POLAR EQUILIBRIUM

An interactive Analysis of the Controlling Global Thermal Forces

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ABSTRACT: *The rapid retraction of the polar ice caps, glaciers fields and global snow depositories, the destruction of the Amazon rain forests, expanding deserts & persistent continental droughts raised the scepter of universal demise. Whereas greenhouse gases and more specifically, carbon dioxide (CO2), have been the name to blame, the pertinent question is whether CO2 is the driving denominator OR whether CO2 is simply a measurement or indicator of much more powerful forces at work. In order to answer the question as to both the driving forces and the pertinence of perceived events, a global heat balance model has been devised as to the interaction of fossil fuel combustion, solar heat gain, radiation loss into deep space as to the polar ice caps and carbon depositories. With emissivity/absorptivity the driving factors in the polar equilibrium model, a 2nd crust formation model has been devised as a corollary as to chilling/heat dissipation at formation of the earth. As a prerequisite, the formation and equilibrium models must act in synergy with consistent loss/gain rates. A consequence of the study is loss/gain emissivity of* ***0.4/0.8,*** *respectively. It is hence being attested that CO2 blanketing is not a material factor in the respective ranges as the power of radiation into deep space (or solar radiation conversely) that is 4th-power driven. Rational interaction between the combustion of hydrocarbon fuel and the depletion of the ice reserves of the world have been demonstrated (the polar equilibrium model). Rapid chilling of the earth subsequent to formation has also been demonstrated via the transient crust formation model. However, a seemingly bizarre quirk (the 1st Harmonic of Formation) transpired 3.5-4B years after formation that fractured the mantle of the earth as a consequence of transient thermal stress concentrations. The latter resulted in the onset of continental drift that spawned an era of intense volcanic activity breaking the stranglehold of the deep freeze that was settling onto the incipient earth.*

Key Words: *CO2, ICE, EQUILIBRIUM, EMISSIVITY & FORMATION*

1. INTRODUCTION

The most compelling question confronting modern society is that of sustaining the global environment in its present form. It is conversely necessary to develop means of quantifying the impact of man-made disturbances as to global resources, environmental transients and cosmic interaction. Although the intense combustion of fossil fuels and wanton destruction of the Amazon forests have increased the atmospheric carbon dioxide concentration to a 400,000 years peak (*Crichton 1*), the earth and associated environment must be seen in the perspective of a slice in an evolutionary process that started billions of years ago when the solar system was spawned via the condensation of interstellar material that itself was the product of a cosmic furnace, producing the elements that we are familiar with, out of seemingly NOTHING. Although the Polar ice caps evolved some 20 million years ago (*Wiki 2*), the underlying ice sheets have been *"advancing and retreating on 40-100,000 year time scale"* via expansion/contraction glaciation cycles (*Wiki 2*). The current ice age started 2.58M years ago & peaked/terminated officially *20-10,000* years ago in accordance with sedimentary dating (*Wiki 2*). See Fig. 1 exposition. We are hence living in the realm of global harmonics comprising a period of 40,000 -100,000 years, driven by a combination of environmental forces and cosmic events inclusive of a slewing magna that sustains continental drift (a survival prerequisite) whilst serving as a gatekeeper to evolution generally and human life specifically via an electromagnetic cloak/shield.

In order to answer the question as to environmental deflagration, we need to separate regressioal trends from special events. Although the ice age may be the consequence of a natural disaster (comet/ caldera/cosmic event) that turned the scales of global equilibrium fundamentally, it was most probably simply the consequence of natural transitional forces associated with the chilling of the earth whereby

"steaming swamps & high density carbon dioxide atmosphere" (the products of mantle formation) rendered the early forms of bacteriological life that rapidly colonized & transformed the carbon dioxide burden into free oxygen, fresh water oceans and *CLEAR SKIES*. By all accounts, *"clear skies"* manifested with the advent of the ***Palaeozoic Era*** (245-570M years ago)*(Dinosaur Timeline 3)* that conversely spawned the embryonic corals/trilobites colonies, fish/shellfish, spiders/reptiles algae swamps, conifers & tree forests. Continental drift/reformation that emerged some 750M years ago (*UCMP 4*) (ditto ***1st Harmonic*** quirk) set the stage for radical environmental change resulting in: (1) the emergence/demise of the dinosaur, (2) formation of the polar ice caps, (3) incipient mammals, (4) the great rivers that dominate the earth (the Amazon/Nile has been dated at 11-100M years ago - *AOL 5*), and (5) salination of the oceans. However, most fundamentally, continental drift/reformation unlocked the necessary ***magna heat*** that thawed the deep freeze at the time and seeded the world with fertilizing chemical compounds.

The inevitable consequence is that in order to sustain the global environment in its present form, we need to determine BOTH the underlying thermodynamics of formation of the shell/mantle/crust of the earth in its present form, as well as the threshold of atmospheric carbon/CO2 in relation to the heat balances that sustain global harmonics. The issue at task hence is (1) to create interactive/transient models the shell/mantle/crust formation of the earth on the one hand, and (2) determine the controlling manmade/natural forces that dominate environmental equilibrium on the other hand.

2. SPREADSHEET CRUST MODEL

In accordance with the prerequisite of rational computation analysis, *TWO* spreadsheet models have been developed as to (1) *POLAR EQUILIBRIUM* (eg the impact of manmade activities as to the deflagration of the polar ice caps), and (2) *CRUST FORMATION* (i.e. the rate of freezing/ solidification of the shell/mantle/crust of the earth as well as consequential, or mean, surface temperature regression). The advent of industrialization and combustion of hydrocarbon fuel through the 20/21st centuries (1900 to 2100AD) serves as the driving denominator of the *Polar equilibrium* model. Solar gain/radiation loss, the Amazon basin, urbanization generally, polar interaction and CO2 particulate density conversely rank as secondary variables. Transient heat conduction with phase-transition conversely conform the basis of the *Crust formation* analysis. A unique (numerical) solution of the Binder Schmidt graphical methodology of the 2nd order Fourier differential analysis for transient heat conduction in a homogeneous material (*Janeke 6*) has been employed in a desktop format (spreadsheet #1) to solve the transitional/non-linear crust formation problem with a boundary shift. Although the *equilibrium* and *crust formation* models are autonomous platforms, the emissivity/absorptivity as to deep space radiation and solar gain are common denominators. It is noteworthy that the threshold of emissivity has been rationally demonstrated in both instances. Of significance however is that in accordance with the *crust formation* model (spreadsheet #2) the surface temperature of the earth dropped rapidly from a hypothetical 6,000F at formation to 450F/1B-years; 200F/2B-years; 90F/3B-years; 30F/4B-years & -6F/4.5B-years. In accordance with the objective of global thermal equilibrium as to the driving combustion/radiation/urbanization forces, corresponding *solar/space* emissivity *threshold* levels of 0.8 and 0.4 respectively, have been determined. Also see *REGRESSION CONVERGENCE* Section #8 as to (1) the power of radiation & (2) mantle/surface equilibrium.

It therefore appears that clear skies that spawned precipitation, rivers, rain forests, snowcaps, glaciers and ultimately the polar ice caps manifested some 2B-years after formation (2.5B BC) when the surface temperature of the earth dropped to 200F (*Janeke 6; ScienceDaily 7*). Early forms of life may conversely have evolved as early as 1B-years after formation of the earth (eg 3.5B-years ago) (*Yahoo/LS 8*) when the mean surface temperature dropped to a relatively cool 450F. However, with (1) consistent black bulb radiation loss, (2) the loss of core heat due to an ever-increasing mantle depth, and (3) depletion of the CO2 shroud that mitigated radiation loss, the onset of the ICE AGE 40M years ago (*PopularMechanics 9*) was an inevitable consequence of thermal regression. Although the parametric data leading to surface chilling may be arguable, the advent of the ice age (supra) serves as a *validating benchmark* (the 1st ice age already hit the world 1B years ago according to *Wikipedia 2*) given that the regression must invariably conform to an inverse asymptotic profile. The impact is simply that rampart ice formation would have doomed life on earth was it not for some extrinsic event (plausibly continental drift/reformation -- *Wikipedia 2*) that released masses of heat and hydrocarbon gases from the innards of the earth via friction, implosion and intense volcanic activity over a number continental drift/reformation cycles associated with various states of transient crust formation.

Although the ***formation/crust*** model leads to a paradox as to global warming, the sin is not so much in human activity (that by all accounts generates necessary heat), but the *WASTE* of natural resources in the process of urbanization and industrialization. CO2 particulate simply serves as a ***measurement*** of the destructivity of the carbon/hydrocarbon heritage of the earth by human driven activity.

3. GLOBAL EQUILIBRIUM MODEL

In order to complete the heat balance loop, it is necessary to develop the perceived global impact of human activity in terms of combustion of hydrocarbon combustion and destruction of the carbon heritage of the earth. Although human activity only became constructively mechanized two hundred years ago with the advent of the steam engine, steel making and urban consumption via the mining of subsurface coal deposits, early civilizations thrived by deforesting as to construction, fuel and agriculture. Great icons of ancient times (e.g. the cedars of Lebanon and great oak forests of the British Isles and Europe) simply disappeared from the scope of the earth. Ditto the ancient Chinese dynasties that turned lush acreage into deserts & silted up entire ecosystems via *"blind reclamation"* (*Springerlink 10*). Of significance however is that we entered the 20th century with a carbon dioxide content of approx ***300ppm*** (*Books 11*) with the present (year 2000) level set at ***350ppm***, with a projected ***8000ppm*** at 2100. Actual oil/hydrocarbon production has been rendered via a diversity of sources (*People 13, Encyclopedia 14*). Global ice cover has been rendered at ***32x10^15*** *Ton* (*USAtoday 15*). Basic dimensional date of the earth has been rendered as ***11^16*** *SF &* ***3.3^7*** *ft* in area/ diameter respectively (*Vendian 16*). The consequence of the ensuing *equilibrium* (spreadsheet #1) heat balance model is the fundamental *solar/space* emissivity premise of ***0.8*** and ***0.4*** in order to orchestrate rational (global) balance of the driving thermodynamic forces. Polar interaction however transpired as a most fundamental element in the global equation.

Three computational sheets have been produced to illustrate underlying polar interaction & benchmark conditions. Table 1 illustrates global trends with *ZERO* polar interaction (Icefactor =***0.0***) which would result in a ***14.7F*** increase in the mean global temperature by 2100. This is obviously a non-event as interaction is inevitable. In event of 50% polar interaction (Table #2) the corresponding global temperature increase would be limited to ***7.3F*** (with a 5% corresponding ice-sheet depletion impact). Table 3 conversely illustrates "100%" polar interaction that would lead to a ZERO increase in global temperatures through 2100, albeit at the cost of 10% of the global ice-sheet reserves. The message is simply although we are seeing immense meltdown phenomena, the global meltdown impact is really *"de minimus"* due to 1) the immense nature of ice deposits, and 2) the fact that the world being rationally chilled-out as a consequence of deflagration of crust formation. Although the world originated as a boiling plasma pot 4.5B years ago, it chilled rapidly due to the powerful black-bulb radiation force that is ***T^4*** driven with consequential chilling to approx ***55F*** 1B years ago (3.5B years into formation) (the advent of the 1st ice age *Wiki 2*) and a projected –8F presently. The issue simply is that the world is spinning in an (hostile) absolute ZERO environment with minimal solar heat. Consideration of a reversed scenario whereby HEAT/greenhouse gases may be an essential denominator as to survival of the world as we know it merits serious consideration.

Although we may conceiveably be living in the realm of global harmonics with a period of 40-100,000 years, we cannot take it for granted that a "*spinning magna*" would continue to suffice as a gatekeeper to human life via the cloak of an electromagnetic shield. Continental drift is by all accounts also coming to an end. Although the polar ice caps may well be a remnant of a previous ice age, it is an essential component to life on earth & must be preserved at all costs. Issue #4 is that the carbon/hydrocarbon heritage of the earth must be reserved as a chemical building block for future generations. Issue #5 is that wind, ocean nuclear & geothermal heat should be the driving denominators for powering urbanization inasmuch as tapping the extrincic sources of power outside the realm of the global envelope.

4. EQUILIBRIUM THRESHOLDS

The following variables have been considered in the equilibrium and formation models:

- Carbon content of the Amazon basin
- Carbon content of global forests generally
- Combustion of fossil fuels as to CO2 emission

- Combustion of fossil fuels as to thermal pollution
- Latent heat content of polar ice caps
- Solar incidence vs. deep space radiation
- Temperature of the magna at formation
- Continental drift/reformation.

5. GLOBAL/QUANTA VARIABLES

The following equilibrium thresholds need to be determined:

- Spherical area of the earth
- Plan/projection area of the earth
- Mass/weight of the atmosphere as is
- Production of coal/oil and natural gas
- Carbon dioxide (CO2) emission rates
- Polar ice mass/weight and trends thereto
- Carbon content of the Amazon/rain forests
- Global forestry carbon content and trends thereto
- Nuclear and alternative/sustainable energy sources.

6. SUMMARY

Although the particulate concentration, trend of emission of CO2, and ancillary greenhouse gasses are alarming, it is essential to understand BOTH the thermodynamics of formation of the shell/mantle/crust of the earth in its present form as well as the driving forces behind both the symbiosis of CO2 equilibrium and polar ice formation. Having developed the necessary EQUILIBRIUM & CRUST FORMATION models, it becomes apparent that CO2 is a consequence of *urbanization* and not the driving function thereto. More specifically, a unique balance has been determined between the equilibrium and crust formation models with an emissivity/absorbtivity level of ***0.8/0.4*** respectively as to space radiation and solar gain. As (1) neither denominators are CO2 sensitive at the slated range, and (2) space radiation is T^4 driven (*Boltzman* radiation equation), “greenhouse” emissions may be relegated as a non-event as to global warming. The perceived retraction of the polar ice caps should also be viewed in GLOBAL cycles rather than isolated events. Destruction of the rain forests generally and hydrocarbon reserves specifically is a more serious issue that is within the realms of human management. The bottom-line, however, is that the core/mantle of the earth has become practically inert with consequential risk of ***chill-out*** of the earth in deep space under prevailing conditions. A symbiosis between human activity and natural forces/reserves is hence an essential protocol to environmental preservation.

7. SEQUEL: 1st HARMONIC of FORMATION

A gradient flux 3.5 B years after formation (that appears to be a unique consequence of rapid chilling of the earth during the initial Billion years), created an ostensible backlash 2.5B years later (Spreadsheet model #2) that most probably induced stellar shear forces into the layered mantle of the earth resulting in plate fractures, subsequent drift of the fractured plates and reformation hundreds of million years later into the world as we know it. The name of the game must have been the ensuing volcanic activity that injected necessary heat and chemical compounds into the atmosphere of the time.

8. REGRESSION CONVERGENCE

In order to understand the impact of CO2 particulate and equilibrium threshold of the earth in its present form, it is necessary to demonstrate the power of radiation into deep space as a perfect/infinite heat sink. Two examples are illustrated, i.e. (1) incremental heat loss/gain as to absolute temperature variances, (2) the immense initial chilling rate of the crust/mantle subsequent to formation, (3) emissivity and absorptivity balances. Table 8.1 illustrates percentage variance of radiation transfer into space with incremental

temperature increases. Table 8.2 and Figs 8.1 and 8.2, respectively, illustrate: (1) the power radiation transfer as a 4th power function, (2) the rate of convergence and (3) the ultimate equilibrium disparity.

Table 8.1

	T-abs	T-ratio	%-Var
0	500	1.00	100.0
1	501	1.00	100.8
2	502	1.00	101.6
3	503	1.01	102.4
4	504	1.01	103.2
5	505	1.01	104.1
6	506	1.01	104.9
7	507	1.01	105.7
8	508	1.02	106.6
9	509	1.02	107.4
10	510	1.02	108.2

Table 8.2

GLOBAL HEAT BALANCE INVERSION

#	T-Abs	Gross rad	E	Heat loss	Solar rad	A	Heat gain
1	6500	-16984870	0.4	-6793948	282	0.8	226
2	5500	-8706820	0.4	-3482728	282	0.8	226
3	4500	-3901745	0.4	-1560698	282	0.8	226
4	3500	-1427845	0.4	-571138	282	0.8	226
5	2500	-371680	0.4	-148672	282	0.8	226
6	1500	-48170	0.4	-19268	282	0.8	226
7	1000	-9515	0.4	-3806	282	0.8	226
8	800	-3897	0.4	-1559	282	0.8	226
9	600	-1233	0.4	-493	282	0.8	226
10	500	-595	0.4	-238	282	0.8	226
	E-Area	5.5E+15	ED	33000000 ft		ER	3.3E+17

Fig 8.1

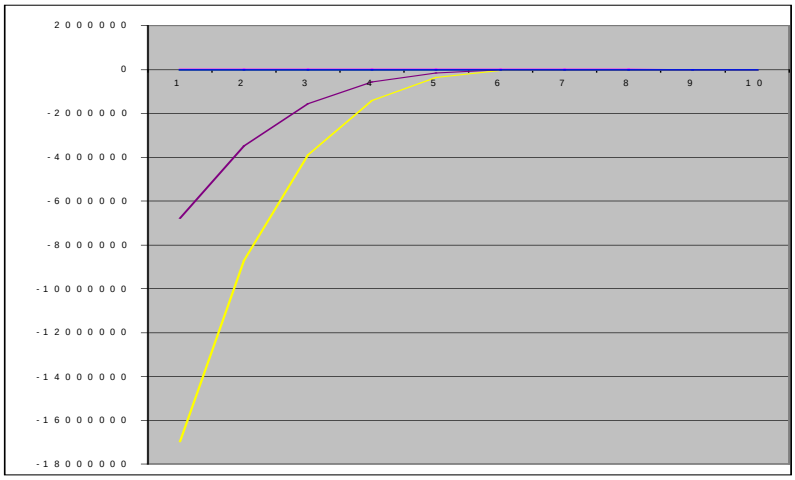
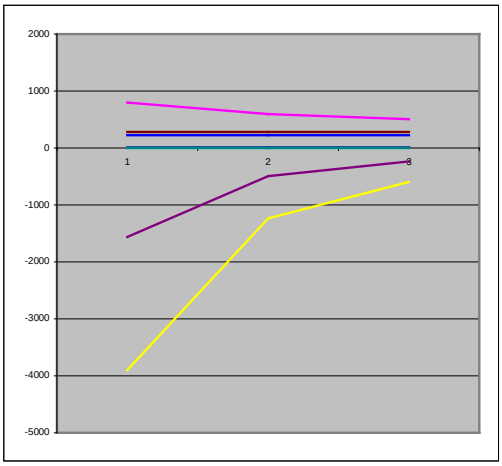


Fig 8.2



Cj/2009-08-13 (updated 08-24)

www.pespes.com
www.polarequilibrium.com

ARTWORK:

1. *Continental Drift*
2. *Global Chilling*
3. *Crust Formation*
4. *1st Harmonic of Formation*

COMPUTATIONAL ANALYSIS:

1. *Equilibrium model (3x)(3p)*
2. *Crust formation model (1x)(4p)*

REFERENCES:

1. Crinchton Thriller State of Fear
http://www.ucsusa.org/global_warming/science_and_impacts/global_warming_contrarians/crichton-thriller-state-of.html#1

Scientists with climate expertise have considered not just the narrow sampling of the scientific literature that Crichton cites but many hundreds of additional papers in order to understand the full complexity of the climate system. Increases in carbon dioxide (CO2) create an overall warming tendency in the atmosphere. Shifts in clouds, water vapor, and the great currents in the ocean and air, however, cause complex responses in which some regions warm more than the average while others warm less than average, or even cool. Furthermore, other human-induced changes on the atmosphere can lead to regional cooling/heating.

2. Ice Age
http://en.wikipedia.org/wiki/Ice_age

*More colloquially, when speaking of the last few thousand years, "the" ice age refers to the most recent colder period (or freezing period) with extensive ice sheets over the North American and Eurasian continents: in this sense, the most recent ice age peaked, in its Last Glacial Maximum about 20,000 years ago. The earliest well-documented ice age, and probably the most severe of the last **1 billion years**, occurred from 850 to 630 million years ago (the Cryogenian period) and may have produced a Snowball Earth in which permanent ice covered the entire globe and was ended by the effects of the accumulation of greenhouse gases such as CO_2 produced by volcanoes. A minor ice age, the Andean-Saharan, occurred from 460 to 430 million years ago, during the Late Ordovician and the Silurian period. There were extensive polar ice caps at intervals from 350 to 260 million years ago, during the Carboniferous and early Permian Periods, associated with the Karoo Ice Age. While an ice sheet on Antarctica began to grow some 20 million years ago, the current ice age is said to have started about 2.58 million years ago. During the late Pliocene the spread of ice sheets in the Northern Hemisphere began. Ice ages can be further divided by location and time; for example, the names Riss (180,000–130,000 years bp) and Würm (70,000–10,000 years bp) refer specifically to glaciation in the Alpine region.*

3. Dinosaur Timeline
http://www.kidcyber.com.au/topics/dinoeras.htm

The first reptiles appeared during the Palaeozoic Era (570 million to 245 million years ago), just before the Mesozoic Era (245 million to 65 million years ago). Each of these eras is divided up into sections called periods.

4. Continental Drift
http://www.ucmp.berkeley.edu/geology/anim1.html

University of California Museum of Paleleontology

5. Amazon River Dated to 11 Million Years
http://news.aol.com/article/amazon-river-11-million-years-old/563934?icid=main|htmlws-main|dl1|link2|http%3A%2F%2Fnews.aol.com%2Farticle%2Famazon-river-11-million-years-old%2F563934

The Amazon, which starts in the Andes and flows easterly into the Atlantic Ocean, originated as a transcontinental river back in the Miocene Epoch between 11.8 million and 11.3 million years ago, and took its present shape about 2.4 million years ago. For comparison, the New River in North America and the Nile in Africa are thought to be several hundred million years old. The reason for this is that rivers are controlled by their source area. Rivers are as old as the mountains in the hinterlands, one could say.

6. Transient Heat Conduction with a Change of Phase (Janeke, Master's Thesis 1967)
www.pespes.com

*An adaptation of the **Binder-Schmidt** (graphical) solid-state transient heat conduction model providing for a **change-of-phase** & rate of transition front travel thereto that was analytically & experimentally verified & programmed in FORTRAN.*

7. Rise Of Oxygen Caused Earth's Earliest Ice Age
http://www.sciencedaily.com/releases/2009/05/090507094218.htm

*Two and a half billion years ago, **before** the Earth's atmosphere contained appreciable oxygen, photosynthetic bacteria gave off oxygen that first likely oxygenated the surface of the ocean, and only later the atmosphere. The first formed oxygen reacted with iron in the oceans, creating iron oxides that settled to the ocean floor in sediments called banded iron-formations - layered deposits of red-brown rock that accumulated in ocean basins around the worldwide. Later, once the iron was used up, oxygen escaped from the oceans and started filling up the atmosphere*

8. Oldest Animal Fossils Found in Lakes, Not Oceans
http://news.yahoo.com/s/livescience/20090727/sc_livescience/oldestanimalfossilsfoundinlakesnotoceans

*For some **3 billion** years single-celled life forms such as bacteria dominated the planet. Then, roughly **600 million** years ago (eg 900M years after formation), the first multi-cellular animals appeared on the scene, diversifying rapidly.*
.

9. Solved: The Mystery Of The First Ice Age
http://www.popularmechanics.com/science/research/1281731.html

*The fossil record, say geologists, makes it perfectly clear that for most of the **4.5 billion years** that the Earth has orbited the sun even the most northern climes have been warm and balmy places. Then, about 40 million years ago something happened to really turn down the thermostat.*

10. The destruction of ancient ecological environment & movement of civilization in China
http://www.springerlink.com/content/p970v35747080166/

*China is one of the ancient civilization countries. Owing to the blind reclamation, the vegetation had been destroyed, causing soil erosion and **desertification**, and making the civilization center move to the Changjiang (Yangtze) River valley from the (Huanghe) Yellow River.*

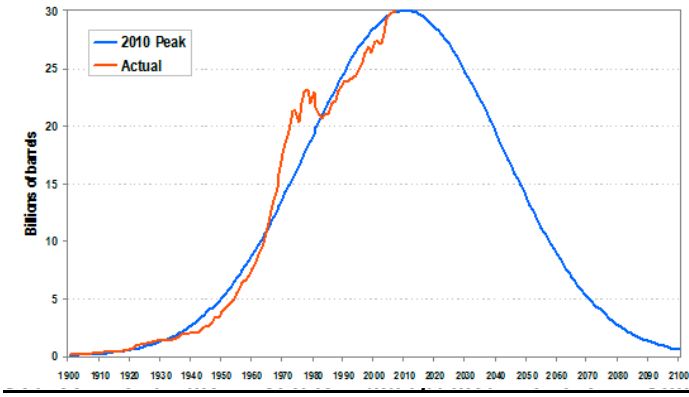
11. Carbon Dioxide and Climate: A Scientific Assessment
http://books.nap.edu/openbook.php?record_id=12181&page=R1

*The CO_2 concentration in the atmosphere has risen from about 314 ppm (parts per million, volume) in 1958 to about 334 ppm in 1979, i.e., an increase of 20 ppm, which is equivalent to 42×10^9 tons of carbon. It has further been estimated that more than **150×10^9** tons of carbon have been released to the atmosphere since the middle of the nineteenth century, at which time the CO_2 concentration in the atmosphere most likely probably **290-300 ppm**.*

12. Accelerated Global Warming and Atmospheric CO2 Emissions: An assessment of the likely increase of CO2 in the atmosphere due to climate change and if the Amazon Rainforest ceases to be a CO2 sink
http://www.hydrogen.co.uk/h2_now/journal/articles/2_global_warming.htm

The C02 content of the atmosphere by 2050 and 2100 could be as follows:
Today's level in say year 2,000=350ppm
Increase at today's rate up to 2050 = 50 years x 3 ppm =150ppm
Increase from 2050 to 2100 assuming 25% growth in fossil fuel use and the Amazon rainforest ceasing to be a C02 sink = 50 years x 6 ppm =300ppm
Therefore total C02 in the atmosphere at 2100 =800ppm

13. World Annual Oil Production (1900-2007) and Peak Oil (2010)
*http://people.hofstra.edu/geotrans/eng/.../world**oil**reservesevol.html*



stical Review of World Energy

With total oil reserves estimated to be around 1,800 to 2,200 billion barrels, about 1,080 billion barrels have been extracted between the beginnings of commercial exploitations in 1860 and 2005. Another 1,500-1,600 billion barrels thus remain to be extracted, of which 1,000 billion barrels are proven reserves, the remaining 500-600 billion barrels consisting of reasonable assumptions. About 50% of all the petroleum consumption took place after 1984 and about 90% of all the petroleum that has ever been consumed was so after 1958. Under such circumstances, most of the remaining oil could be extracted by 2060. However, several nuances have to be brought forward:

14. Coal use levels off (global coal consumption)
http://www.encyclopedia.com/doc/1G1-15150590.htm

After four decades of nearly uninterrupted growth, world use of coal is no longer growing. It fell 1.4 percent during 1990 and 1991, and preliminary data from 1992 show it falling another 0.3 percent, to ***2.18 billion tons*** *(oil equivalent). Economic contraction in Russia and Eastern Europe and a more modest recession elsewhere primarily caused the drop.*

15. Answers to sea level rise locked in ice
http://www.usatoday.com/weather/resources/coldscience/aiceshet.htm

Imagine the 48 states and maybe half of Mexico covered with ice and you have Antarctica. It is a continent of about ***5.4 million square miles****, which makes it about one and a half times as large as the USA's 48 contiguous states. Ice, averaging* ***1.6 miles deep****, covers 97.6 percent of Antarctica, giving it 90 percent of the world's ice and 70 percent of all of the globe's fresh water – in the form of ice.*

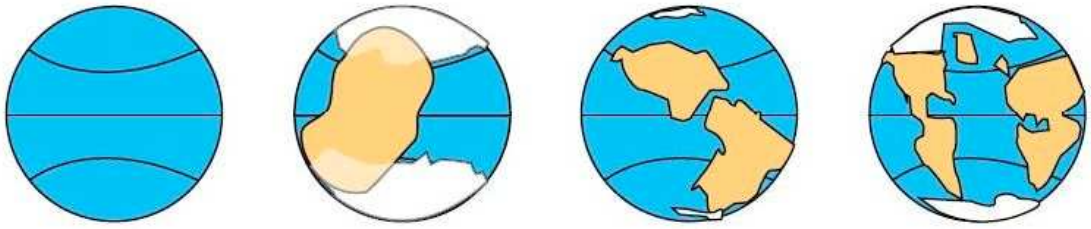
16. The relative size of Earth, Jupiter, Sun 1 : 10 : 100

http://www.vendian.org/envelope/dir1/earth_jupiter_sun.html

The ***surface*** *area of Earth =10^15 SM (11x10^16 SF)*
Diameter *of the earth =10^7 meters (3.3x10^7 ft)*

Addenda:

Spreadsheet model #1 (3p)
Spreadsheet model #2 (4p)
Artwork (1p)



0.0B years
6000F

3.7B years
35F

4.1B years
14F

4.5Byears
-6F