide and of 193 W/m² from the radiation of the water vapour, that contributes about 83% of the OLR. This radiation originates mostly from the highest layer of optical thickness 1.07 which is the source of 80% of the photons reaching the cosmos[40].

As shown on card n°6, it's the water content of the high troposphere above 600 mbar that drives the OLR, not the total water content. IPCC 2013, § D3 of the Summary for Policy Makers, writes that anthropic influences have contributed to the increase of the mean water content of the air, with a caveat: *medium confidence* or may-be an equal likelihood for the statement to be false or true! [41] The water vapour content of the air between the top of the air and the altitude of pressure P (atm) is decreasing roughly like $P^{4.5}$ [42] : hence 80% of the total water vapour is between P=1 and P=0.75 near 2.3 km, and the total water content of the air closely follows the surface temperature.

Figure 10-A Plot of the water vapor content of the air 1988 2009 (global average) from the M VAP-M archive in kg/m² or mm of water

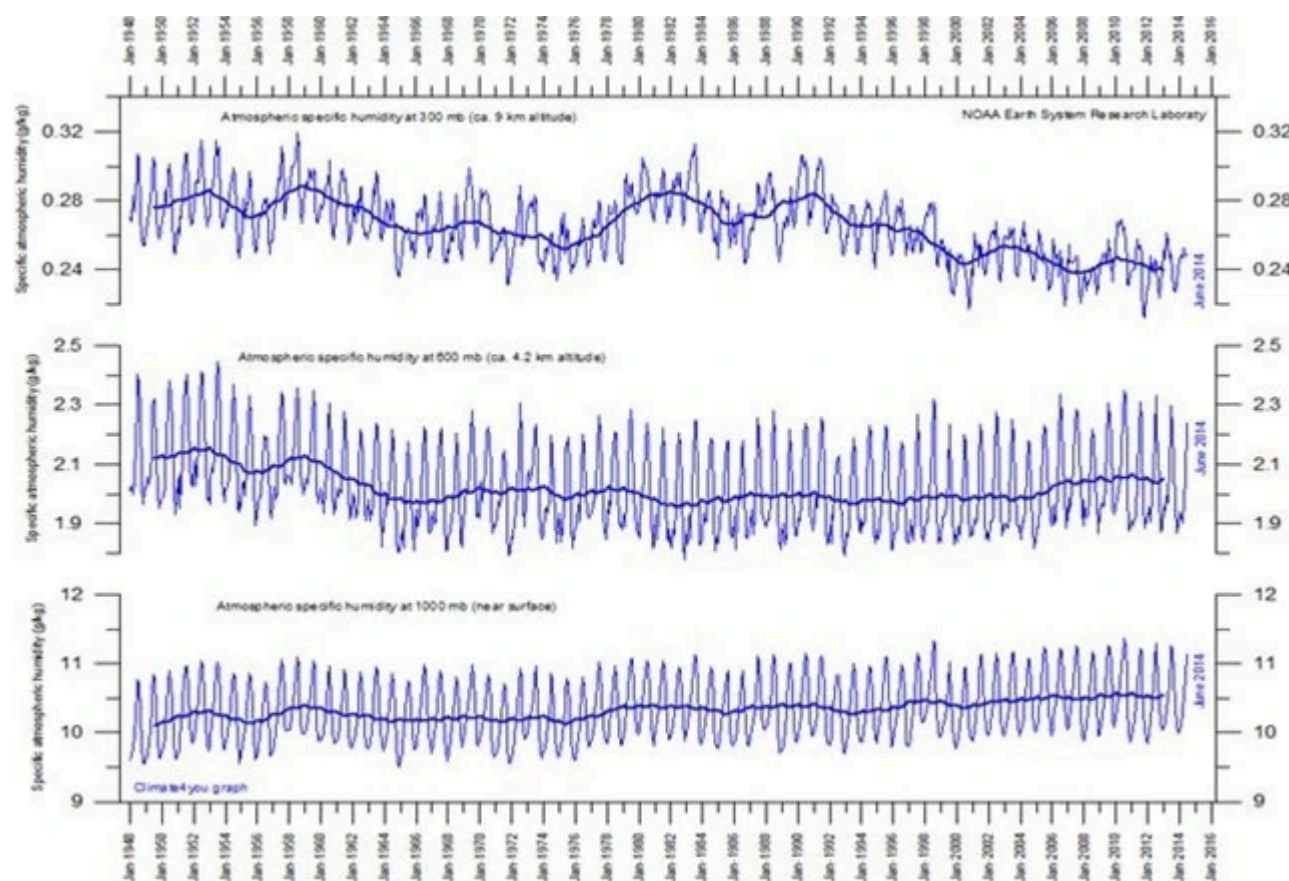
https://eosweb.larc.nasa.gov/project/nvap/nvap-m_table drawing by <http://clivebest.com/blog/?p=4871>



If there is slightly less water vapour in the upper troposphere near 300 mbar then the OLR from water vapour will originate from a lower and warmer layer and the OLR will increase. Hence while the bulk of the water vapour in the lowest layers (2.3 km) closely tracks the temperature of the surface, it's the water vapour content of the high troposphere that controls the outgoing longwave radiation (OLR) and the global balance of the absorbed solar radiation with the OLR. [43]

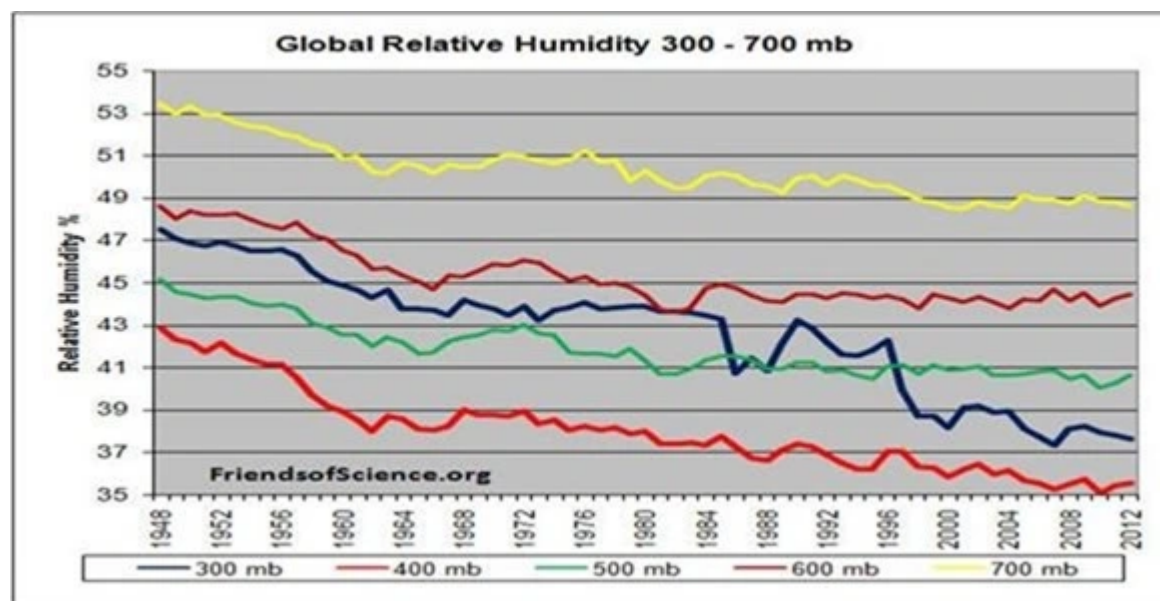
Prof. Ole Humlum (www.climate4you.com) has drawn the estimates of the water vapour content (0.28 g/kg to 0.24 g/kg) for the 300 mbar layer from Jan 1948 to June 2014 (figure 10-B) [44]

Figure 10-B quantity of water vapor in the air at three levels in g/kg at 300 mbar (9 km), 600 mbar (4.2 km) at 1000 mbar, Jan. 1948 to June 2014 <https://wattsupwiththat.files.wordpress.com/2014/07/noaa20esrl20atmospericspecifichumidity20globalmonthlytempsince194820with37monthrunningaverage1.gif>



The relative humidity suggests as well that the OLR from the water vapour in the spectral regions where figure 6-A shows high optical thickness has been slowly increasing, as the source of radiation to the cosmos moved to slightly “lower and warmer” layers.

Figure 10-C Relative Humidity since 1948 from balloon borne soundings at 700 mbar, 600 mbar, 500 mbar, 400 mbar & 300 mbar.(see also <http://www.esrl.noaa.gov/psd/cgi-bin/data/timeseries/timeseries1.pl> from reanalyzes)



Truth n° 11 The maximum area of the Austral ice pack is increasing

[Poitou & Bréon] *And then what? This is not contrary to what the IPCC says. This information is in its last report. Those records figures are for the end of the austral winter. This ice disappears almost completely in summer. A more relevant information would be the yearly average of the mass of the ice pack.*

There are many good “ice pages” like <http://arctic.atmos.uiuc.edu/cryosphere/antarctic.sea.ice.interactive.html>

or <http://wattsupwiththat.com/reference-pages/sea-ice-page/>

According to the “climate models” a decrease of the Antarctic ice pack should have occurred since 1981 (see notice n°9); models forecast about +5°C at 60°S for CO₂ doubling. From a recent assessment by Turner et al. [45] over the last 30 years, models say for the 1979-2005 time span a decrease of the ice pack area by -13.6%/decade [46] in February and by minus 0.4 M km² in September.

Observations are a steady increase from 14 M km² (1986) to 16 M km² for the recent years (up to 16.8 M km² on day 261 of 2014)

Note: There is no significant trend in the UAH-MSU lower troposphere monthly time series for 60°S-85°S (end 1978-2014), albeit the peak-to-peak range of the temperature anomaly is about (-2°C, +2°C)

Truth n°12 The sum of the areas of the arctic and austral ice packs which are phase-opposite is nearly constant; the total albedo of the cryosphere has not changed much

[Poitou & Bréon] *Here are an error and an irrelevant information. The error is the statement that the albedo of the cryosphere does not change. There is an unmistakable decrease of the snow covered areas during the spring and snow is part of the cryosphere.*

The irrelevant information is the area of the ice pack: what is important is the mass or volume of the ice, not its surface. And the mass is continuously and quickly decreasing

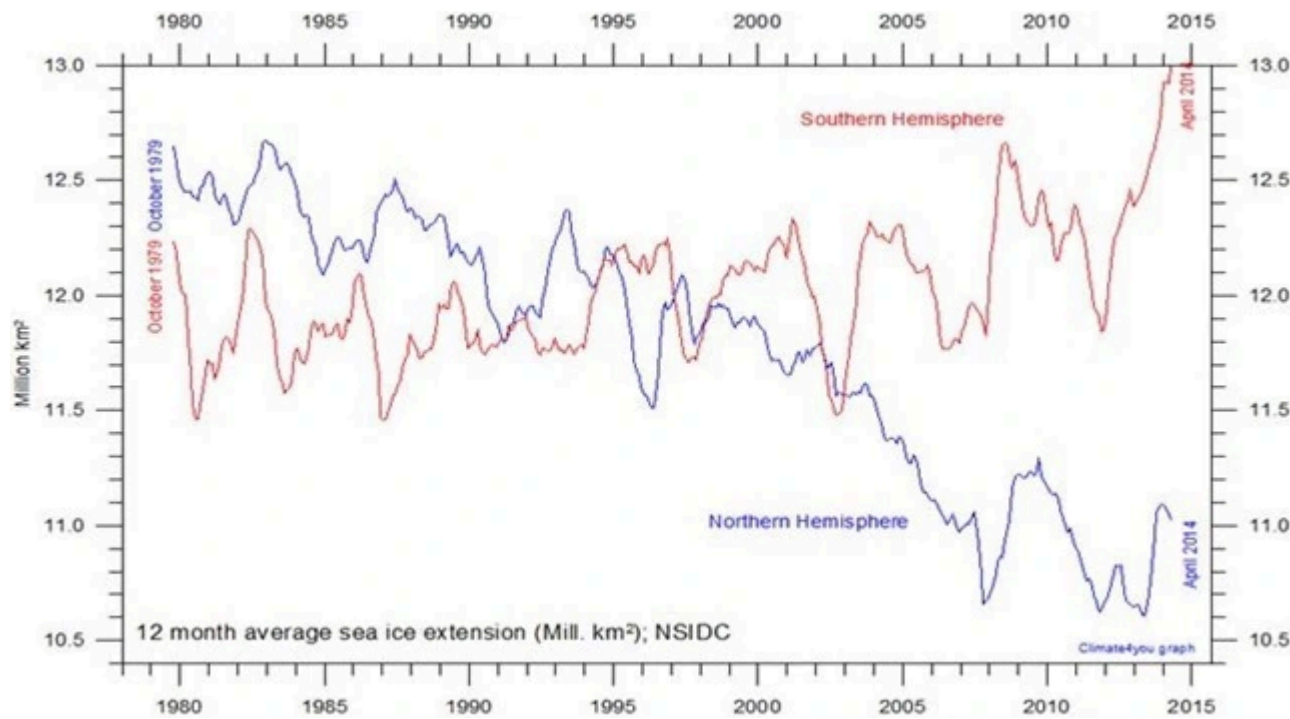
The ice pack albedo is said to be an important positive feedback of the carbon dioxide warming possibly leading to a “*tipping point*” followed by a “*runaway warming*”.

The statement of P&B is somewhat odd as the high-latitude marine areas are almost continuously covered by low clouds; and for the cloudless case the Fresnel formulas show that the light from a Sun low over the horizon is reflected almost as much by water than by the irregular surface of the ice pack.

Figure 12-A from Prof. Ole Humlum (www.climate4you.com) displays the extent of the northern and southern ice packs for the last 35 years; they are indeed phase-opposite .

Figure 12-A Extents in M km² of the Arctic and Antarctic ice packs October 1979 to April 2014 with a 12 months moving average

Source: [National Snow and Ice Data Center \(NSIDC\)](http://nsidc.org/data/seaice_index/index.html).. http://nsidc.org/data/seaice_index/index.html



Poitou & Bréon put forward the spring snow-cover as does IPCC 2013 SPM § B3: “over 1967-2012 the extent of the snow-cover a decreased by 1.6% per decade for March and April and 11.7%/decade for June”.

The figure 12-B shows the Northern Hemisphere snow coverage data for each of the months since 1966 for: 6 months of the year have seen a stable or increasing snow cover, the other 6 months a decreasing snow cover.

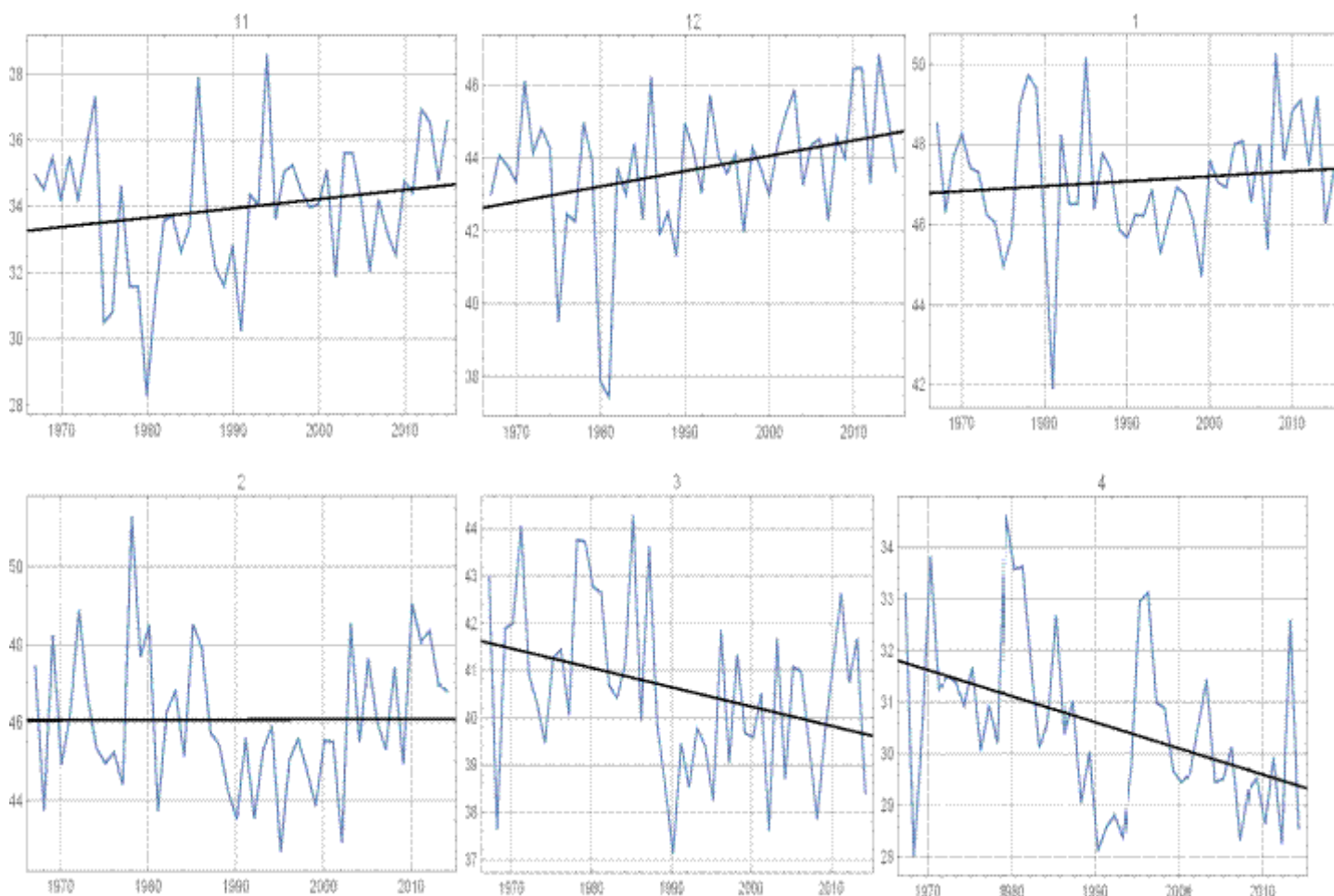
The means of the first 12 years (1966-1977) and of the last 12 years (2002-2014) of the records are as follows, in M km² November to October: {Nov., 34.1, 34.6}, {Dec., 43.6, 44.6}, {Jan., 47.3, 47.8}, {Feb., 46.4, 47.0}, {March, 41.3, 40.3}, {April, 31.1, 29.6}, {May, 20.7, 17.6}, {June, 12, 7.5}, {July, 5.7, 3}, {Aug., 3.8, 2.5}, {Sept., 5.5, 5.2}, {Oct., 19.4, 19.1}, again an increase in winter months and a decrease for the months June to August.

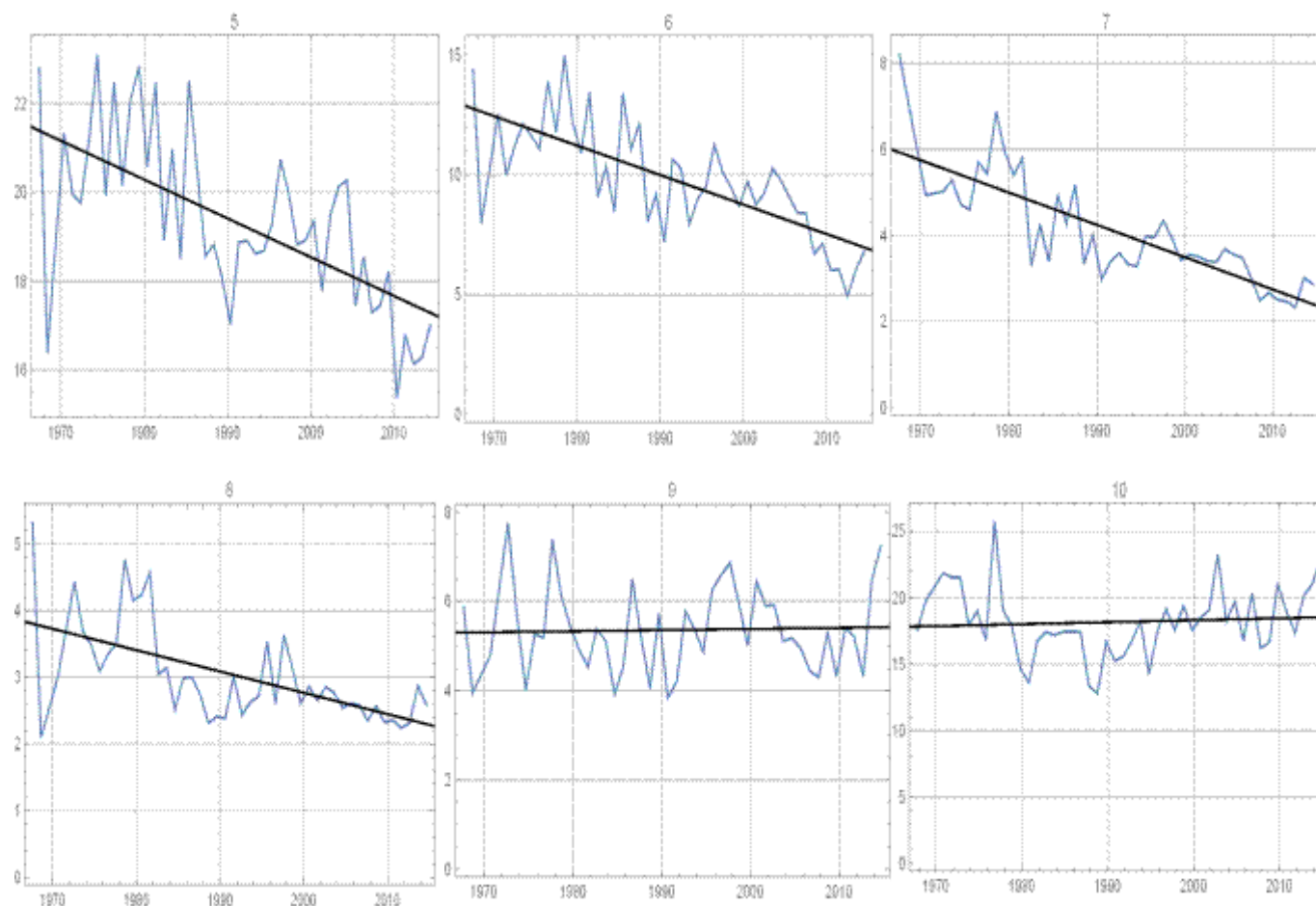
According to figure 5-A the effect of the natural cycles has been of about 0.5°C on the HadCRUT4 series between the means of the same 12 years. Whether the snow feedback June to August along the Arctic coast has an effect on the global temperatures has yet to be said. It has been said the winter temperatures went up in the years 1975-2005 (despite the somewhat increased snow cover), while summer temperatures did not.

Poitou & Bréon do not explain why the ice pack volume would be relevant for the albedo; according to Haas (2005) [47] the changes of the thickness of the sea ice are small since they are correctly measured by an airborne radio apparatus, only over the Arctic.

Figure 12-B For each month November (11) to October (10) snow cover from 1966 to 2015 over the Northern hemisphere with (likely meaningless) linear trends <http://climate.rutgers.edu/snowcover/files/moncov.nhland.txt>

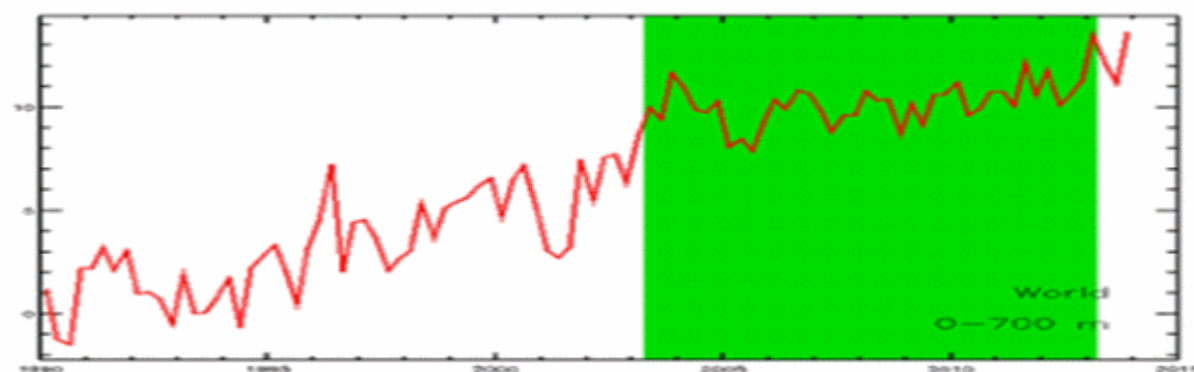
Note the different vertical scales on each of the plots





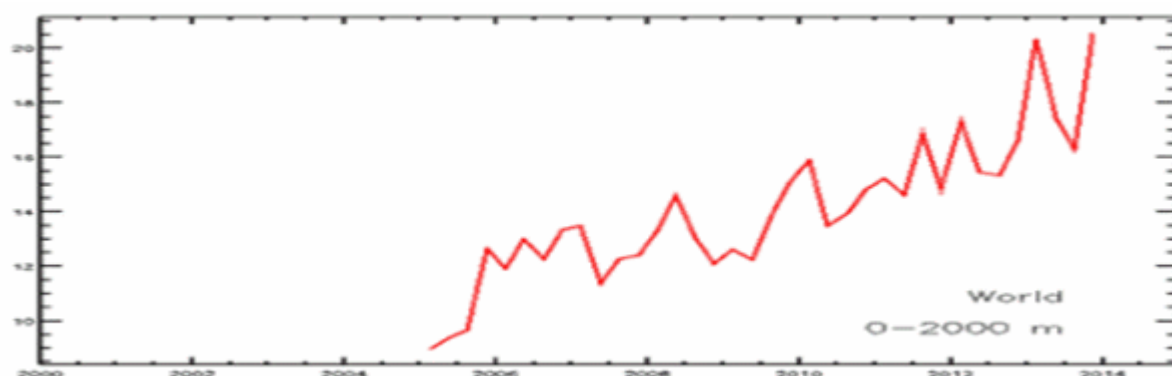
Truth n°13 The observations from the 3000 ARGO floats may suggest, since 2003, a very slight cooling of the oceans and almost no increase of the ocean heat content.

[Poitou & Bréon] Over the first 700 m there is surely no decrease of the oceanic heat content, even if the recent warming is less than the warming of past decades: on the figure below in green, the time span since 2003 carefully selected by sceptics to support their talks



But why stay at 700 m? Here the ocean heat content up to 2000 m depth from the data

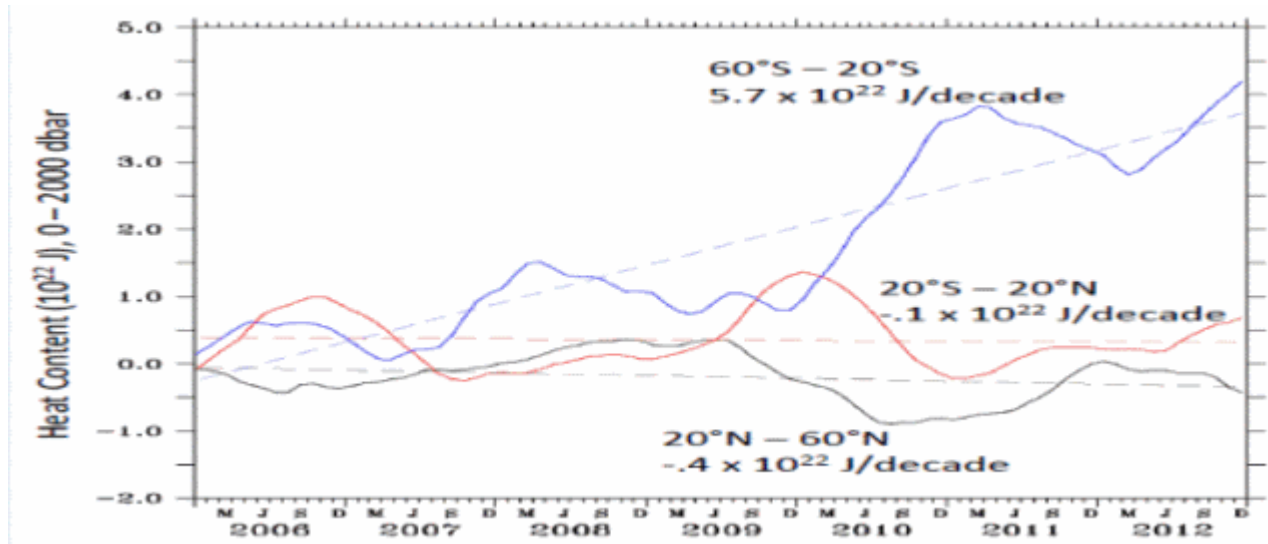
http://data.nodc.noaa.gov/woa/DATA_ANALYSIS/3M_HEAT_CONTENT/DATA/heat_3month/



The vertical units of the graphics shown above are 10^{22} J = 10 ZJ; over 1990-2004 the order of magnitude of the “warming” is $100 \text{ ZJ} / (509 \times 10^{12} \text{ m}^2) = 0.4 \text{ W/m}^2$. The time span since 2005 is that of Argo buoys: about half [48] of the data collected has been deleted to suppress an inconvenient cooling said to be due to defective devices.

A 2013 update [49] shows that the increase of the ocean heat content is restricted to the 20°S-60°S oceans.

Figure 13-A Argo floats change of the ocean heat content 60°N-20°N, 20°N-20°S, 20°S-60°S down to 2000 deci-bar in 10^{22} J

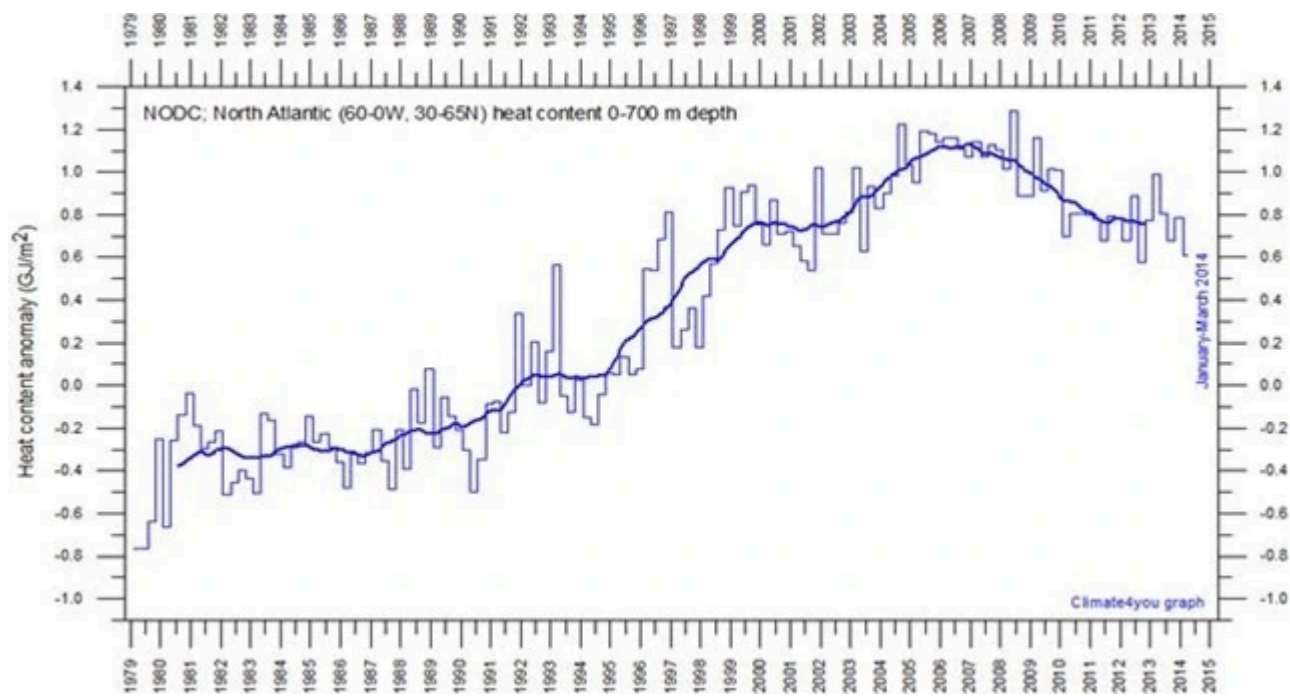


As there are no known mechanisms by which infrared radiation can heat the bulk of liquid water (infrared radiation is absorbed by the first few tens of microns of liquid water), it's likely that all of the increase in the southern oceans heat content is related to changes of the albedo, that is to changes of the cloud cover. Another example is the North Atlantic (figure 13-B).

Figure 13-B Ocean Heat content of the North-Atlantic (30°N-65°N) from 1955 to 1st Q 2014. from www.climate4you.com

1 GJ/m² over 30 years are 1.05 W/m² and if spread over 700 m of sea water +0.18°C

The recent decrease may be about – 0.5 GJ/m² over 6 years that is equivalent to a (negative) “forcing” of -2.6 W/m²

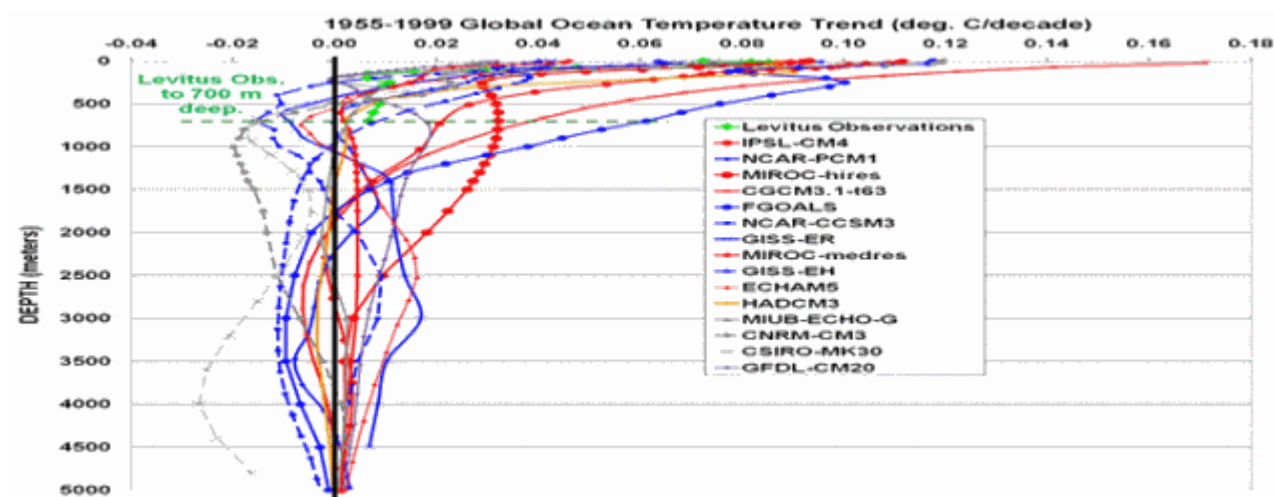


On the 2000 meter depth graph over 2006-2014 of Poitou & Bréon, the yearly minima increased from 10 units to 16 units of 10^{22} J that is 0.41 W/m²; but there is every year some oceanic heat storage during six months and a release of this heat the following six months: the maximum of the global outgoing longwave radiation is in July, shifted by 6 months w.r.t. the solar flux hat is maximum in January (1412 W/m^2) and minimum in July (1321 W/m^2).

Disregarding those quarter to quarter oscillations, according to Levitus (2012) “The heat content of the World Ocean for the 0–2000 m layer increased by $24.0 \pm 1.9 \times 10^{22} \text{ J}$ corresponding to a rate of 0.39 W/m^2 (per unit area of the World Ocean) and a volume mean warming of 0.09 deg C ” and “The heat content of the World Ocean for the 0–700 m layer increased by $16.7 \pm 1.6 \times 10^{22} \text{ J}$ corresponding to a rate of 0.27 W m^2 (per unit area of the World Ocean) and a volume mean warming of 0.18 deg C .”

But again such global averages are of little value: regional observations should be related to the regional cloud coverage and albedo and possibly to changes of the strength of surface currents.

Figure 13-C Model Forecasts and redistribution of heat in the depths of the ocean (in green are Levitus world-average observations above 700 m) in °C/decade Source : <http://www.drroyspencer.com/2011/08/deep-ocean-temperature-change-spaghetti-15-climate-models-versus-observations/>



IPCC SPM 2013 p. 13 §D1 states that *The observed reduction in surface warming trend 1998 to 2012 ...is due in roughly equal measure to a reduced trend in radiative forcing and a cooling contribution from natural internal variability, which includes a possible redistribution of heat within the ocean (medium confidence [or 50% chance to be true and 50% chance to be false ?])*. Figure 13-C shows that this redistribution is beyond the grasp of the models.

Truth n° 14 The outgoing longwave radiation from the upper atmosphere is larger than what models say: there is no “blanket” effect due to Greenhouse gases

[Poitou & Bréon] *It is quite obviously wrong to say there is no blanket effect due to the tropospheric greenhouse gases. Saying such awful things should disqualify the perpetrator. The total of the outgoing solar and thermal infrared radiations is lower than the incoming solar flow.*

The last sentence of P&B refers to the global imbalance that should have been seen in the oceanic calorimeter: but the observed geographically selective effect (notice n° 13) does not fit well with the assumption of a uniform infrared radiative forcing due to more CO₂. As already said, the radiative heat transfer surface to air is the radiation of the surface absorbed by the air minus the radiation of the air absorbed by the surface: it would be exactly zero for an isothermal atmosphere and is nearly zero for an opaque atmosphere (figure 6-A).

The “blanket” [50] is supposed to reduce the radiative cooling of the surface. But as the radiative transfer of heat between the surface and the air is about nil (see notice n°1) it is still zero for “doubled CO₂”; a fraction of a W/m² is no longer lost by the surface by direct radiation to the cosmos but by a slightly enhanced evaporation with condensation (and radiation to the cosmos) somewhere else (see notice n°6).

There is no relation between the radiation flows exchanged by surface and air (whose net balance is about zero) and the radiation from the top of the air lost to the cosmos some kilometres above the surface; the cooling of the “top of the air” at mid and high latitudes is compensated by advection of humid air from mid latitudes.

The radiation emitted is a diagnostic of the temperature of the trace gases of the air; the temperature in the troposphere is T(P) with $T(P) / T_{\text{top}} = (P/P_{\text{top}})^{R/(C_p + C_{pi})}$; T_{top} and P_{top} “summarize the position of the “top” of the air; surface temperature is driven by the ratio $(P_{\text{surface}} / P_{\text{top}})^{0.19}$ where P_{top} is characteristic of the latitude and of the season and R = 8.314/(molar mass).

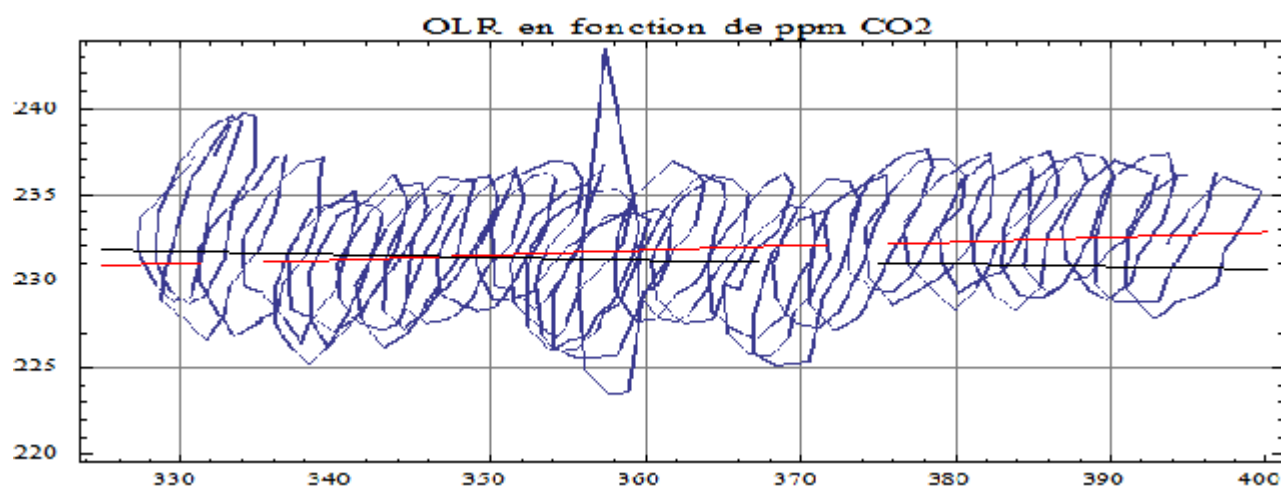
As obvious on figures 6-A and 6-B, T_{top} and P_{top} are determined by the water vapour that radiates over some 1900 cm⁻¹ much more than the 40 cm⁻¹ of the tropospheric CO₂ near 614 cm⁻¹ and 718 cm⁻¹; stratospheric radiation to the cosmos is not very important because the cooling of each layer is exactly equal to its heating mostly by UV absorbed by Ozone.

“Models” forecast a “blanket effect” with a reduced radiation to the cosmos: forty years of observations of the Outgoing Longwave Radiation (1974-2014) do not show any such thing.

Figure 14-A Monthly global average of the Outgoing Longwave Radiation in W/m² plotted against the CO₂ content of the air in ppm per Mauna Loa series, for the same month, (1974-2014). Note the seasonal cycles of the vegetation growth. The red line is the linear trend of about +2 W/m²/century; there is no apparent “heat trapping” due to the increasing CO₂.

The black line what should have been seen according to Myrhe’s logarithmic formula.

source [http://www.climate4you.com/GlobalTemperatures.htm#Outgoing longwave radiation global](http://www.climate4you.com/GlobalTemperatures.htm#Outgoing%20longwave%20radiation%20global)



See as well <http://wattsupwiththat.com/2013/12/21/the-magnificent-climate-heat-engine/> for a map of the CERES data: the changes in the cloud cover and the transfer of heat from the tropics to the high latitudes explain the fluctuations of the OLR.

The radiative imbalance of the Earth stated by Hansen et al. has been discussed by Kramm & Dlugi [51] whose conclusion is “we may conclude that a planetary energy imbalance of 0.58 +/- 0.15W/m² claimed by Hansen et al. (2011) for the period 2005-2010 is not justifiable. The same is true in case of the planetary energy imbalance of 0.8 +/- 0.15W/m² claimed by Hansen et al. (2005).”

Truth n° 15 The Stefan-Boltzmann formula does not apply to gases which are neither black bodies nor grey bodies; why does the IPCC community use it for gases?

[Poitou & Bréon] *It is not the IPCC but the whole scientific community competent on those topics that uses Stefan Boltzmann law for gases, and that since tens of years. IPCC is only quoting from the scientific literature. The Stefan Boltzmann law applies to any body that absorbs electromagnetic radiation and hence to infrared absorbing gases.*

The Stefan-Boltzmann σT^4 formula only applies to a black body, not to a gas. The absorption spectrum of the main trace-gases are on figures 6-A and 6-B: at the temperatures of the air CO₂ radiates significantly only between the optical frequencies (or wavenumbers) 595 cm⁻¹ to 740 cm⁻¹ where its optical thickness is at least 2; it does not radiate over the whole thermal infrared spectrum (100 cm⁻¹ to 2500 cm⁻¹) relevant for the temperatures of the Earth's atmosphere.

Poitou & Bréon amazingly confirm that the “climate community” uses, since tens of years, a very inappropriate formula! Let's remind that a grey body formula $\varepsilon \sigma T^4$ is sometimes used to describe the radiation of trace gases at a uniform temperature: Hottel has given some charts, usable only for a uniform temperature[52]. We shall see in annex 15-A an another example of an erroneous use of $\varepsilon \sigma T^4$

A rough computation of the thermal diffuse infrared radiation flows is not complicated: it's like summing over the whole air column the quantity $k(\nu, P, T) \pi B(\nu, T) \rho_{\text{trace}} dz = \pi B(\nu, T) dt$ weighted by the attenuation of the diffuse radiation between the source at P and the point of observation: $k(\nu, P, T)$ is the absorption coefficient, B the Planck function, ρ_{trace} the mass of trace gas per unit volume.

For instance the down-welling radiation from the air observed at a distance t from the top of the air is the integral of

$(2 E_2(t-t') \pi B(\nu, T(t'))) dt'$ between $t'=0$ and $t'=t$. Those expressions can, as shown by S. Chandrasekhar [53] in 1950, be computed with some additions and multiplications thanks to Gauss formulas for the numerical computation of integrals.

The correspondence between t and P(atm) (or altitude z) is deduced from relations like

$$dt = k(\nu, P, T) \rho_{\text{trace}} dz = k(\nu, P, T) \rho_{\text{trace}} dP / (\rho_{\text{air}} g) = (k(\nu, P, T) / g) (\rho_{\text{trace}} / \rho_{\text{air}}) dP$$

$t(\nu, P) = t_{\text{total gas trace}}(\nu) P^a$ where the exponent a summarizes the changes of $(k(\nu, P, T) / g) (\rho_{\text{gaz trace}} / \rho_{\text{air}}) \sim P^{a-1}$ as a function of altitude or pressure and temperature with $T(P) \sim P^{0.19}$. The spectral shape of $t_{\text{total trace gas}}(\nu)$ is displayed on figures 6-A to C.

Why this fondness for the σT^4 blackbody radiation formula? Because it appears in innumerable books and papers as the cornerstone of the following “demonstration”:

- 1) the “blanket effect” reduces the average outgoing longwave radiation (OLR) of the Earth by some 3.7 W/m² or 4 W/m² for an instantaneous doubling of the CO₂ content of the air with FIXED tropospheric temperature and humidity
- 2) to restore the OLR the air must warm from T to T' with $\sigma T'^4 = \sigma T^4 + 3,7 \text{ W/m}^2$ and hence $T' = (6,525 \cdot 10^7 + T^4)^{1/4}$; for T-273 = -20°C or 0°C or 15°C or 30°C we get T'-T values of +1°C or +0,8°C or +0,7°C or +0,6°C ; this is said to be the direct effect of the doubling of the CO₂ content of the air [54]
- 3) then any warming can be deduced thanks to the hypothesized “amplifying water vapor feedbacks”

Card n°14 has shown that the “blanket” effect is not to be seen in the observations of the OLR; card n°10 has shown that observations do not show any increase of the upper air water vapour content, dispelling point 3); card n°9 has shown that the hot spot and the “amplifying water vapor feedback ” were not observed either.

The σT^4 is indeed a decoy to avoid handling properly and separately the four components of the OLR seen on figure 6-C for a cloudless sky, and to avoid explaining the automatic compensations between those four components:

- 1* the water vapor radiating mostly from the troposphere (say 190 W/m²),
- 2* the radiation from the surface that has escaped absorption by water vapor, clouds and CO₂ (global average 20 W/m²),
- 3* the CO₂ and the ozone radiating from the stratosphere (say 20 W/m²),
- 4* the CO₂ from the troposphere near 618 cm⁻¹ and 720 cm⁻¹ for a CO₂ “doubling” (figure 6-B right).

But CO₂ doubling does not occur “instantaneously” and at FIXED temperature and humidity: going from 400 ppm to 800 ppm at today's rate of +2 ppm/year would take 200 years!

If CO₂ increases there is more cooling at say 250 mbar and less cooling below: such a setting is likely to be erased by convection; and by a slight reduction of the water vapour content of the upper troposphere that will restore the OLR.



Annex 15-A Example of an abuse of the expression $\varepsilon \sigma T^4$

Lets follow W. Eschenbach's [55] discussion of an often quoted article of Stephen E. Schwartz [56] *Heat capacity time constant and sensitivity of Earth's climate system*. Journal of Geophysical Research June 2007. The change of the heat content of the globe (mainly in the oceans) is $dH/dt = S(1-a) - E$, where S is the solar radiation, a the albedo, E the global infrared emission; such a relation is likely and there are historical series for H (figure 13-A), E (figure 14-A) for S and a ; whether global averaging makes sense is debatable.

The next assumption is $dH/dt = C dT_{\text{surface}}/dt$ where C is a suitable thermal capacity; this is incorrect; we shall see why.

Last assumption is $E = \epsilon \sigma T_{\text{surface}}^4$; this is incorrect. Then by adding a so-called forcing F we get an equation in T_{surface}

$$C dT_{\text{surface}}/dt = S(1-a) - \epsilon \sigma T_{\text{surface}}^4 + F$$

For $dT/dt = 0$ if ϵ decreases (less OLR) or if F is positive T_{surface} must increase.

The transient response to a forcing F applied at time $t = 0$ is $T_{\text{surface}}(t) - T_{\text{surface}}(0) = F \tau / C (1 - \exp(-t/\tau))$, or for a time increasing $F(t) = F_1 t$ $T_{\text{surface}}(t) - T_{\text{surface}}(0) = F_1 \tau / C (t - \tau (1 - \exp(-t/\tau)))$

Lets look at the *Ansatz* and hypotheses used:

* dH/dt and dT_{surface}/dt are said to be proportional. W. Eschenbach compares those values quarter by quarter and year by year: there is no correlation over the last 50 years (1955-2009) for which some estimates of the ocean global heat content are available

Moreover if the surface temperature of the oceans determines the temperature of the air, it is not the temperature of the air but the insolation and the clouds that drive the changes of the ocean heat content.

* Second conjecture: there would be a ratio ϵ between the radiation from the surface and the OLR; this is nonsense [57] as said on card n°1: the radiative heat flow from a body A to a body B is: (radiation from A absorbed by B) minus (radiation of B absorbed by A). It is about nil between the air and the surface; it would be exactly nil for an (hypothetical) isothermal atmosphere at the temperature of the surface.

* Implicit hypothesis: S and a are constant while changes in cloud coverage change a , H and ϵ .

Let's look now at the conclusions of St. E. Schwartz:

* regressing the series of H_{oceans} and T_{surface} leads to a thermal capacity C of 14 W/m²/year/K equivalent to 110 m of water; C is taken as 17 W/m²/year/K for the whole planet by addition of 5% for molten glaciers, 5% for the heat content of continental masses and 4% for changes of the temperature of the air

* The autocorrelation of the mean surface temperatures (1880-2004) leads to a time constant τ of 5 years

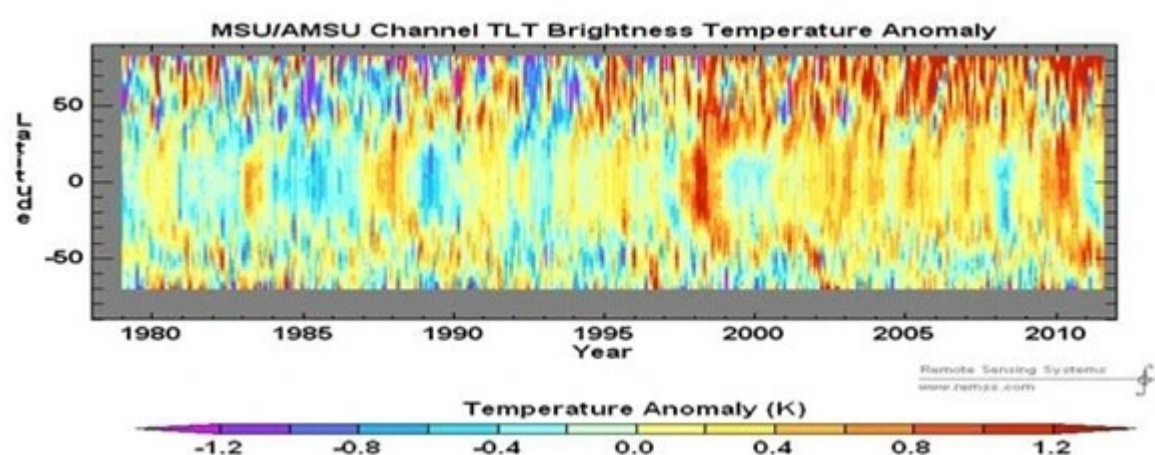
* The "climatic sensitivity" is then $\tau / C = 5/17 = 0.3 \text{ K/(W/m}^2\text{)}$ [58].

* over the 20th century the observed warming of 0.57°C would imply a radiative forcing of 1.9 W/m² that is 2.2 W/m² for greenhouse gases [59], – 0.3 W/m² for the changes of the aerosols ... and nil for the climate cycles prominent on figures 5-A to 5-C (among other cycles of 1000 years, 210 years and 60 years) and the El Niños (figure 2-C and 15-A).

The graphic figure 15-A shows the Earth's pulsed central heating, the El Niños and their "tele-connections"; figure 2-B shows the latitude-averaged temperature that drives the CO₂ increments of figure 4-A. Those natural effects drive all of the temperature changes observed without the super-natural "forcing" F that should be uniform all over the globe.

Figure 15-A Temperatures of the lower troposphere as a function of time and of latitude (source RSS)

http://images.remss.com/msu/msu_data_monthly.html click on history



Truth n° 16 The trace gases absorb the radiation from the surface and radiate at the temperature of the air, which is at some height, most of the time slightly lower than that of the surface. The trace-gases cannot "heat the surface", according to the second principle of thermodynamics which prohibits heat transfer from a cooler body to a warmer body.

[Poitou & Bréon] *This is another big stupidity. Does the author deny the existence of the greenhouse effect? It's a physical phenomenon well understood since several centuries! Such statements should immediately strip their author of any credibility for readers who know some science. If the author was correctly using the second principle of the thermodynamics he would have seen that it is indeed the surface that delivers heat to the emissive trace gases, which are also the absorbing gases. Those gases prevent the surface from losing some of the heat brought by the sun*

To send the heretic to the stake Poitou & Bréon charge him of atheism, of “denying the existence of the greenhouse effect”. That kind of argument has been used since almost two millennia “All men, except a few very ones who are very depraved and vicious, believe in the dogmas and myths of my community, which have been revealed centuries ago; hence my dogmas are true and my prophecies are undisputable”.

“Since several centuries” is likely to refer to Fourier whose memoir of 1824 does not say anything on a “greenhouse effect” [60] (see also card n°1) or to Arrhenius whose tentative explanation of glaciations [61] and de-glaciations by a radiative effect of the CO₂ has been proved wrong (a) because in ice cores the CO₂ content follows the temperature by some centuries and (b) because redoing his computations with the correct absorption spectra gives a warming of 0.2°C for a doubling of the CO₂ content of the air (cf card n°1).

As said on cards n°1, n°6 and n°15, for an atmosphere in a gravitation field, the tropospheric lapse rate is $dT/dz = -g/(C_p + |C_h|)$ where $g=9,8 \text{ m/s}^2$, $C_p=1005 \text{ J/kg}$, and C_h summarizes the effect of the heating of the air (1) by absorption of the solar infrared by water vapour or liquid and (2) by the condensation of the water vapour. This is exactly equivalent to $T(P) = T_{\text{top}} (P/P_{\text{top}})^{R/(C_p + |C_h|)}$ where $R = 8,314 / 0,02896 = 287$.

There is no need of heat to “warm the surface” because its temperature is a consequence of the gravitation and of the mass of the air, both on Earth and on Venus. The lapse rate (despite the temperature inversions near the surface at night and in the winter polar regions) insures that the radiation of the air absorbed by the surface is slightly less than the radiation of the surface absorbed by the air. Hence the air cannot warm the surface as the net balance is about zero or slightly positive from surface to air. [62]

The surface cools mostly by evaporation (order of magnitude 100 W/m²), by convection (20 to 30 W/m²) and for about 20 W/m² by direct thermal infrared radiation reaching the cosmos after escaping absorption by water vapour and clouds.

Amazingly Poitou & Bréon state that “absorbing and emitting gases prevent the surface from losing some of the heat brought by the sun”; they should have said that the radiative heat transfer surface to air is almost negligible and stay so for changes of the trace gas content of the air around today's values.

Notes

(1) The pseudo explanation about “preventing the surface from losing heat” is typical of what has been summarized by Pfr Gerlich & Tschuschner : “The main strategy of modern CO₂-greenhouse gas defenders seems to hide themselves behind more and more pseudo-explanations, which are not part of the academic education or even of the physics training. A good example is the radiation transport calculations, which are probably not known by many. Another example is the so-called feedback mechanisms, which are introduced to amplify an effect which is not marginal but does not exist at all. Evidently, the defenders of the CO₂-greenhouse thesis refuse to accept any reproducible calculation as an explanation and have resorted to unreproducible ones”

(2) The ravings by some proponents of the greenhouse effect to circumvent the second principle of thermodynamics are illustrated by R. T. Pierrehumbert *Infrared radiation and planetary temperature* Physics today January 2011 p.38: “The planetary warming resulting from the greenhouse effect is consistent with the second law of thermodynamics because a planet is not a closed system. It exchanges heat with a high temperature bath by absorbing radiation from the photosphere of its star and with a cold bath by emitting into the essentially zero temperature reservoir of space ... the greenhouse effect shifts the planet's surface temperature toward the photospheric temperature by reducing the rate at which the planet loses energy at a given surface temperature ...” This statement does not apply to “air warming the surface” or to statements like : “The energy that is available to the Climate system consists of the absorbed solar energy, the greenhouse effect thermal energy as well as several sources of nonsolar energy (i.e., geothermal, tidal, and waste heat)” (Lacis, Hansen et al. Tellus, 2013, p.16) as if the air produced energy!

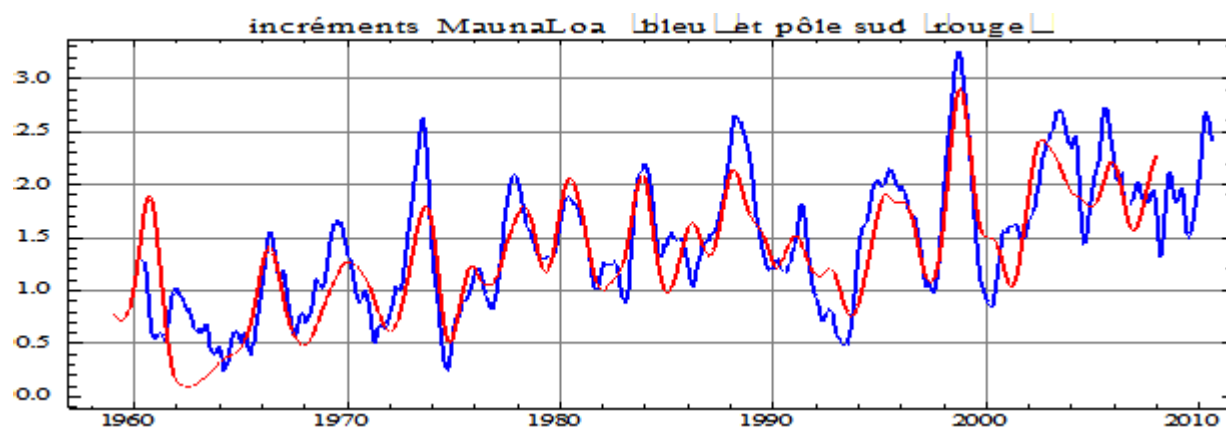
Truth n° 17 The temperatures have always driven the CO₂ content of the air, never the reverse. Nowadays the net increment of the CO₂ content of the air follows very closely the inter-tropical temperature anomaly

[Poitou & Bréon] *Again a poorly digested discourse from the climate sceptics. If CO₂ is following the temperature by some months how is it possible to have a continuous increase of the CO₂ content of the air while the author explains that there has been no increase of the temperatures since 1997?. The slow changes of the CO₂ content of the air are driven by plate tectonics and silicate weathering. The greenhouse gases have played an essential role in the great climatic changes of the geological eras (see figure on card n°7)*

There are two sets of observations: those of the last 50 years and those from the ice cores.

A) For the last fifty years the increments of the CO₂ at Mauna Loa (19°30N) and at the South Pole are coincident (figure 17-A) As it takes some semesters for the air to go from the Northern Hemisphere to the South Pole, a common source is likely inter tropical out-gassing.

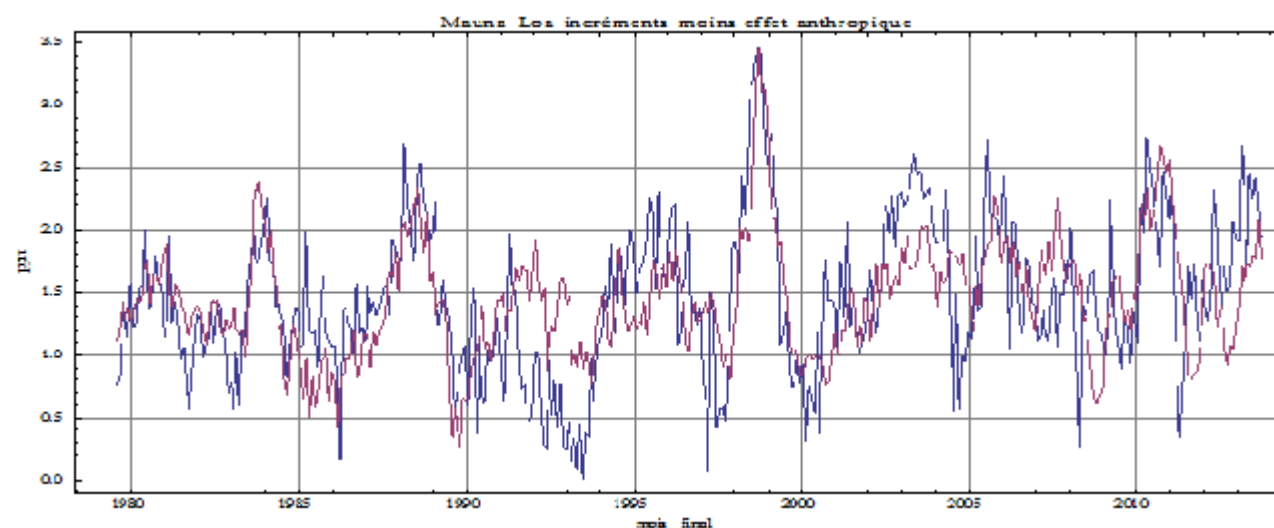
figure 17-A Monthly increments of the CO₂ content of the air $d[CO_2]/dt$ for $dt=12$ months: in blue at Mauna Loa (with a weighted moving average {1, 1, 2, 3, 4, 3, 2, 1, 1}) and in red at the South Pole (up to 2008)



Subtraction of the anthropic increments computed for a 5 years life-time in the air from the observed $d[CO_2]/dt$ for $dt=12$ months leaves the increments shown in blue on figure 17-B; those natural increments coincide most of the time with the purple curve which is a linear function of the inter-tropical temperature anomaly of the lower troposphere $T(t)$; this is a direct proof of the relation $d[CO_2]_{\text{natural}}/dt = k(T(t) - T_0)$ where $dt=12$ months to avoid the seasonal fluctuations due to the growth of the vegetation. Note the effects of volcanic dusts in 1982-85 (El Chichon) and 1991-94 (Pinatubo).

figure 17-B Blue curve: monthly values of the natural increments over $dt=12$ months for the Mauna Loa series (referenced to the last month of the 12 months)

Purple curve: monthly values of $1.45 + 1.6 AT_{\text{UAH MSU intertropical}}$ shifted by 0.6 years where AT is the anomaly of the inter-tropical lower troposphere (anomaly w.r.t the mean over 1981-2010 of the same UAH-MSU series)



This is a simple and direct check of the published results referenced to at the end of card n°1.

This relation $d[CO_2]_{\text{natural}}/dt = k(T(t) - T_0)$ is consistent with the results of Beenstock & al. that the $[CO_2](t)$ series must be differentiated once before attempting a correlation with the series of the temperatures $T(t)$. The out-gassing zone relevant for the Mauna Loa can be seen on figures 17-C and 17-D and has been detailed by Prof. J. Park (2009) (see card n°1).

Let us summarize that the CO₂ content of the air is made of two parts, as explained on cards n°3 & 4

(1) a natural part proportional to the time integral of the temperatures $\int (T(t) - T_0) dt$ as shown on figure 17-B; it was 310 ppm in 1958 and is now 376 ppm; the difference between 376 and 310 is exactly the sum of the twelve months increments.

(2) an anthropic part roughly equal to the cumulative anthropic emissions weighted by $\exp(t'-t)/u$ where t' is the time of the emission and t the time of observation, u is the life time of about 5 years perfectly consistent with $\delta^{13}C$ isotopic observations; this anthropic part is (end 2013) about 6% of the CO₂ content of the air (cards n°3 & 4).

Figure 17-C is a map of the absorption and of the out-gassing of the ocean for a non El Niño year, according to Takahashi.

Figure 17-C Map of the net flows between air and ocean in 1995 according to Takahashi

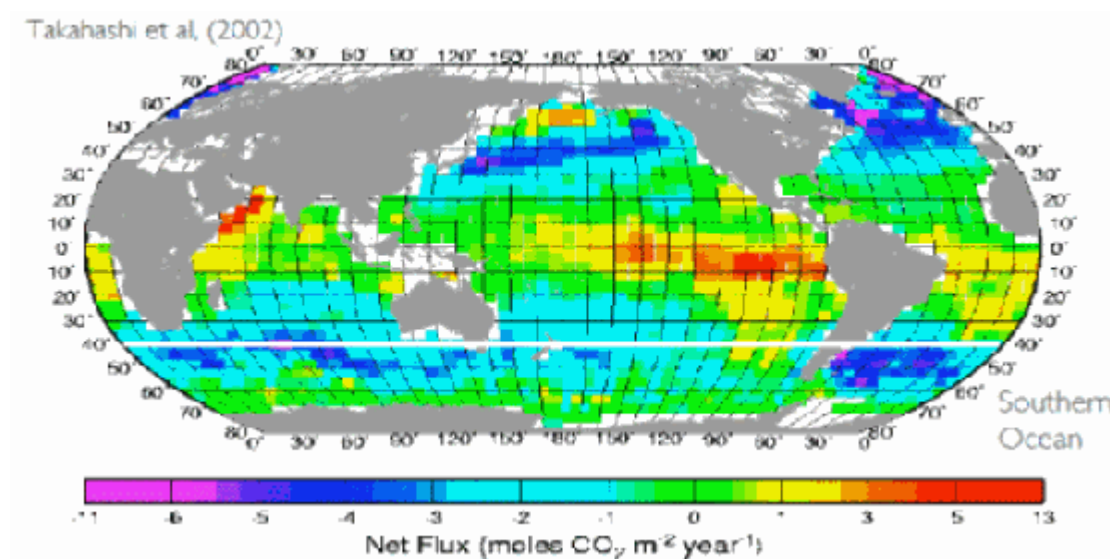


Figure 17-D hints at the very strong spatial variability of the CO₂ content of the air and of the surface waters; exchanges between air and ocean are proportional to the difference of the pressures times the cube of the speed of the wind. [63]

Figure 17-D [64] CO₂ content of the air (in ppm) and of the surface water (in μ atm)

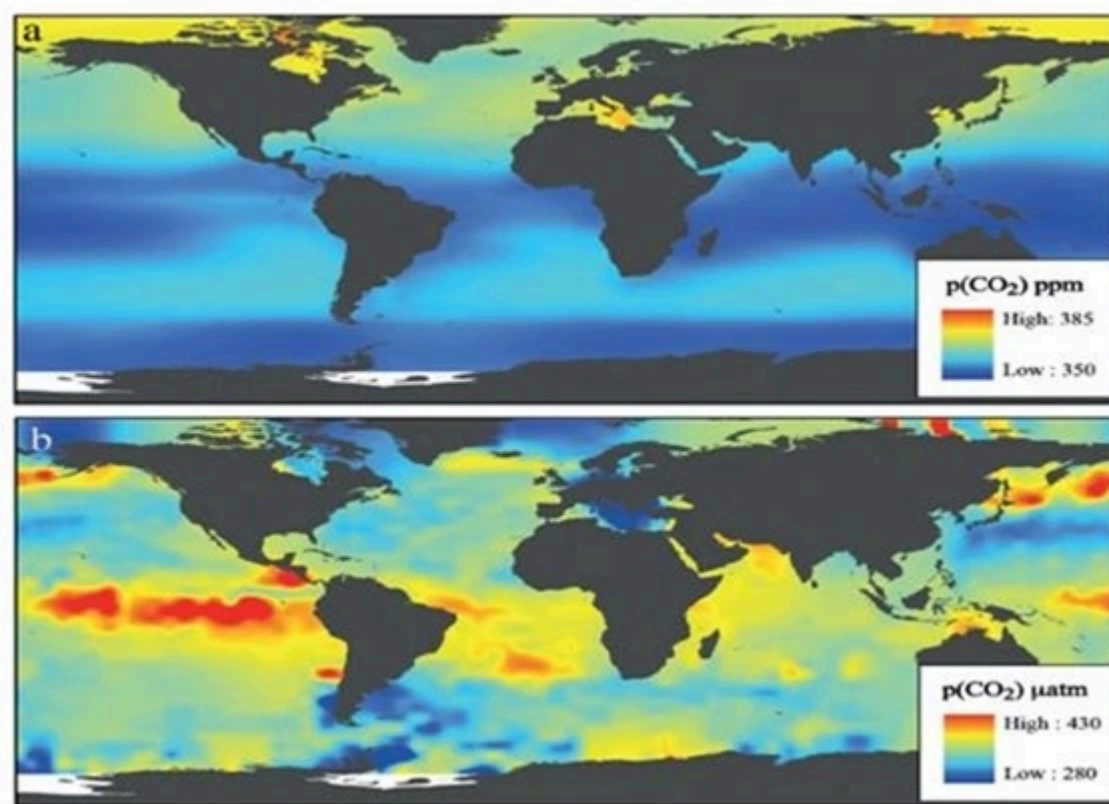


Figure 3.1 Carbon dioxide concentrations over the ocean. A. Atmospheric p(CO₂) levels (ppm). B. Surface p(CO₂) (μ atm). Note the change in scale among plots. Data from Takahashi *et al.* (2009).

B) For the ice cores the progressive closing of the diffusion paths between the surface and the “air bubbles” of a layer of the firn is tantamount to a temporal low-pass filter which smoothes the transitions faster than several centuries (in Antarctica where the precipitation of ice is a few mm/year, it’s the time it takes for some 50 m of water to accumulate). Some references to observations of a delay of several centuries between temperature increase (or decrease) and the following CO₂ increase (or decrease) have been listed on card n°2.

It is now easy to answer the question of Poitou & Bréon: “If CO₂ is following the temperature by some months, how is it possible to have a continuous increase of the CO₂ content of the air while the author explains that there has been no increase of the temperatures since 1997?”

As said on card n°1 $d[CO_2]/dt = k(T(t) - T_0)$ means

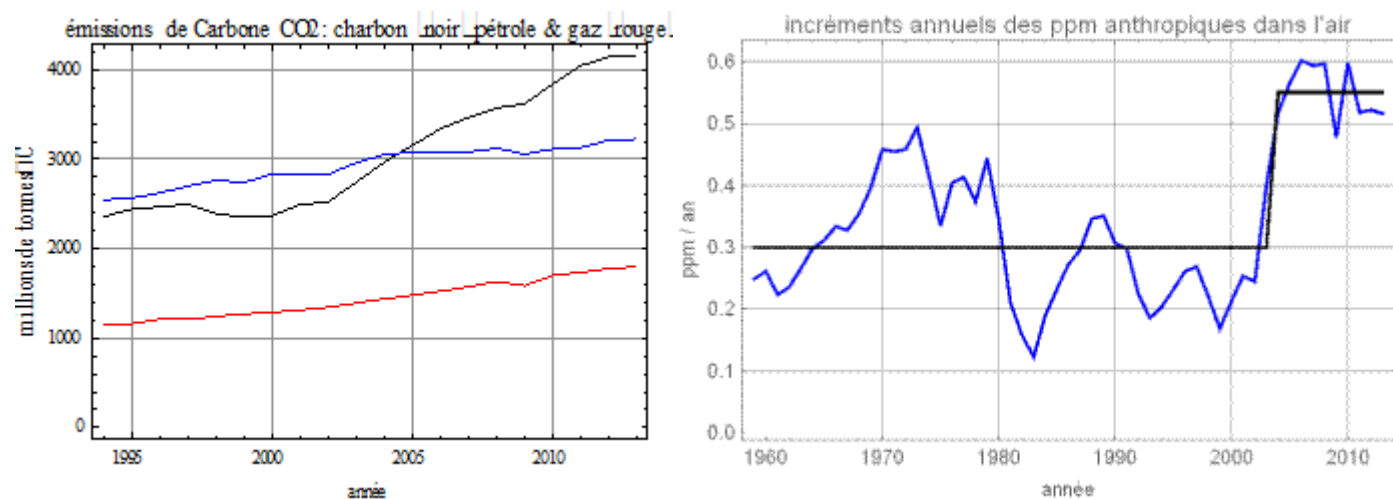
constant increase of the [CO₂] content of the air = temperatures stable w.r.t to the reference T₀

Conclusion: The CO₂ content of the air is a consequence of the temperature(s) and can not be their cause

Note: Despite the increase of the yearly increment of the anthropic content of the air due to the “Chinese” coal surge since 2003 from about +0.3 ppm/year near 2000 to +0.55 ppm/year near 2012 (figure 17-E, right), the yearly increments $d[CO_2]/dt$ (natural plus anthropic) have been slightly diminishing (figure 17-F). Hence the natural $d[CO_{2,natural}]/dt$ has been somewhat decreasing, in line with the life-time weighted out-gassing formulas on card n°4.

Figure 17-E left: anthropic emissions in Mt-C during the last 20 years (http://cdiac.ornl.gov/ftp/ndp030/global.1751_2010.ems and BP 2014) (black coal, blue oil and red natural gas)

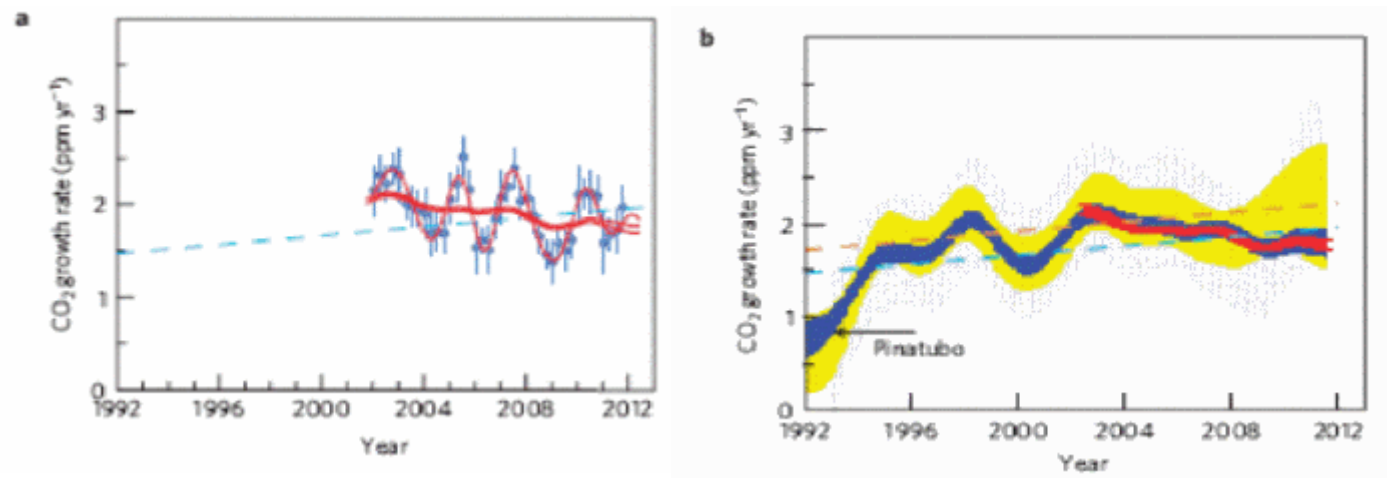
Right: yearly increments of the anthropic ppm for a 5.5 years life time in the air; increased use of natural gas since 1980 reduced it to +0.3 ppm/year before the recent coal surge



The observations of figure 17-F dispel the myth that all the increase of the CO₂ of the air is from anthropic origin; the anthropic emissions remaining in the air for a 5 years life time have surged since 2003 while the overall the CO₂ growth rate has been slowly decreasing!

Figure 17-F Figure 2 of Francey et al. *Atmospheric verification of anthropogenic CO2 emission trends* Nature Climate Change, 10 February 2013
Observations of the growth of the CO₂ in the air

- a) *Slowing CO2 growth (dC/dt) blue points are annual differences in monthly mean CO2 concentration. The smoothed 1.8-yr and 5-yr (thick red) curves are derived from the monthly values. The light-blue dashed line is an extrapolated linear regression fitted to 50 yr of South Pole dC/dt.*
- b) *d[CO2]/dt at Cape Grim (Tasmania) (blue curve), at Mauna Loa (yellow) and at Alert (817 km from the North Pole I n the Canadian Arctic) (grey curve) en Gt-C/an. The red curve is from a.*



Truth n° 18 **The CLOUD project at the European Center for Nuclear Research is probing the Svensmark-Shaviv hypothesis on the role of cosmic rays modulated by the solar magnetic field on the low cloud coverage; the first and encouraging results have been published in Nature**

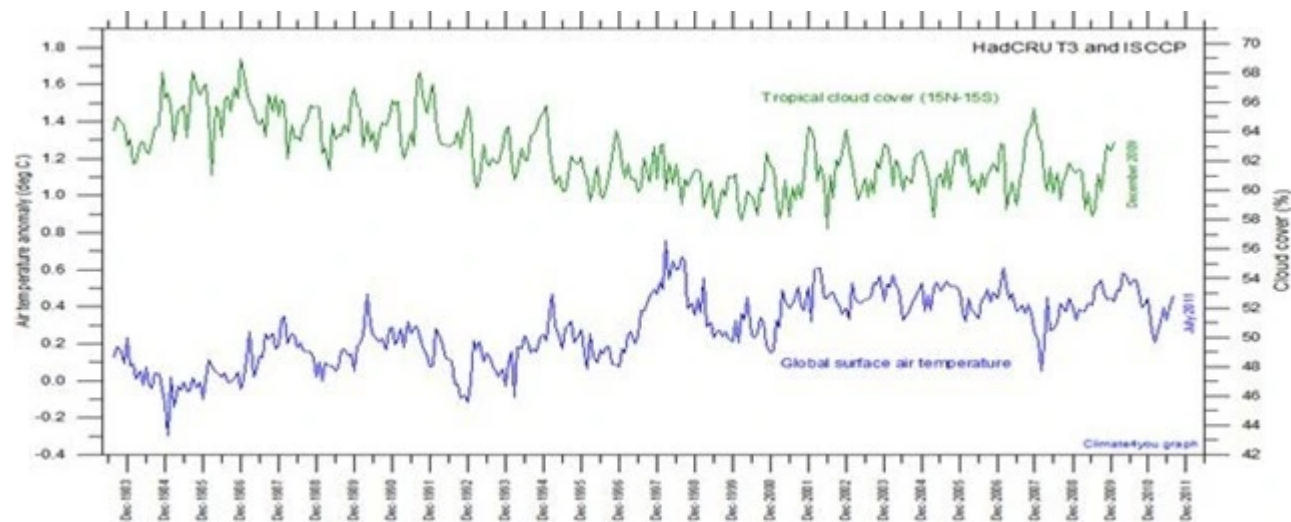
[Poitou & Bréon] *The first results published in Nature (2011 and 2013) then in Science (2014) have identified some chemical compounds that are present in the air and may lead to cloud condensation nuclei (CCN) in quantities similar to those observed. But the cosmic rays contribute only to a small fraction of the CCN. This has been discussed in the last IPCC report*

The historical coincidences of deadly cold episodes with famines and plague with times of strong cosmic rays flows registered in the ¹⁰Be and ¹⁴C records have been firmly assessed. A strong production of those isotope signals minima of the sun and a lesser deflection of the (galactic) cosmic rays, possibly along de Vries 215 years cycles.

During the Ort sunspot minimum, Seine, Rhine and Po were frozen (Rhine from Nov. 15, 1076 to April 7, 1077); during the minimum of Wolf, the 1315-1316 famine reduced western Europe population by more than 5% and the subsequent great plague (1347-1350) by 30% to 50%; the Maunder minimum saw in France an excess death of 1.3 M on 22 M habitants (1693-1694); in the following years 30% on the Finnish population (1696-1697), 25% of the Scottish population (1696-1699) and 10% of the French population (1708-1709) died.

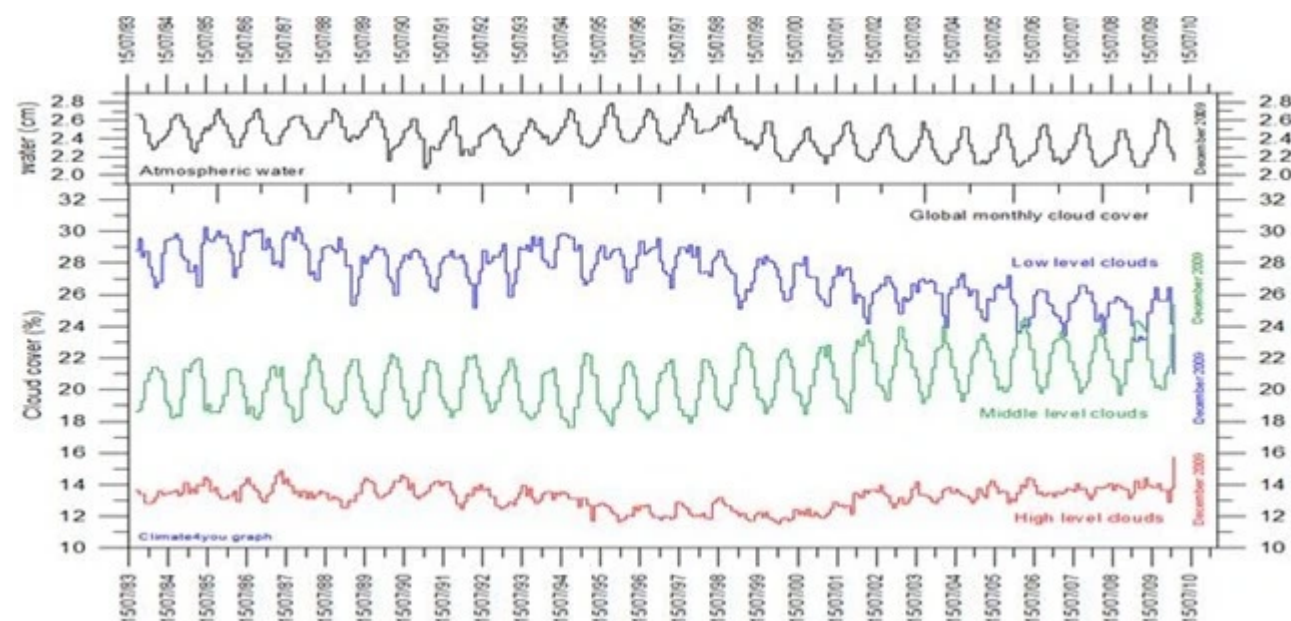
A possible link between cloudiness (that went down from 66% to 62%) 15°S-15°N and mean global surface temperature may be guessed on the figure 18-A.

Figure 18-A Monthly values of cloud coverage over 15°S-15°N and mean global surface temperatures from December 1983 to December 2009 (Ole Humlum www.climate4you.com)



Low cloud coverage went from 29% in 1986 to 25% in 2007 according to [The International Satellite Cloud Climatology Project](http://www.pensee-unique.fr/theses.html) (ISCCP); more on <http://www.pensee-unique.fr/theses.html> and on www.climate4you.com.

Figure 18-B Cloud coverage for the three types of clouds and mean water content of the air: July 1983 to December 2009



Truth n° 19 Numerical “Climate models” are not consistent regarding cloud coverage which is the main driver of the surface temperatures.

Project Earthshine (Earthshine is the ghostly glow of the dark side of the Moon) has been measuring changes of the terrestrial albedo in relation to cloud coverage data; according to cloud coverage data available since 1983, the albedo of the Earth has decreased from 1984 to 1998, then increased up to 2004 in sync with the Mean Global Temperature.

[Poitou & Bréon] Again a long list of nonsense in those statements. Project Earthshine started in 1999; the Earthshine measurements cannot show that the albedo of the Earth is mainly driven by the cloud coverage. This is a known fact that Earthshine measurements integrating over the globe do not allow to differentiate between clouds, aerosols or snow. Those measurements have significant error bars that prohibit linking albedo and the mean global temperature of the recent years. Recent climate models reproduce well the observed trends of the cryosphere; they have uncertainties about future clouds that appear in the uncertainties displayed on the results of the models.

The poor quality of the modelled Cloud coverage has been discussed since tens of years; here is an example of 1999

Figure 19-A Cloud coverage as a function of latitude according to 30 different models used by IPCC [65]:

Figure 5 of http://www.grims-model.org/front/bbs/paper/bams/BAMS_1999-4_Gates_et_al.pdf

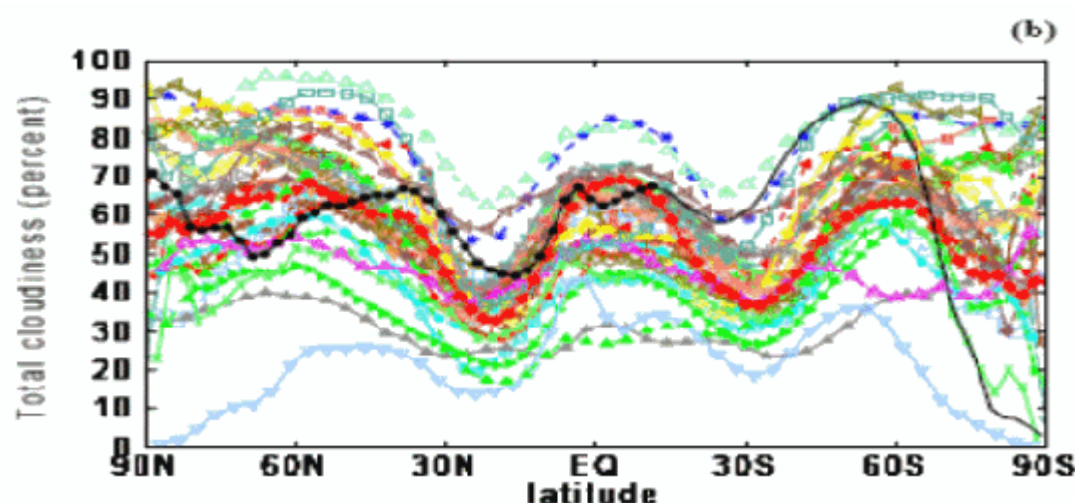
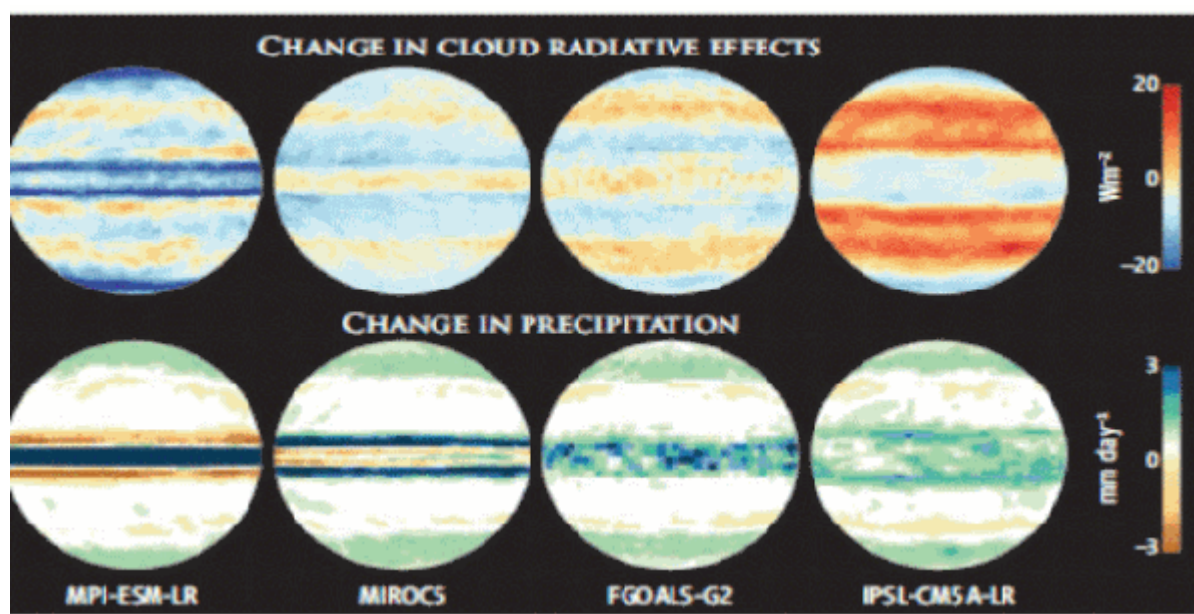


Figure 19-B shows a 2013 test case from Bjorn Stevens & Sandrine Bony [66].

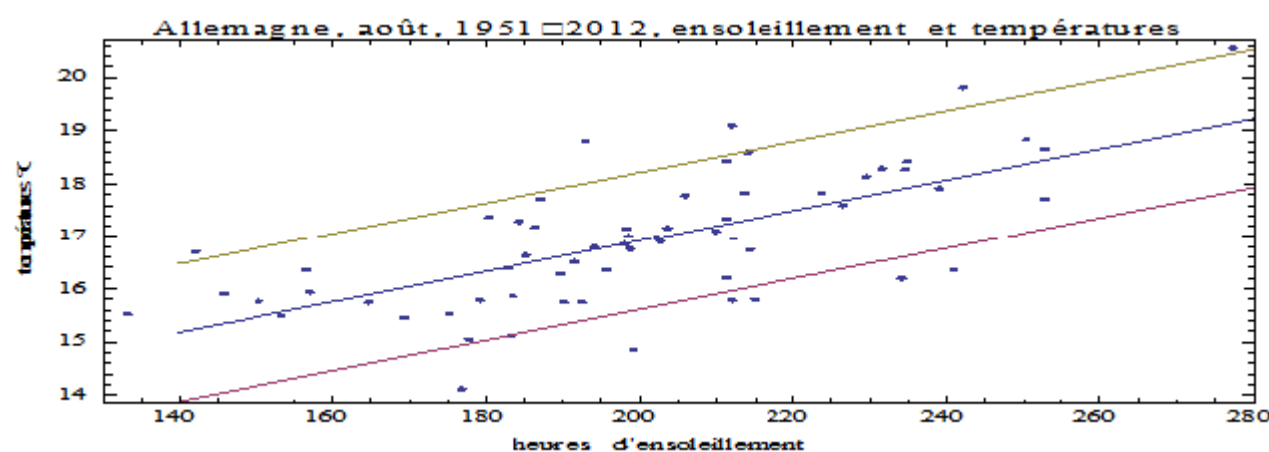
Figure 19-B Comparison of the results of four models on a test case aqua-planet. Where and how much do the cloud radiative effects and the rain change for a given warming?



The caption of the figure by Stevens & Bony is: "Wide variation. The response patterns of clouds and precipitation to warming vary dramatically depending on the climate model, even in the simplest model configuration. Shown are changes in the radiative effects of clouds and in precipitation accompanying a uniform warming ($4^{\circ}C$) predicted by four models from Phase 5 of the Coupled Model Inter-comparison Project (CMIP5) for a water planet with prescribed surface temperatures".

Figure 19-C is an example of covariation of the mean temperature of August with the number of hours of insolation, according to the data of the German DWD. Other examples are in the references of the footnote [67].

Figure 19-C Mean temperatures for the month of August versus number of hours of sun (Germany 1951 to 2012: data from the DWD site)

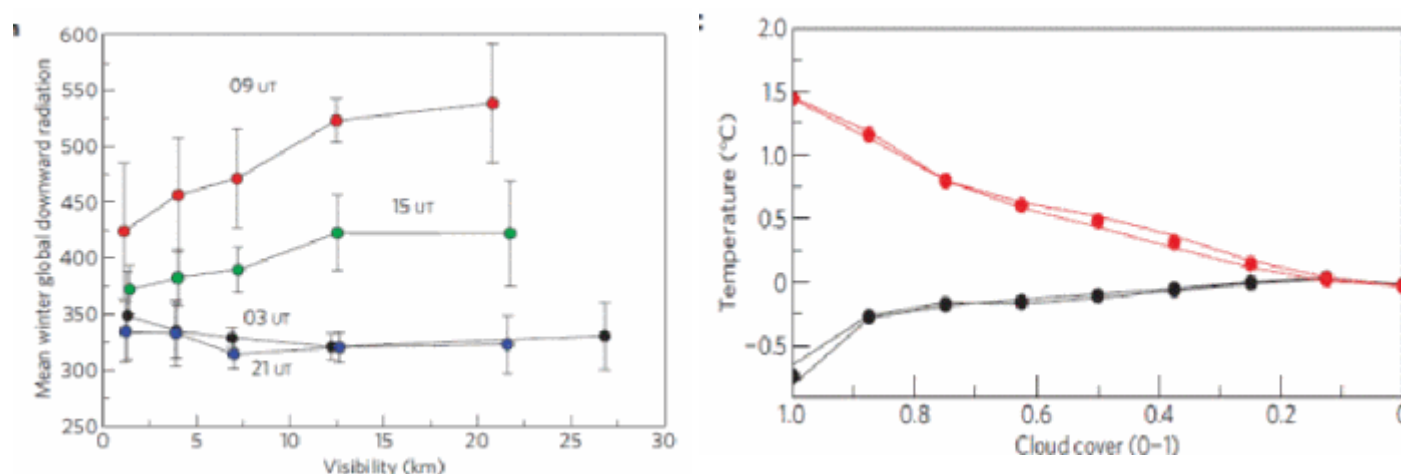


The warming in Western Europe since about 1995 can be related to an increase of about $+1^{\circ}C$ of the surface temperature of the North Atlantic – following an equivalent cooling over 1970-1995- and an increase of the insolation with less aerosols. R. Vautard, P. Yiou, G. J. van Oldenborgh [68] analyzed data from 342 European met stations (selected from 4479) over $10^{\circ}W$ - $30^{\circ}E$ & $35^{\circ}N$ - $60^{\circ}N$; figures 19-D show that a day with a good visibility receives about $100 W/m^2$ more than a day with mist, and (right) that the cloud cover significantly impact the temperature at day (black) and at night (red)

Figure 19-D (R. Vautard et al. 2009)

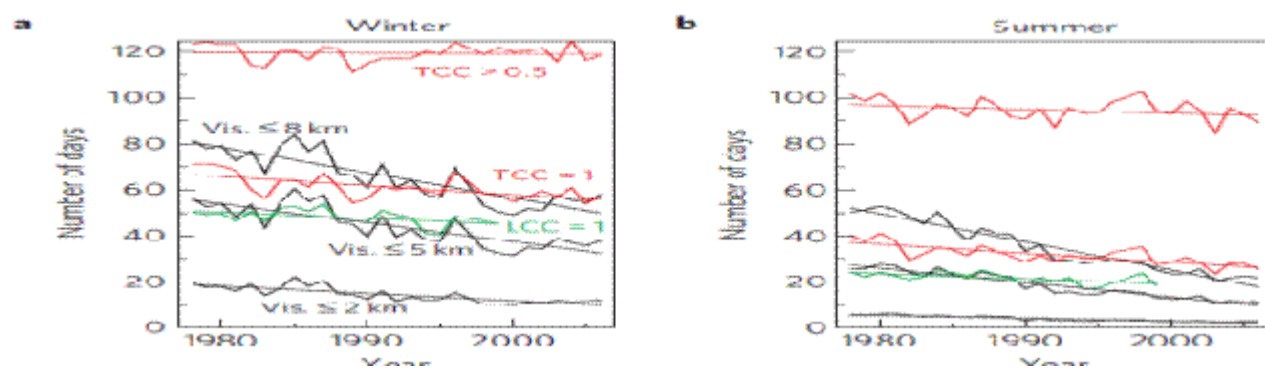
Left: mean winter downward solar and infrared radiation (350 à $320 W/m^2$ at night) as a function of the visibility distance and at four times of the day: 09 h, 15 h, 21 h and 03 h

Right: changes of the temperatures by day (black circles) and by night (red circles) according to the cloud coverage (the zero cloud coverage is at the right end of the abscissa scale)



The trends of cloud cover and of visibility for summer and winter over 1978-2007 bring as well some explanation of the observed warming.

figure 19-E Western Europe 1978-2007: red curves number of days with a total cloud coverage (TCC) above $\frac{1}{2}$ or equal to 1 ; green curve number of days with a low cloud coverage (LCC) equal to 1; grey curves number of days with a visibility below 2 km, 5 km and 8 km (R. Vautard et al. 2009) [^](#)



Regarding the Earthshine project the clouds are indeed making the bulk of the albedo observed (see slide 25/29 of Enric Pallé [69]); the varying longitudinal cloud coverage can be seen thanks to the rotation of the Earth.

There is consistence [70] between the estimates of the ISCCP, the global albedo, the insolation measured at the surface and the length of the daily insolation observed in many places: all of them are likely to explain the temperature changes.

Figure 15-A has shown the global pacing by the El Niños (and their tele-connections) of the temperature changes of the lower troposphere as function of both time and latitude; this pacing may be due to the coming to the surface, at high latitudes, of warm water from the Pacific warm pool, as they move to higher latitudes on the western rim of the oceans after an El Niño.

The quick tempered reaction of Poitou & Bréon: “Again a long list of nonsense in those statements” may suggest that they don’t like that clouds and insolation drive the temperatures and the heat content of the upper ocean (card n°13).

Truth n°20 The forecasts of the “climate models” are diverging more and more from the observations. A model is not a scientific proof of a fact and if proven false by observations (or falsified) it must be discarded, or audited and corrected. We are still waiting for the IPCC models to be discarded or revised; but alas IPCC uses the models financed by the tax payers both to “prove” attributions to greenhouse gas and to support forecasts of doom.

[Poitou & Bréon] *There are no models of the IPCC; the are models of the community of scientists whose conclusions are accepted by the IPCC. Contrary to what the author says the climate models have made some forecast that happened to be true. And not all model forecasts are leaning to the alarmism for instance the diminution of the arctic ice pack has been much quicker than forecast*

The models are made for Climate that is averages over long periods. The fluctuations around this average are noise for the models

The verified forecasts are of the type “it’s warmer in summer than in winter”. The relevance of the models does not appear on the following figures which summarize forecasts and “hind-casts” by 73 models used by IPCC AR5 2013 for the inter-tropical zone (figure 20-A) and for the globe (figure 20-B). There is an obvious disagreement between the CO₂ driven models and the observations[71].

Figure 20-A Temperature of the mid troposphere 20°S-20°N. Comparison of the results of 73 models of 2012 and of the observations: even the back-prediction does not replay the observations of the weather balloons or of the satellites

<http://www.drroyspencer.com/wp-content/uploads/CMIP5-73-models-vs-obs-20N-20S-MT-5-yr-means1.png>

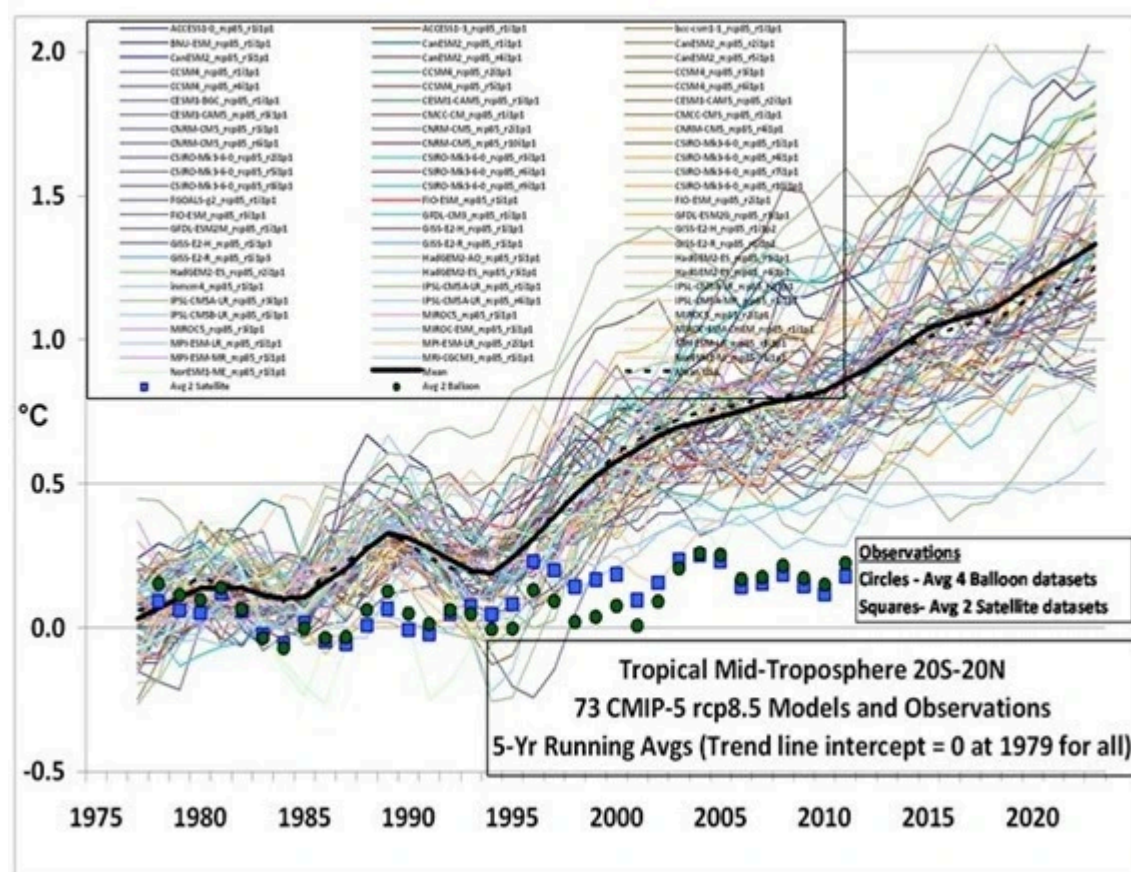
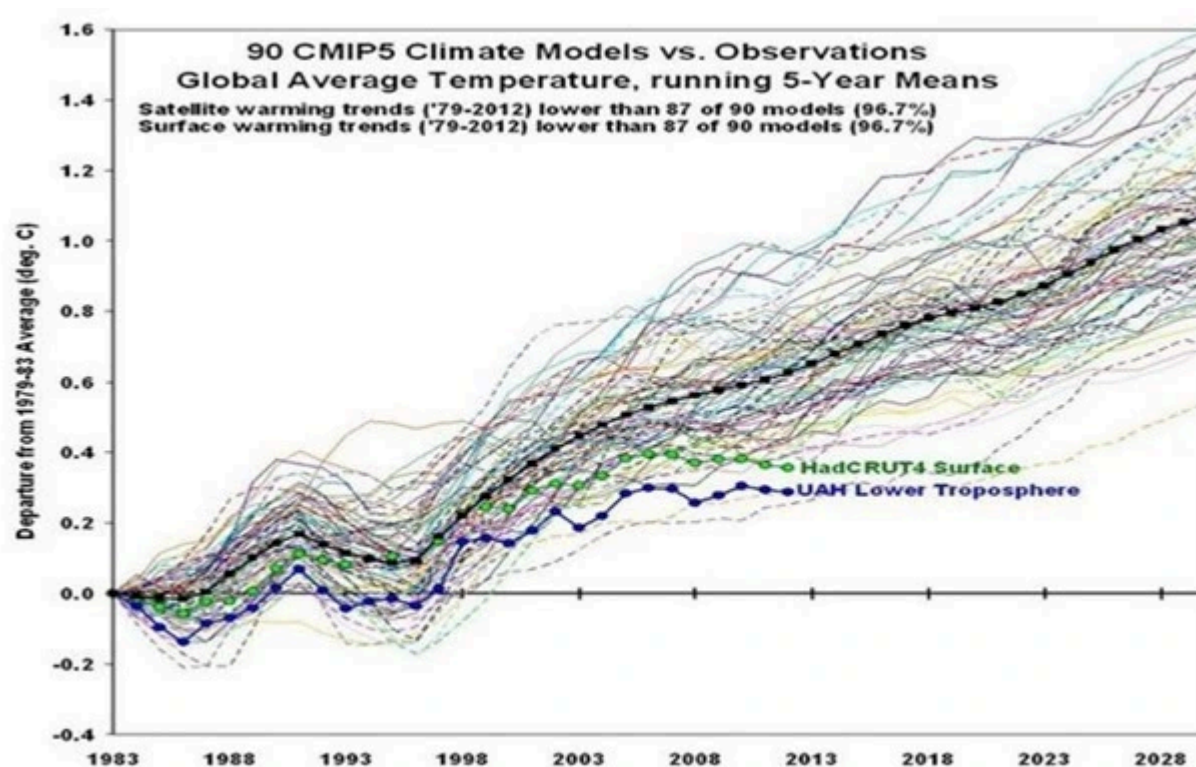


Figure 20-B Surface temperatures (mean global) comparison of 90 CMIP models used for the IPCC AR5 2013 and the series HadCRU T 4 (surface) and UAH MSU (lower troposphere)

Note that the jump (0.2°C to 0.3°C) related to the great El Niño of 1997-98 and the dips in the temperature curves related to volcanic dusts from El Chichon and Pinatubo explain most of the warming since 1983



The credibility of climate models has been checked w.r.t. to regional observations by Pfr Koutsoyiannis^[72]

Figure 20-C Comparison of observations and of back-predictions Paris, France temperatures of the warmest and coolest months 1850-2005. Observations are plotted in blue

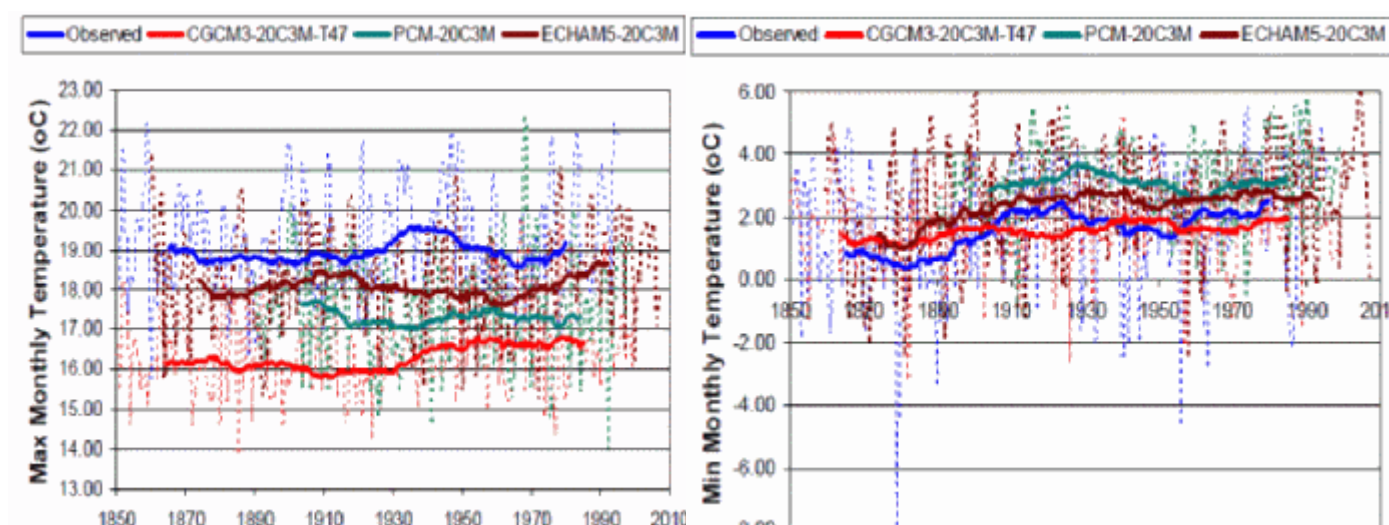
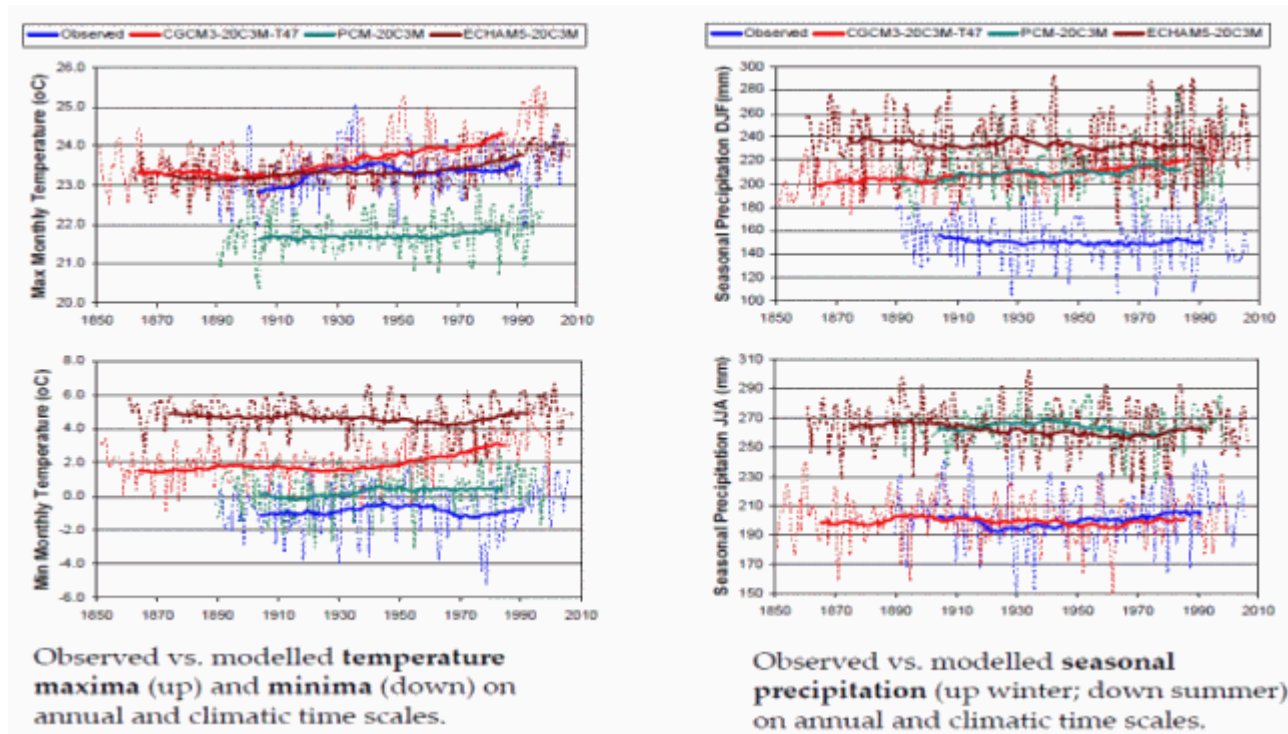


Figure 20-D Comparison of observations and of back-predictions United States temperatures of the warmest and coolest months 1850 – 2005. Observations are plotted in blue



It may happen that one of the models hind-casts correctly one of the parameters of interest for one the seasons, but never all significant parameters like the min and max temperatures and the seasonal precipitations for all seasons.

Poitou & Bréon say *“Fluctuations around the mean are noise for the models”* This statement that there are natural fluctuations built in the models and that a mean trend can be computed by averaging over many runs of one model or over many runs of different models has no justification in numerical analysis.

IPCC AR3 2001 Paragraph 5 section 14.2.2.2 states *“In climate research and modelling, we should recognise that we are dealing with a coupled non-linear chaotic system, and therefore that the long-term prediction of future climate states is not possible.”*

This “unbecoming” statement has not been disproved since 2001.

Conclusion:

The growing divergence between models and observations even on a global average, and the lack of mathematical foundation to the statement that the fluctuations between runs of the same models and between runs of different models “are noise” [73] forbids their use as justification of economic or political decisions.

Truth n°21 As said by IPCC in its TAR (2001) *“we are dealing with a coupled non-linear chaotic system, and therefore the long-term prediction of future climate states is not possible.”* Has this state of affairs changed since 2001? Surely not for scientific reasons...

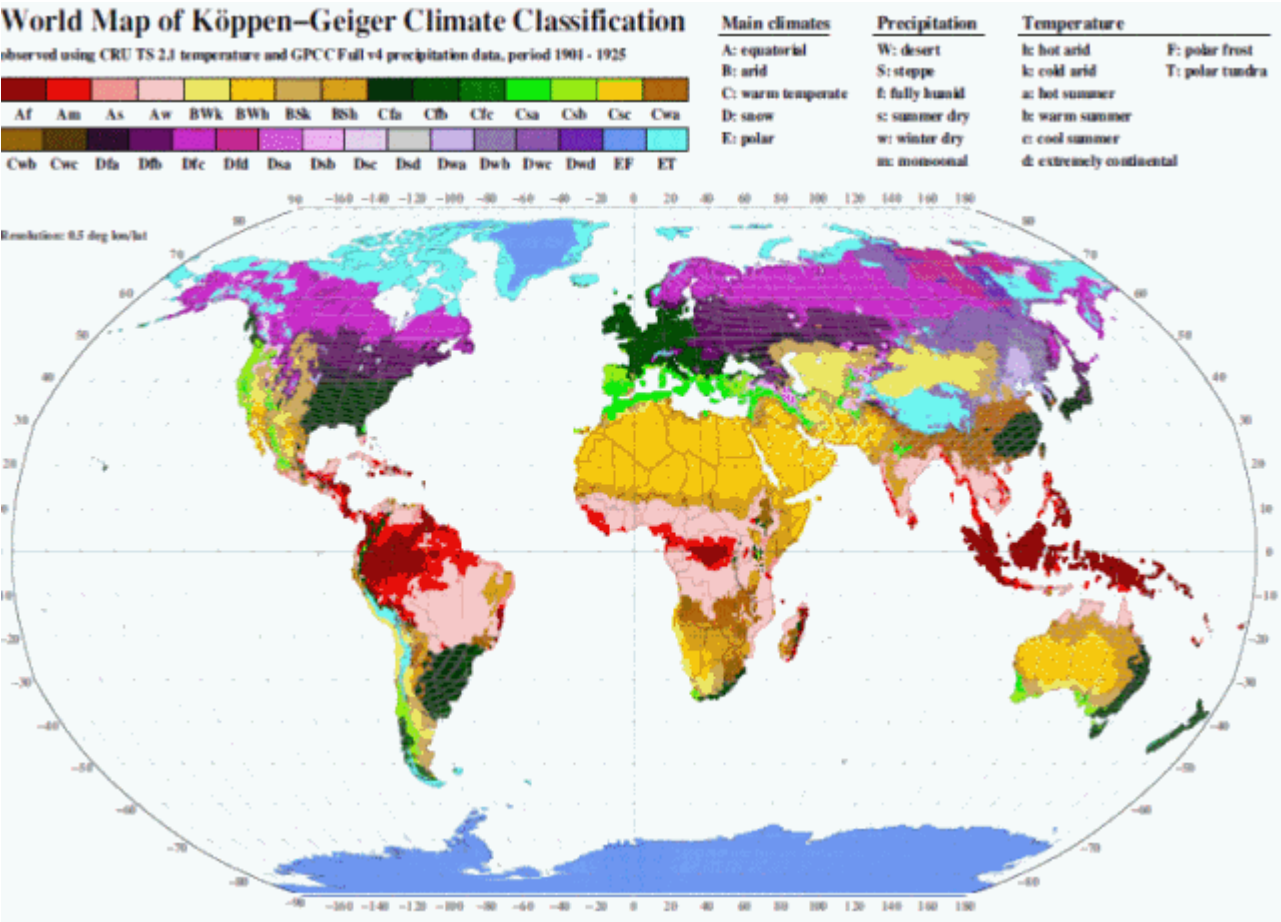
[Poitou & Bréon] *It is because the climate is a chaotic system that models can forecast the Climate for conditions very different of today's. Chaos does not mean “anything” and the domain over which the system is running is perfectly bounded by the conditions at the limits. That's why one can forecast the climate states to which we are going to but not the path that will be lead us to those states.*

Indeed the mean state of a chaotic system can be defined by the forcings. For instance albeit the atmosphere is chaotic, we can forecast with a high degree of confidence that the next month of July will be –on average- warmer than April. In the same way we can forecast that despite the chaotic character of the climate a higher concentration of greenhouse gases leads to higher temperatures.

It's amazing that the author who pretends to have some knowledge of the physics does not understand this.

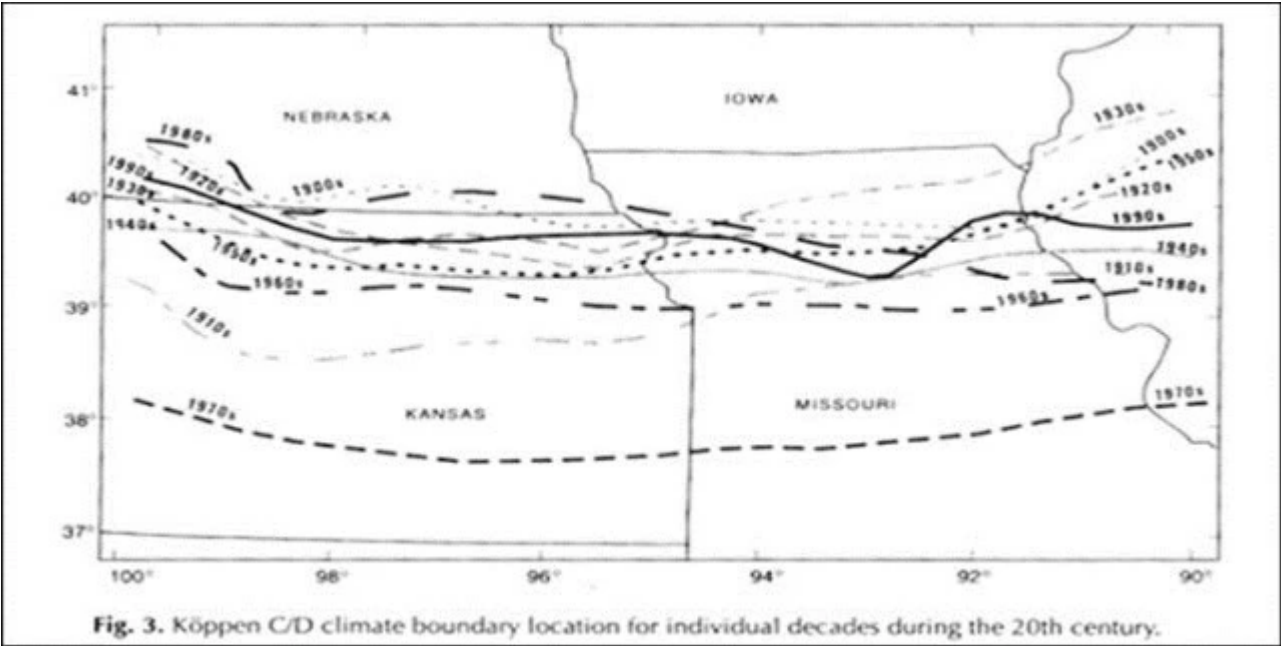
The climates have been defined by the geographers since Wladimir Köppen (1846-1940) and his *Handbuch der Klimatologie* (1930) with a few simple parameters which define the vegetation at the first glance: Mediterranean climate with no rain during the summer, monsoon climates with rains only during the summer monsoon or equatorial rain forest or tundra look quite different. 30 climates have been defined.

Figure 21-A The climates according to Köppen and Geiger (from Rubel & Kottek) 1901-1925 <http://koeppen-geiger.vu-wien.ac.at/>



The latitudinal limits between those climates are shifting northward or southward according to cycles as seen on figure 21-B for the USA [74] ; this may explain the fear, expressed in the 1970s in many periodical and books, of an imminent glaciation; that fear faded after the reversal of the PDO (Pacific Decadal Oscillation) in 1977. [75]

Figure 21-B Decadal Limits between the climates C and D of Köppen in Midwest of the United Sates during the 20th century from 1900-1910 to 1990-2000

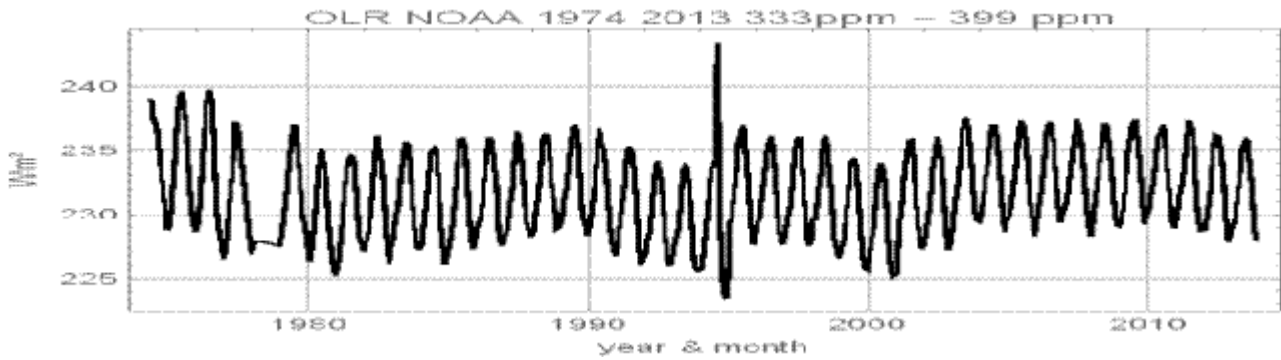


“ ... the mean state of a chaotic system can be defined by the forcings “

The very existence of the forcings by trace gas is unproved: the cumulative forcings said by the IPCC since 1955 is about 1200 ZettaJoule while the oceanic calorimeter (card n°13) shows regional divergences and an increase of the ocean heat content of only 140 ZJ to 170 ZJ.

IPCC AR5 WG1, page 67, thematic focus element TFE.4. figure 1 explains away this discrepancy (a factor 6 to 7 !) by the assumption of an increased outgoing longwave radiation (OLR) of about 3 W/m²: this is not seen on the records (figure 21-C)

Figure 21-C outgoing longwave radiation (OLR) 1974-2014 monthly values of the global average: from data provided by the Royal Dutch Meteorological Office KNMI http://climexp.knmi.nl/data/inoaa_olr_0-360E_-90-90N_n.dat



In addition the forcings have been upped by almost 50% from 1.6 W/m² in AR4 (2007) to 2.3 W/m² in AR5 (2013) with little ground.

“Indeed the mean state of a chaotic system can be defined by the forcings... forecast with a high degree of confidence that the next month of July will be –on average- warmer than April”

Do we need meshed models with about 80 adjustable parameters and thousands of nodes to forecast that? And by the way in regions of summer monsoon (tagged Aw pale rose on figure 21-A) the temperature is lower during the summer rains than in April!

Figures 20-A to 20-D , 19A and 19B show that the meshed models performance for hind-casting, despite the discretionary use of “cooling aerosols”, forbid and disprove statements like *“ That’s why one can forecast the climate states to which we are going”*

Let’s also quote a conference by P. Morel, physicist and former director of the WMO observation programme: *“It is written in the technical documents of international bodies that the climate meshed models “embodies the laws of the physics”. This statement proves illusory because those models are indeed decoupled from the fundamental physical principles defined at the microscopic scale by a hiatus, the meteorological processes at the small and medium scales [or synoptic processes] which are not described in their physical reality. That is why the climate forecasts have little credibility for the intense phenomena (cumulonimbus, tornados, hurricanes, blizzards, etc.), for the rains and precipitations, for the hydrological processes and for the regional consequences of the future global changes. Those meteorological [synoptic scale] processes are handled only with empirical formulas (or parameterizations) which are not logical consequences of the physical laws. Nevertheless some modellers like to believe that their models are based on fundamental laws, as this belief excuses them for not validating each of the formulas they put into the models”.*

The natural cycles should be understood and identified before discussing the supposed chaotic effects. The well known cycles (60 years, 215 years, etc.) and the El Niños are nowhere seen on the outputs of the IPCC models.

The use of long time series with algorithms like SSA-caterpillar provides sensible forecasts and good hind-casts from the identified quasi-periodicities[76].

There are other methods for using several data series when the physics of a system is too complex; they avoid dealing with *“models embodying the laws of physics ... with parametrization of the water vapor cycle”* and provide convenient checks.

The methods of Black Box Model Identification applied to an energy balance model provide directly the so called “equilibrium sensitivities” with respect to three inputs: CO₂; solar and volcanic activities; this is shown by Prof. de Larminat in his book *“Climate Change: Identifications and projections”*[77] where Identification techniques well known in industrial processes, are applied to 16 combinations of historical reconstructions of temperatures (Moberg, Loehle, Ljungqvist, Jones & Mann) and of solar activity proxies (Usoskin-Lean, Usoskin-timv, Be10-Lean, Be10-timv) for the last millennium, with some series going back to year 843.

A careful analysis of the confidence intervals and domains leads to the (here outrageously summarized) conclusions:

- (1) it cannot be shown that observations “prove” the anthropic origin of the observed warming; the *climate sensitivity* or even its sign cannot be said confidently,
- (2) the solar activity is the main driver of the “climate change”; its role (sensitivity in °C/(W/m²) is understated by IPCC by a factor 10 to 20; IPCC argues from *“physical considerations”* to restrict the role of the Sun to the sole total solar irradiance (TSI). But the black box models applied to the series give a much higher sensitivity than the ones said by the IPCC, and Solar activity explains most of the warming since the exit from the little ice age.

In other words Philippe de Larminat has shown that:

- (a) the warming that led to the ongoing warm period is due essentially to the combined effects of solar activity and of the natural variability of climate (such as the 60 year cycle prominent in the residues)
- (b) the contribution of human activity, if any, does not differentiate sufficiently from the aforementioned effects to allow pretend that it is significant with the high degree of certainty as claimed by the IPCC.

While uncertainty calculations and tests of the hypotheses provide all the suitable academic validations, somewhat more visual proofs are the agreement between the results and the observations and the predictive capability of the “black box” model: blind simulations, not incorporating any information about temperatures beyond year 2000 predict with an amazing accuracy the “plateau” in global warming. For short term predictions, the method uses the classical “state estimation” (Kalman filters), whereby the “state” reflects combinations of heat quantities accumulated in the thermal inertia of the oceans.

Beyond the evaluation of the sensitivities, the method also provides a rigorous calculation of the probability for a parameter to be within a given interval, without all the subjective “confidence” or “likelihood” statements which adorn every paragraph of the IPCC WG1 reports.

Another type of “black box” analysis, called non linear self organized dynamic modelling [78], has been applied to the most recent and reliable data sets (1980-2007) available like global mean temperature, CO₂, ozone, solar spots, radiative cloud fraction, aerosol index, etc this software has many uses in all kinds of domains for the processing of big data sets; it avoids the a priori manufacture of a “physical model” to connect the quantities 

documented by the different time series. This identification programme has, in 2007, delivered forecasts for the next ten years: the forecast mean global temperatures have proven consistent with the observations 2008-2014: see www.knowledgeminer.eu;

<http://www.climateprediction.eu/cc/Main/Main.html>.

Note that the variable “CO₂ concentration” is classified by knowledgeminer not as a driver but as a consequence! This is quite in line with the findings of cards n°1, 3, 4, 17 and with those of Prof. Ph. de Larminat.

Let us remind that self-organized fully dissipative systems can be modeled robustly from the maximum entropy production “principle”^[79] which avoids detailed computations of the fluid dynamics and their inherent sensitivity to initial conditions.

Truth n°22 Last but not least the IPCC is neither a scientific organization nor an independent organization: the summary for policy makers, the only part of the report read by international organizations, politicians and media is written under the very close supervision of the representative of the countries and of the non-governmental pressure groups.

The governing body of the IPCC is made of a minority of scientists almost all of them promoters of the environmentalist ideology, and a majority of state representatives and of non-governmental green organizations

[Poitou & Bréon] *The persons who decide the redaction of the Summary for Policy Maker are the scientists who have led the writing of the big report and representative of the states. Nothing can be written in the summary if scientists don't agree.*

There we would like examples of topics of the SPM that would not be in accordance with the complete report written by the scientists

To dispel the statements by P&B it's sufficient to read the submission by Donna Laframboise, investigative journalist, Canada titled: **The Lipstick on the Pig: Science and the Intergovernmental Panel on Climate Change**, submission to Commons Energy and Climate Change Committee, UK Parliament hyperlinked and footnoted version December 10, 2013:

https://nofrackingconsensus.files.wordpress.com/2013/12/laframboise_uk_parliament_submission_dec2013.pdf

Let's quote the conclusion of this submission:

“The IPCC was not established – and is not controlled – by science academies. Rather, it is a child of one of the most politically driven bodies known to humanity, the United Nations.

As a UN entity, the IPCC's primary purpose isn't to further scientific knowledge but to provide scientific justification for another UN entity – the 1992 treaty known as the United Nations Framework Convention on Climate Change (UNFCCC).

Evidence of this is in plain sight. At a 2008 event celebrating the IPCC's 20th anniversary, chairman Pachauri told a group of IPCC insiders: “The UNFCCC is our main customer.”

Similarly a 2011 presentation by vice chair van Ypersele ends this way: “Conclusion: IPCC is eager to continue serving the UNFCCC process.”

An international treaty is a political instrument. This makes it impossible for any reasonable person to conclude that the IPCC is about science for science sake.

This is science for politics sake.”

The submission by Donna Laframboise shows as well how the schedule and the wording of the reports are ordered and very tightly controlled by IPCC bureaucracy; let's quote from the paragraph INTERNATIONAL POLITICS of the submission by Donna Laframboise:

“IPCC authors spent years writing the 14 chapters that comprise AR5's Working Group 1 report. Sixty-five of those authors were then selected (by the bureaucracy) to write a précis. Needless to say, reducing 14 chapters of material to 31 pages involves a great deal of fallible human judgment.

If the IPCC was even a facsimile of a scientific body, matters would have ended there. The 31-page précis – called the Summary for Policymakers – would have been released to the public. But that's not what happened. Instead, those 31 pages were merely a draft. The final version of the document only emerged after a four-day meeting in which the political significance of every sentence had been thoroughly dissected.

Delegations from more than 100 countries were involved in the four-day, behind-closed-doors, barred-to-the-media meeting. Politicians, diplomats, and bureaucrats argued about phrasing – and about which tables, graphs, and illustrations should be included. When they were done, the Summary for Policymakers was five pages longer than the draft but contained 700 fewer words.

*At a press conference in late September 2013, the IPCC released its new improved version of the summary. This is the only AR5 document most policymakers and journalists are ever likely to read. Rather than being the unadorned words of IPCC scientists, this **statement reflects a politically-negotiated view of reality.***

Shortly afterward, the IPCC released a document titled **Changes to the Underlying Scientific/Technical Assessment**. It includes 10 pages of “corrections” the IPCC intends to make to AR5’s first 14 chapters. Turning normal procedure on its head, the IPCC doesn’t expect its summary to be consistent with the underlying report. **Rather, this organization has a long history of adjusting its reports so that they accord with its politically-negotiated summaries.**

In the words of the first paragraph of this document, IPCC personnel “have identified some changes to the underlying report to ensure consistency with the language used in the approved Summary for Policymakers” (*italics added*).

Directly following this quote, we are assured that these changes “do not alter any substantive findings.” Since these are the same people who insist the IPCC is a scientific body, that it writes objective reports, and is “never policy-prescriptive,” such a claim should be taken with a grain of salt. ”

An in depth analysis of the true nature of the IPCC, showing it is a highly political body pretending to be a scientific group of experts, is to be found in Drieu Godefridi’s book LE GIEC EST MORT, vive la science! (Texquis, 2010) (<http://giec-est-mort.com/>) and in its conference [80] at the Académie Royale.

Science is trying to describe the reality while a norm -moral or legal- says what should be allowed or forbidden.

Scientism [81] pretends to deduce logically the norm from the science: it’s a blunder in reasoning as a norm or law expresses value judgments, not scientific facts.

If IPCC WG1 report looks “scientific” (despite being based on shameless distortions of facts and on a fancy pseudo-physics as shown by the discussion of the truths n°1 to n°21), WG2 and WG3 reports are based on value-judgements, culminating in the WG3 list of recommended norms and regulations that every state must endorse and implement.

As all and every human activity even walking outside or growing vegetables produces either carbon dioxide or some of the other “greenhouse gases” (a very long list from laughing gas N₂O to methane), all and every human activity is in the scope of IPCC.

WG3’s proposal disguised as “science” is for “rich countries” to transit to negative growth and to decline and misery, and for “poor countries” to limit their growth while getting hundreds billions of dollars transferred from the “rich” countries via international agencies managing “green funds”.

“Rich countries” should learn, as told by IPCC WG3, to disconnect economic growth and the feeling of well-being, mankind must learn that there are non-human values, etc.

This is not a balanced “scientific assessment” but a very radical political agenda reflecting all of the dangerous and homicidal fantasies of the “deep ecology”, published since the well known reports of the club of Rome and its satellites and promoted by some well known pressure groups and non-governmental organizations.

The fake “global warming science” (models, forcings, etc.) of WG1 is a smoke screen used to justify to the very long list of policy prescriptions, norms and regulations of WG3. As policy prescriptions are not science but politics, IPCC is a political body.

[1] Delmas, Mégie, Peuch, *Physics and Chemistry of the Atmosphere* Belin 2005, 639 pages. This textbook spends only a short paragraph (page 417) on the greenhouse effect: “the absorption by the air [of the radiation of the surface] and the reemission by a cooler layer allows keeping a surface temperature of 288 K. This is commonly called greenhouse effect”. Afterwards the handbook provides the equations of the window in the vacuum between the surface and the cosmos with a air-to-surface radiation flow half of what it is in reality. And modeling a convective gas, one the very best carrier of heat, by the wall of a thermos (or Dewar) bottle is a bizarre idea.

[2] “*Note on the Theory of the Greenhouse*”. The London, Edinburgh and Dublin Philosophical Magazine and Journal of Science, 1909, Vol. 17, pp. 319–320. He compared two small boxes one with a window opaque to infrared, the other one with a NaCl window transparent up to 17 μm and did not measure significant differences.

[3] Arrhenius used very inaccurate spectral infrared data for H₂O and CO₂; NaCl is transparent to the infrared radiation up to 17 μm; the dispersion of the NaCl prism used to calibrate the infrared wavelengths was for Arrhenius $n(\lambda) = 1,5191 - 0,00312 (\lambda - 5)$ instead of the modern $n = (5.174714 + 0.0183744 / (\lambda^2 - 0.015841) - 8949.52 / (3145.695 - \lambda^2))^{0.5}$.

Both Hans Erren (2005) and to Jean-Louis Dufresne (habilitation thesis, 2009) found that the use of correct spectral data reduces the warming as computed by Arrhenius to about **0.2°C** for the doubling of the CO₂ content of the air, instead of some +5.5°C said by Arrhenius ! 

Hans Erren : <http://members.casema.nl/errenwijlens/co2/index.html> gives a complete set of facsimiles and a detailed report

Jean-Louis Dufresne *L'effet de serre : sa découverte, son analyse par la méthode des puissances nettes échangées et les effets de ses variations récentes et futures sur le climat terrestre* Paris 2009 (117 pages)

[4] [Prof. Dr. Gerhard Gerlich](#) was at Institut für Mathematische Physik, Technische Universität Braunschweig

[5] Gerhard Gerlich, Ralf D. Tscheuschner *Falsification Of The Atmospheric CO₂ Greenhouse Effects Within The Frame Of Physics* International Journal of Modern Physics B 2009 http://arxiv.org/PS_cache/arxiv/pdf/0707/0707.1161v4.pdf 115 pages, 205 references. The paragraph 3-3 compares and discusses many erroneous and nonsensical definitions of the greenhouse effect. This article has been criticized for many poor reasons <http://scienceofdoom.com/2010/04/05/on-the-miseducation-of-the-uninformed-by-gerlich-and-scheuschner-2009/>

Reply to Comment on Falsification Of The Atmospheric CO₂ Greenhouse Effects Within The Frame Of Physics by Joshua B. Halpern, Christopher M. Colose, Chris Ho-Stuart, Joel D. Shore, Arthur P. Smith, Jorg Zimmermann 41 pages <http://arxiv.org/pdf/1012.0421.pdf&embedded=true> December 2010

[6] G. Kramm, R. Dlugi *Scrutinizing the atmospheric greenhouse effect and its climatic impact* Natural Science Vol.3, No.12, 971-998 (2011) doi:10.4236/ns.2011.312124 (108 references)

[7] 80% of the photons reaching the surface come from a layer of air of optical thickness 1,07 above the surface; the total optical thickness of the water vapor of the air is displayed on figure 6-A

[8] *L'effet de serre plus subtil qu'on ne le croit* revue Découverte n°373 Mars-Avril 2011, pp. 32-43; a slightly different paper has been published with the same title in La Météorologie 2011.

[9] Berger A., Tricot Ch., 1992. The Greenhouse Effect. *Surveys in Geophysics*, 13, pp. 523-549.

Cargèse 2009 summer school <http://www.lmd.ens.fr/wavacs/> Rémy Rocca slides 71 à 83 writes (slide 72) “The difference is due to the greenhouse effect: the trapping of infrared radiation by the atmosphere. **Surface is heated by the presence of the atmosphere (lucky us!)**” [sic !].

As a matter of fact there is no radiative trapping but the surface temperature is higher because of the pressure-temperature relation. The “lucky us” reflects a religious state of mind: the existence of the greenhouse effect should not be put to scrutiny because it is natural and good and rises the average temperature of the surface of the globe from -18°C to +15°C.

Those numbers are meaningless as the average temperature of the surface of the Moon is between 80°C on the lit face and -200°C on the dark face and averaged over a lunar day it's 98 K at the poles and 206 K at the equator.

The -18°C assumes there are no greenhouse gases, no water vapor but nevertheless that clouds produce an albedo of 0.3 !

[10] <http://www.ramanathan.ucsd.edu/files/pr72.pdf> V Ramanathan Trace-Gas Greenhouse and Global Warming Volvo environmental Prize lecture 1997

[11] This 33 K difference between 288 K and 255 K said to be the global average temperature of an airless Earth is an additional nonsense: an Earth without atmosphere and water vapour would have no clouds and its albedo would not be 0.3 but possibly 0.12 like the Moon. In addition the global average temperature of an airless Earth should be about that of the Moon, maybe about 200 K.

[12] Kuo C. et al Coherence established between atmospheric carbon dioxide and global temperature *Nature* 343, 709 – 714 (22 February 1990); doi:10.1038/343709a0 this paper of Bell Labs uses telecom signal processing techniques of the two series CO₂ content of the air and temperatures to prove that CO₂ content is driven by the temperatures

Park, J. (2009), A re-evaluation of the coherence between global-average atmospheric CO₂ and temperatures at interannual time scales, *Geophys. Res. Lett.*, 36, L22704, doi:10.1029/2009GL040975 <http://onlinelibrary.wiley.com/doi/10.1029/2009GL040975/abstract> Frequency domain techniques are used to prove that $d[CO_2]/dt = k(T(t)-T_0)$ and to map the areas where outgassing and absorption are relevant for the Mauna Loa (figure 4 and figure 15 of http://people.earth.yale.edu/sites/default/files/files/Park/Park_2011_CO2coherence.pdf)

M. Beenstock, Y. Reingewertz, N. Paldor Polynomial cointegration tests of anthropogenic impact on global warming *Earth Syst. Dynam.*, 3, 173–188, 2012 To avoid spurious correlations the statistical tests show that the [CO₂] serie must be differentiated once before being compared to T(t) hence the only possible relation is between $d[CO_2]/dt$ and T(t)

Murry Salby states a similar relation between $d[CO_2]/dt$ and T(t)

http://www.youtube.com/watch?v=2R0w_cDKwc0 à Hamburg 2013; http://www.youtube.com/watch?v=ZVCps_SwD5w&index=3&list=PLILd8YzszWVTp8s1bx2KTNHXCzp8YQR1z in Sidney 2012 https://www.youtube.com/watch?feature=player_embedded&v=Yrl03ts-9I in Sidney 2011

[Click to access autour-de-salby-et-du-co2.pdf](#)

http://www.rocketscientistsjournal.com/2007/06/on_why_co2_is_known_not_to_hav.html#more on outgassing and Henry law.



D. Wunch et al The covariation of Northern Hemisphere summertime CO₂ with surface temperature in boreal regions <http://www.atmos-chem-phys.net/13/9447/2013/acp-13-9447-2013.pdf>

[13] Hubertus Fischer, Martin Wahlen, Jesse Smith, Derek Mastroianni, Bruce Deck, "Ice Core Records of Atmospheric CO₂ around the Last Three Glacial Terminations," *Science*, vol. **283**, no. 5408, pp. 1712 – 1714 (12 March 1999) "High-resolution records from Antarctic ice cores show that carbon dioxide concentrations increased by 80 to 100 parts per million by volume **600 ± 400 years after the warming of the last three deglaciations.**"

J. P. Severinghaus, E. J. Brook *Abrupt climate change at the end of the last glacial period inferred from trapped air in polar ice* *Science* (286) pp. 930-934, 1999

Nicolas Caillon, Jeffrey P. Severinghaus, Jean Jouzel, Jean-Marc Barnola, Jiancheng Kang, Volodya Y. Lipenkov, "Timing of Atmospheric CO₂ and Antarctic Temperature Changes Across Termination III," *Science*, vol. **299**, no. 5613, pp. 1728 – 1731 (14 March 2003)

[14] Lowell Stott, Axel Timmermann, Robert Thunell *Southern Hemisphere and Deep-Sea Warming Led Deglacial Atmospheric CO₂ Rise and Tropical Warming* 27 September 2007 on *Science Express* DOI: 0.1126/science.1143791 and supporting online material 1143791S.

[15] http://www.rocketscientistsjournal.com/2006/10/co2_acquittal.html#more Jeffrey Glassman (PhD) has been the scientific director of the missiles at Hughes Aircraft

[16] Roe, G. *In defense of Milankovitch*, *Geophys. Res. Lett.*, 2006, 33, L24703, doi:10.1029/2006GL027817 compares the time derivative of the ice volume dV/dt and the 65°N insolation; the match is very good except at the onset of deglaciations.

[17] Sorokhtin O. G., G.V.Chilingar, L.F. Khilyuk *Global Warming and Global Cooling Evolution of the Climate of the Earth* Elsevier 2007, 313 pages

[18] Diego Macias, Adolf Stips, Elisa Garcia-Goriz *Application of the Singular Spectrum Analysis Technique to Study the Recent Hiatus on the Global Surface Temperature Record* PLOS ONE 1 September 2014 , Volume 9 Issue 9 e107222 (free access)

[19] The airborne carbon stock is about 850 Gt-C (2014) and the absorption by ocean and vegetation is 170 Gt-C/year. The most important feature is that due to CO₂ fertilization of the air, plants grow bigger more quickly, have more leafs and absorb more: hence the yearly absorption increases like the stock of the air.

Graven HD, Keeling RF, Piper SC, [et al.](#), 2013, *Enhanced Seasonal Exchange of CO₂ by Northern Ecosystems Since 1960*, *Science*, Vol:341, ISSN:0036-8075, pages 1085-1089 (the amplitude of the seasonal vegetation effect measured aboard planes (3 km to 6 km) has, north of 45°N grown by 50% w.r.t airplane observations carried late 1950s beginning 1960s.)

Prof. Ranga B. Myneni (department of Earth & Environment Boston University USA), *The Greening Earth*, Probing Vegetation Conference From Past to Future July 4-5, 2013 Antwerp, Belgium

Donohue Randall et al. *Deserts 'greening' from rising CO₂* (CSIRO, the Commonwealth Scientific and Industrial Research Organisation. Australia's national science agency. 3 July 2013 <http://www.csiro.au/en/Portals/Media/Deserts-greening-from-rising-CO2.aspx> GRL 2013

Pretzsch, H., Biber, P., Schütze, G., Uhl, E., Rötzer, Th *Forest stand growth dynamics in Central Europe have accelerated since 1870.*, (2014) *Nat. Commun.* 5:4967, [DOI:10.1038/ncomms5967](https://doi.org/10.1038/ncomms5967)

James Hansen, Pushker Kharecha and Makiko Sato [Climate forcing growth rates: doubling down on our Faustian bargain 2012 Environ. Res. Lett. 7 044035 Full text PDF \(631 KB\)](#) suggest that the "chinese coal" has much increased the productivity of the plants

[Ying Sun](#), et al. *Impact of mesophyll diffusion on estimated global land CO₂ fertilization* PNAS 2014

[20] Bolin, B. & Eriksson, E. (1959): *Changes in the carbon dioxide content of the atmosphere and sea due to fossil fuel combustion*. In: Bolin, B. (Ed.): *The atmosphere and the sea in motion*. Scientific contributions to the Rossby Memorial Volume. The Rockefeller Institute Press, New York, 130-142

[21] Scafetta *Empirical evidence for a celestial origin of the climate oscillations and its implications* *Journal of Atmospheric and Solar-Terrestrial Physics* 72 (2010) 951–970 <http://www.fel.duke.edu/~scafetta/pdf/scafetta-JSTP2.pdf>

Mazzarella A. and N. Scafetta, 2012. *Evidences for a quasi 60-year North Atlantic Oscillation since 1700 and its meaning for global climate change*. *Theoretical Applied Climatology* 107, 599-609. <http://arxiv.org/ftp/arxiv/papers/1206/1206.5835.pdf>

[22] I.E Frolov et al. *Climatic changes of the Eurasian ice shelf* (in Russian) Saint Petersburg Naouka 2007 pp. 106-110

he finds a peak to peak modulation of the solar constant of up to 30 W/m² with a non sinusoidal wave shape

[23] <http://www.clim-past.net/8/765/2012/cp-8-765-2012.pdf> and http://www.climateaudit.info/pdf/multiproxy/shi_2013.pdf

[24] Jean Louis Dufresne & Jacques Treiner "L'effet de serre atmosphérique plus subtil qu'on ne le croit" (*Découverte* n°373 Mars-Avril 2011, pp. 32-43)

[25] as the saturation partial pressure is like $\exp(6400/T) T^{-5.31}$

[26] as the solar infrared radiation at 2.5 μm and 4.3 μm are slightly more absorbed by the “doubled” stratospheric CO_2 (about 0.4 W/m^2 as 24 hours average) the required additional cooling of the surface by evaporation will be only 0.4 W/m^2

[27] Ramanathan, V., Callis, L., Cess, R., Hansen, J., Isaksen, I., Kuhn, W., Lacis, A., Luther, F., Mahlman, J., Reck, R., and Schlesinger, M.: *Climate-chemical interactions and effects of changing atmospheric trace gases*, Rev. Geophys., 25, 1441-1482, 1987

Hansen, J., Sato, M., Kharecha, P. and von Schuckmann, K.: *Earth's energy imbalance and implications*, Atmos. Chem. Phys., 11, 13421–13449, www.atmos-chem-phys.net/11/13421/2011/, 2011.

[28] G. Wöppelmann, B. Martin Miguez, M.-N. Bouin, Z. Altamimi *Geocentric sea-level trend estimates from GPS analyses at relevant tide gauges world-wide* Global and Planetary Change 57 (2007) 396–406 made a correct recalibration with the ITRF (International Terrestrial Reference Frame) defined by the International Earth Rotation Service

[29] Thesis of Nicolas Pouvreau *Three hundreds years of tide gauge measurements: tools, methods and components of the sea level at Brest* <http://tel.archives-ouvertes.fr/docs/00/35/36/60/PDF/ThesePOUVREAU.pdf>

Baart T.F. Van Gelder, P.H. De Ronde, J.; Van Koningsveld, M., Wouters, B., 2012. *The effect of the 18.6-year lunar nodal cycle on regional sea-level rise estimates*. Journal of Coastal Research, 28(2), 511–516. They find for the Netherlands over 1900-2005

$h(t) = 1,9 \text{ mm/year } t + 12 \text{ mm } \sin(2 \pi t/18,6 + x)$ with no acceleration, a peak in Feb. 2005 and a subsidence of 0.4 mm/year

[30] A. Cazenave **2,8 mm/an, Le risque climatique**, numéro spécial, dossiers de la Recherche, 2004, pp. 46-51. 2004

“The drawned worlds” *The Guardian* (11/09/2004) with only the top of the Dutch windmills emerging from sea water in 2020.

[31] About Greenland IPCC SPM § B4 states: “we can say with a very high confidence level that the maximum mean sea level during the last interglacial (129 ka to 116 ka) has been at least 5 m above today's seal level.... but this occurred under significantly different orbital forcing conditions” This is to make us believe that a global mean temperature could drive the melting or calving of the Greenland; but the Eemian diminution of the Greenland ice cap is by no means related to an average global temperature but to the local summer insolation that during the last interglacial was up to 30 W/m^2 to 60 W/m^2 stronger than today's. see:

van de Berg Willem Jan et al. *Significant contribution of insolation to Eemian melting of the Greenland ice sheet*, Nature Geoscience 4 Sept. 2011 DOI: 10.1038/NCEO1245 http://www.staff.science.uu.nl/~broek112/home.php_files/Publications_MvdB/2011_vdBerg_NatGeo.pdf

Robinson A., H. Goelzer *The importance of insolation changes for paleo ice sheet modeling* The Cryosphere Discuss., 8, 337–362, 2014 www.the-cryosphere-discuss.net/8/337/2014/ doi:10.5194/tcd-8-337-2014 . This paper corrects a previous one of

A. Robinson, R. Calov, and A. Ganopolski *Greenland ice sheet model parameters constrained using simulations of the Eemian Interglacial* Clim. Past, 7, 381–396, 2011 www.clim-past.net/7/381/2011/ doi:10.5194/cp-7-381-2011

[32] Andrew Shepherd et al. *A Reconciled Estimate of Ice-Sheet Mass Balance* Science 338, pp. 1183-1189 (2012)

this *reconciliation* is an averaging of a set of estimates including outrageous ones fabricated in advance of the Copenhagen Conference of Parties

[33] H. Jay Zwally et al. *Mass Gains of the Antarctic Ice Sheet Exceed Losses* <http://ntrs.nasa.gov/search.jsp?R=20120013495> SCAR ISMASS Workshop, July 14, 2012 “During 2003 to 2008, the mass gain of the Antarctic ice sheet from snow accumulation exceeded the mass loss from ice discharge by 49 Gt/yr (2.5% of input), as derived from ICESat laser measurements of elevation change

this is significantly different ... “

[34] <http://joannenova.com.au/2012/05/man-made-sea-level-rises-are-due-to-global-adjustments/> de Frank Lansner

[35] Wada, Y., L. P. H. van Beek, C. M. van Kempen, J. W.T.M. Reckman, S. Vasak, and M.F.P. Bierkens (2010), *Global depletion of groundwater resources*, Geophysical Research Letters, Vol. 37, L20402, doi:10.1029/2010GL044571, 2010,

Leonard F. Konikow *Contribution of global groundwater depletion since 1900 to sea-level rise* GRL VOL. 38, L17401, doi:10.1029/2011GL048604, 2011

Y. Wada et al. *Past and future contribution of global groundwater depletion to sea-level rise*, Geophysical Research Letters may 2012

[36] an up to 50 cm deep minimum occurred during the great El Niño of 1997-98; this provides the food for nonsensical “EXCEL” linear trends over 1992-2012: as the early part of the curve is depressed, the linear trend computed over 1992-2012 is steeply increasing; in reality “trends” are flat both before and after that great El Niño.

[37] David Douglass *Ocean Heat Content and Earth's radiation imbalance* Heartland conference N.Y. March 2009

David H. Douglass, Robert S. Knox *Ocean heat content and Earth's radiation imbalance* Physics Letters A 373 (2009) 3296–3300



Douglass, Christy et al.: *A comparison of tropical temperature trends with model predictions*. International Journal of Climatology, 2007

<http://www.scribd.com/doc/904914/A-comparison-of-tropical-temperature-trends-with-model-predictions?page=6>

<http://www.climateaudit.org/?p=3058>

[38] Ross McKittrick, Stephen McIntyre, Chad Herman *Panel and Multivariate Methods for Tests of Trend Equivalence in Climate Data Series* Atmospheric Science Letters 2010

[39] S.Costa and K. Shine *Outgoing longwave radiation due to directly transmitted surface emission*

<http://plutao.sid.inpe.br/col/dpi.inpe.br/plutao/2012/11.28.19.31.24/doc/Outgoing%20Longwave%20Radiation%20due%20to%20Directly%20Transmitted%20Surface%20Emission-1.pdf>

[40] the transmission of diffuse infrared radiation across a layer of optical thickness t is $2E_3(t)$ that is 20% for $t=1.07$ and 6% for $t=2$

[41] http://www.ipcc.ch/publications_and_data/ar4/wg1/en/ch1s1-6.html

[42] $p_{\text{vap}} = RH(P) E_{\text{vap sat}}(P)$; assuming a relative humidity $RH \sim P^{0.75}$, inserting $T(P) = T_{\text{surface}} P^{0.19}$ and $p_{\text{air}} = P / (R T) \sim P^{0.81}$ in $E_{\text{vap sat}}$ leads to $E_{\text{vap sat}}(Pa) = 1.331 \cdot 10^{26} \exp(-6816/T_{\text{surface}}) T_{\text{surface}}^{-5.13} P^{-1.0947+1451.8/T_{\text{surface}}}$

$(p_{\text{H}_2\text{O}} / p_{\text{air}}) \sim P^{0.75} P^{-1.0947+1451.8/T_{\text{surface}}} / P = P^{-1.34+1452/T_{\text{surface}}} = P^{3.7}$ for $T_{\text{surface}} = 288 \text{ K}$

$p_{\text{H}_2\text{O}}(P) \sim p_{\text{vap}} / P^{0.19} = P^{0.75-1.09+1452/T_{\text{surface}}-1.19} = P^{4.51}$ for $T_{\text{surface}} = 288 \text{ K}$ and 80% of the fraction of the total water vapor between $P=1$ and $P=0.75 \text{ atm}$ (near 2.3 km) is $(1-0.75^{5.51}) = 80\%$

The differential dt of the optical thickness of a layer of thickness dz , is thanks to the barometer equation $dp = -p_{\text{air}} g dz$

$dt = k(v, P, T) p_{\text{gaz trace}} dz = k(v, P, T) p_{\text{gaz trace}} (-101325 dP / (g p_{\text{air}})) = -k(v, P, T) (p_{\text{gaz trace}} / p_{\text{air}}) (-101325 / g) dP$

hence $dt \sim P^{3.7} dP$; and the optical thickness of water vapour cumulated from the top of the air is about $t_{\text{H}_2\text{O}}(v, P) = t_{\text{H}_2\text{Omax}}(v) P^{4.7}$

$t_{\text{H}_2\text{Omax}}(v)$ for 25 kg/m² is shown figure 6-A.

[43] a 1 W/m² unbalance would, if left in the air, after one year, heat the air by $1 \text{ W/m}^2 \times 365.25 \times 86400 / (10328 \text{ kg/m}^2 \times 1005) = +3^\circ\text{C}$

[44] a reduction of 1/7 of the water vapour content of the air near 300 mbar pushes down by a factor $1/(1-1/7)^{4.7} = 1.03$ the $P_{80\%}$ level and the $P_{80\%}$ temperature increases by a factor $1.03^{0.19} = 1.006$ that is by about 1.5 K for the radiation temperature over the far infrared spectral range

[45] John Turner, Tom Bracegirdle, Tony Phillips, Gareth J. Marshall, J. Scott Hosking *An Initial Assessment of Antarctic Sea Ice Extent in the CMIP5 Models* Journal of Climate 2012 ; e-View doi: <http://dx.doi.org/10.1175/JCLI-D-12-00068.1>

[46] hence over 30 years, in 2009 the maximum ice pack area should be 64 % = $(1-0.136)^3$ of its 1979 value instead of the observed increase by 15% or more

[47] Christian Haas *Auf dünnem Eis Eisdickenänderungen im Nordpolarmeer* pp. 97-101 of *Warnsignale aus den Polarregionen Wissenschaftliche Auswertungen Hamburg* 2006

see www.climate4you.com sea ice/ [Arctic sea ice thickness and displacement](#)

[48] YAN Chang-Xiang, ZHU Jiang *The Impact of "Bad" Argo Profiles on Ocean Data Assimilation* Atmospheric and oceanic science letters , 2010, VOL. 3, n° 2, 59–63 for list of "grey" floats: http://www.nodc.noaa.gov/argo/grey_floats.htm

[49] Dean Roemmich, Scripps Institution of Oceanography *Argo and Ocean Heat Content: Progress and Issues* http://ceres.larc.nasa.gov/documents/STM/2013-10/14_Global_averages.pdf

[50] *a blanket around the Earth* <http://climate.nasa.gov/causes/> http://www.whrc.org/resources/primer_greenhouse.html: Greenhouse gases act like an insulator or blanket above the earth, keeping the heat in. Increasing the concentration of these gases in the atmosphere increases the thickness of this insulator, therefore increasing the atmosphere's ability to block the escape of infrared radiation.

[51] Gerhard Kramm, Ralph Dlugi *Comments on the Paper 'Earth's energy imbalance and implications' By J. Hansen, M. Sato, P. Kharecha, and K. von Schuckmann* <http://arxiv.org/abs/1203.1289>

[52] see any thermal transfer handbook like Taine et al. *Transferts Thermiques* Dunod 2008 page 222-226 §7-7 Hottel hemisphere which details the limits of those simple computations .

[53] S. Chandrasekhar *Radiative Transfer* Oxford University Press 1950, 393 pages Dover NY 1960

[54] The shape of the optical thickness of the water vapour (figure 6-A) is such that almost all the layers of the troposphere are cooling over some part of the spectrum (figure 6-C); hence we can not tell where the air *must warm* to restore the OLR.

[55] Willis Eschenbach *The Cold Equations* January 28, 2011 <http://wattsupwiththat.com/2011/01/28/the-cold-equations/>

[56] <https://answers.yahoo.com/question/index?qid=20080307100910AAWZb2f> paper at <http://www.pensee-unique.fr/HeatCapacity.pdf>.

[57] This ratio goes from 0.9 for cold high latitudes with little water vapor (some kg/m²) to 0.75 in the tropics with up to 75 kg/m² of water vapour. It is about $P_{\text{top}}^{4 \times 0,19} = P_{\text{top}}^{0,76}$; possible examples of $\{T_{\text{surface}}, P_{\text{top}}, \sigma T_{\text{surface}}^4, \sigma T_{\text{surface}}^4 P_{\text{top}}^{0,76}\}$ are {300 K, 0,42 atm, 460 W/m², 237 W/m²} for inter-tropical conditions, {285 K, 0,55 atm, 374 W/m², 237 W/m²} for mid latitudes summer, {253 K, 0,85 atm, 232 W/m², 202 W/m²} for high latitudes winter

[58] that means for the assumed reduction of the OLR of 3,7 W/m² for CO₂ doubling a temperature increase of $(5 \times 3,7 / 17) = 1,1^\circ\text{C}$

[59] As shown on the cards n°1 to n°4, $[\text{CO}_2]_{\text{natural}}$ is the integral of $k(T(t) - T_0)$, is an effect of the temperatures and cannot be their cause.

[60] On page 586 of this text there are some sentences on the apparatus of de Saussure, a forerunner of the tools used to measure the solar constant, apparatus made by Pouillet in 1838. At that time there was not much understanding of the electromagnetic waves discovered 40 years later, and Fourier likely believed in some solid ether carrying the light like an elastic wave, and carrying the heat according to Fourier heat conduction theory.

[61] see the paper of 1906 (facsimile in Gerhard Gerlich, Ralf D. Tscheuschner *Falsification Of The Atmospheric CO2 Greenhouse Effects Within The Frame Of Physics* International Journal of Modern Physics B 2009 115 pages, 205 references) where it is said that the disappearance of the carbonic acid would cause a 18.7% increase of the surface radiation to the cosmos and a decrease of the average surface temperature to 288 K $(1 - 0,187)^{1/4} = 273,5$ K. A quick look at figures 6-A to 6-C shows that it is not the surface that radiates to the cosmos, but mostly the top of the water vapour.

[62] see the graph comparing surface radiation absorbed by the air and radiation of the air to the surface in Dr. Ferenc M. Miskolczi *Physics of the planetary greenhouse effect* International conference on global warming, New York, March -4, 2008. The data are from the TIGR (Tiros initial Guess Retrieval) archive.

[63] Rik Wanninkhof, W. R. McGillis *A cubic relationship between CO₂ air sea exchange and wind speed* GRL, 26, n°13 pp

1889-1892 July 1999

[64] James P. Barry, Toby Tyrrell Lina Hansson, Gian-Kasper Plattner Jean-Pierre Gattuso *Atmospheric CO2 targets for ocean acidification perturbation experiments* pp. 53-66 in *Guide to best practices for ocean acidification research and data reporting* Edited by U. Riebesell, V. J. Fabry, L. Hansson and J.-P. Gattuso. 2010, Luxembourg: Publications Office of the European Union

[65] Gates, W. L., J. Boyle, C. Covey, C. Dease, C. Doutriaux, R. Drach, M. Fiorino, P. Gleckler, J. Hnilo, S. Marlais, T. Phillips, G. Potter, B.D. Santer, K.R. Sperber, K. Taylor and D. Williams, **1999**: *An overview of the Atmospheric Model Intercomparison Project (AMIP)*. *Bulletin of the American Meteorological Society*, **80**, 29-55

[66] Bjorn Stevens, Sandrine Bony *What are Climate models missing ?* Science **340**, 1053 (2013)

<http://www.sciencemag.org/content/340/6136/1053.full.html>

[67] see references in <http://www.nipccreport.org/articles/2011/nov/23nov2011a5.html>

K. C. Wang, R. E. Dickinson M. Wild S. Liang *Atmospheric impacts on climatic variability of surface incident solar radiation* Atmos. Chem. Phys., 12, 9581–9592, 2012 www.atmos-chem-phys.net/12/9581/2012/ doi:10.5194/acp-12-9581-2012

Y.-M. Wang, J. L. Lean, and N. R. Sheeley, Jr. *Modeling the sun's magnetic field since 1713* Atmos. Chem. Phys., 12, 9581–9592, 2012

Fangqun Yu and Gan Luo *Effect of solar variations on particle formation and cloud condensation nuclei* Environ. Res. Lett. **9** (2014) 045004 (7 pp) doi:10.1088/1748-9326/9/4/045004

[68] R. Vautard, P. Yiou, G. J. van Oldenborgh *Decline of fog, mist and haze in Europe over the past 30 years* Nature Geoscience Letters vol. 2, Feb. 2009, pp 115-119

[69] Enric Pallé *Decadal variability in the Earth's reflectance as observed by Earthshine*

http://lasp.colorado.edu/sorce/news/2004ScienceMeeting/SORCE%20WORKSHOP%202004/SESSION_4/4_12_Palle.pdf

<http://iloapp.thejll.com/blog/earthshine?ShowFile&doc=1367577059.pdf>

[70] http://bbso.njit.edu/Research/EarthShine/literature/Palle_etal_2004_Science.pdf

[71] See the books of Robert Tisdale <http://bobbisdale.wordpress.com/> for many analyses of the ocean surface temperatures continuously observed by satellites since 1982 and extensive comparisons of model outputs with observations

<http://wattsupwiththat.com/2013/09/25/new-book-by-bob-tisdale-climate-models-fail/>

[72] Koutsoyiannis, D., A. Efstratiadis, N. Mamassis, and A. Christofides, *On the credibility of climate predictions*, *Hydrological Sciences Journal*, 53 (4), 671–684, 2008 <http://itia.ntua.gr/en/byauthor/Koutsoyiannis/0/>



G. G. Anagnostopoulos , D. Koutsoyiannis , A. Christofides , A. Efstratiadis & N. Mamassis (2010) *A comparison of local and aggregated climate model outputs with observed data*, Hydrological Sciences Journal, 55:7, 1094-1110, DOI: 10.1080/ 02626667.2010.513518 and the thesis of G.G. Anagnostopoulos

[73] In the study of non linear self organized totally dissipative systems it's the fluctuations that are the relevant information.

Computing Navier Stokes equations on thousands of nodes may be relevant for short term weather forecast with small meshes but discrete models unstable w.r.t initial conditions cannot be used for long term predictions, as said by IPCC AR3 2001.

[74] Suckling, P.W. and Mitchell, M.D. 2000. *Variation of the Koppen C/D climate boundary in the central United States during the 20th century*. Physical Geography **21**: 38-45. <http://wattsupwiththat.com/2013/01/04/solar-neutrons-and-the-1970s-cooling-period/>

[75] The start of the global warming frenzy can be dated to papers of Manabe (1967) and of St Schneider (1975) *On the carbon dioxide- climate confusion*. Journal of the Atmospheric Sciences, 32, pp. 2060 – 2066 ; four years before the same Schneider (Science, 1971 vol 173, pp. 138-141) was forecasting the imminent glaciation due to the aerosols from the guilty human industry

[76] Nina Golyandina, Anatoly Zhigljavsky *Singular Spectrum Analysis for Time Series* Springer Briefs in Statistics, 2013, 119 pages

[77] Philippe de Larminat *Climate Change: Identifications and projections* ISTE editions London 2014 (139 pages)

available on line <http://iste-editions.fr/products/changement-climatique>

[78] Madala H.R., Ivakhnenko A.G., *Inductive Learning Algorithms for Complex System Modeling*, 1994, CRC Press, ISBN: 0-8493-4438-7., 350 pages http://ruthenia.info/txt/pavlo/mc/madala_ivakhnenko_1994.pdf

[79] http://en.wikipedia.org/wiki/Non-equilibrium_thermodynamics)

Paltridge, G. W. (2001), *A physical basis for a maximum of thermodynamic dissipation of the climate system* Q.J.R. Meteorol. Soc., 127: 305–313. doi: 10.1002/qj.49712757203 /// G. W. Paltridge, “*Stumbling into the mep racket: A historical perspective*,” in *Non-equilibrium Thermodynamics and the Production of Entropy: Life, Earth, and Beyond* (A. Kleidon and R. Lorenz, eds.), ch. 3, Springer Verlag Berlin Heidelberg, 2005 /// Paltridge G. W. *Global dynamics and climate- a system of minimum entropy exchange*. Quart J Royal Meteorol Soc . (1975) 101: 475-484. /// Paltridge G. W. *The steady-state format of the global climate* Quart. J.R. Met. Soc. (1978), 104, pp. 927-945 <http://www.climateaudit.info/pdf/models/paltridge.1978.pdf>

G. W. Paltridge, G. D. Farquhar, and M. Cuntz, “*Maximum entropy production, cloud feedback, and climate change*,” *Geophysical Research Letters*, vol. 34, 2007

<http://chiefio.wordpress.com/2014/06/01/le-chatelier-and-his-principle-vs-the-trouble-with-trenberth/> June 2014 by E.M. Smith

[80] <http://belgotopia.blogs.lalibre.be/archive/2015/03/12/climat-pourquoi-le-giec-doit-etre-demantele-1140970.html>

[Critique épistémologique du Groupe d’experts intergouvernemental sur le climat \(GIEC\)](#), un cours-conférence du Collège Belgique donné par Drieu Godefridi 28 Avril 2015

[81] A prototypal example of scientism is the “*science of the dialectical and historical materialism*” based on the writings of Marx, Engels, Lenin and Stalin; it was supposed to lead to a higher level of mankind and has been put forward to justify the “*dictatorship of the proletariat*” and the mass murders perpetrated by Lenin, Trotsky ... up to Pol Pot and Kim Il Sung.

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And yet it lives on. The answer to that may b found in one word “Yieldco”