Global Temperature Fact(v4,'09/11/7,19;'10/4/16,'11/5/31)

the prediction equation(EGT)

the easy,but reliable seminar for everybody!!!

- You never rely on any authority ,but you can do it by own comprehensibility !
- caution:In '09/11/3,more accurate EGT solution was found, so see #61(Equation of Global Surface Temperature(correction4)).

Target Facts of seminar

- the emergent fact that unless drastic action, we would be extincted before few decades.
- Without almost ZERO CARBON EMISSION,we could scarecely survibe due to inertia "T rise" which might trigger victious cycle of "T rise by Gas rise".
- Equation of Global Temperature(EGT) make those facts evident,which predict future temperature up and down.
- it's entirely similar to account in {income—outcome}.

surplus for heating up our planet/y

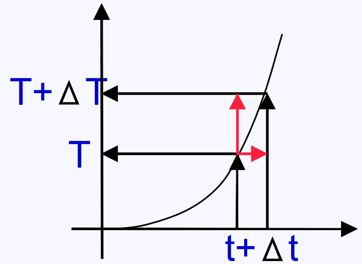
＝{Heat inflow—Heat outflow}/year

bad (T up) good (T down)

Then {CO2&CH4 emit} and {vegtation sink} do great role.

KEY WORDs,etc

- **Mathematical notation and useful formulae.** (Actually you could calculate with a handy calculator)
- a≡b (a equals b due to the definition), a≒b:nearly equal, a≦b:b is larger than a, a/b≡a÷b ; a×b≡ab ; a^m≡multiplying a by m times. π R^2＝circle area of radius R; 4 π R_E^2＝spherical area of earth radius R_E,
- function : T＝T(t) : It's unique causalitical relation with time variable "t" and "T value".
- time(year)derivative of "T"≡ΔT/Δt≡ (T change amount/change sec(or year)time).



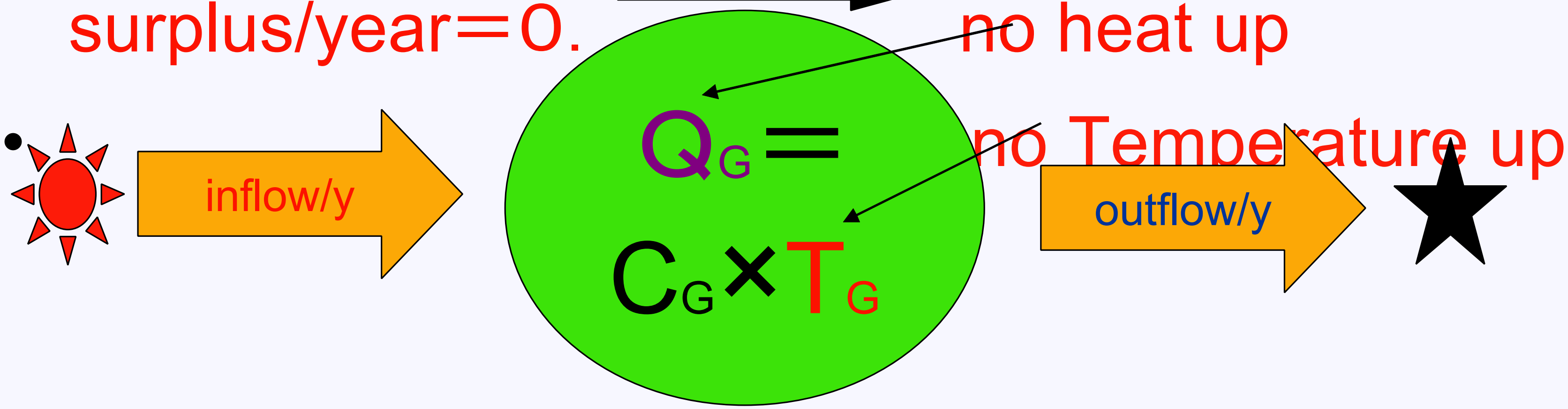
You should not care on caluculation itself(it must be same conclusion by anybody ,if correct),but care on the physical validity and intepretation of equations. -

- ☞:delta : ΔT ≡T(t＋Δt)－T(t). also prefix "δ" indicates small change.
- T≡Temperature(K≡Thermodynamic one、273.1K＝0℃). it is abribated as "T".
- Q≡heat＝energy<Joule≡Watt×second in MKSA(m,kg,sec,ampere) unit >.
- F≡heat flow＝energy through/(unit area x unit time)(=W/m^2·s)).
- C_G≡Global Heat Capacity≡Q_G/T_G≡(dQ_G/dy)/(dT_G/dy).
- Budget : account for {income―outcome＝+surplus,－deficit}/year(or sec).
- Solar ray input(SR)=342W /m^2 ;
- Blackbody Cooling Radiation(CR) from earth of "T_G=287.5K"=σT_G^4=387W /m^2.
- **m=albedo=reflection rate of SR; @=@ppm=CR passing rate into cosmic space,**

- heat amount=Q_G,heatcapacity=C_G,temperatureT_G,
- HEAT＝kinetic energy of moleparticles.
- Those are violent,if temperature went to higher.
- **Conservation low of Energy**

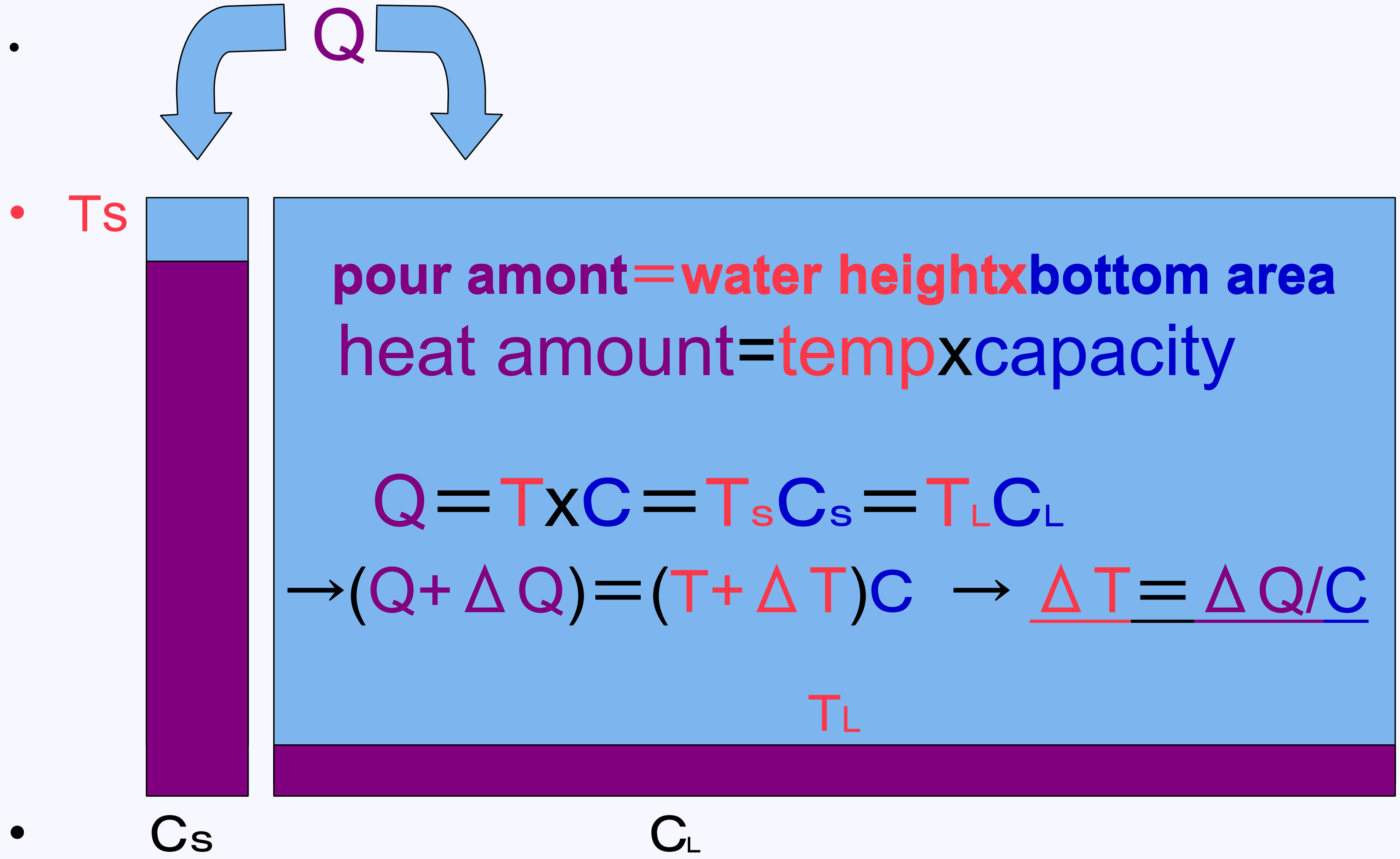
- HEAT BUDGET: inflow/y－outflow/y＝0.

surplus/year＝0.



HEAT CAPACITY

Imagine cups **with different bottom area (C_S,C_L)** and pouring same amount of **water(Q).**



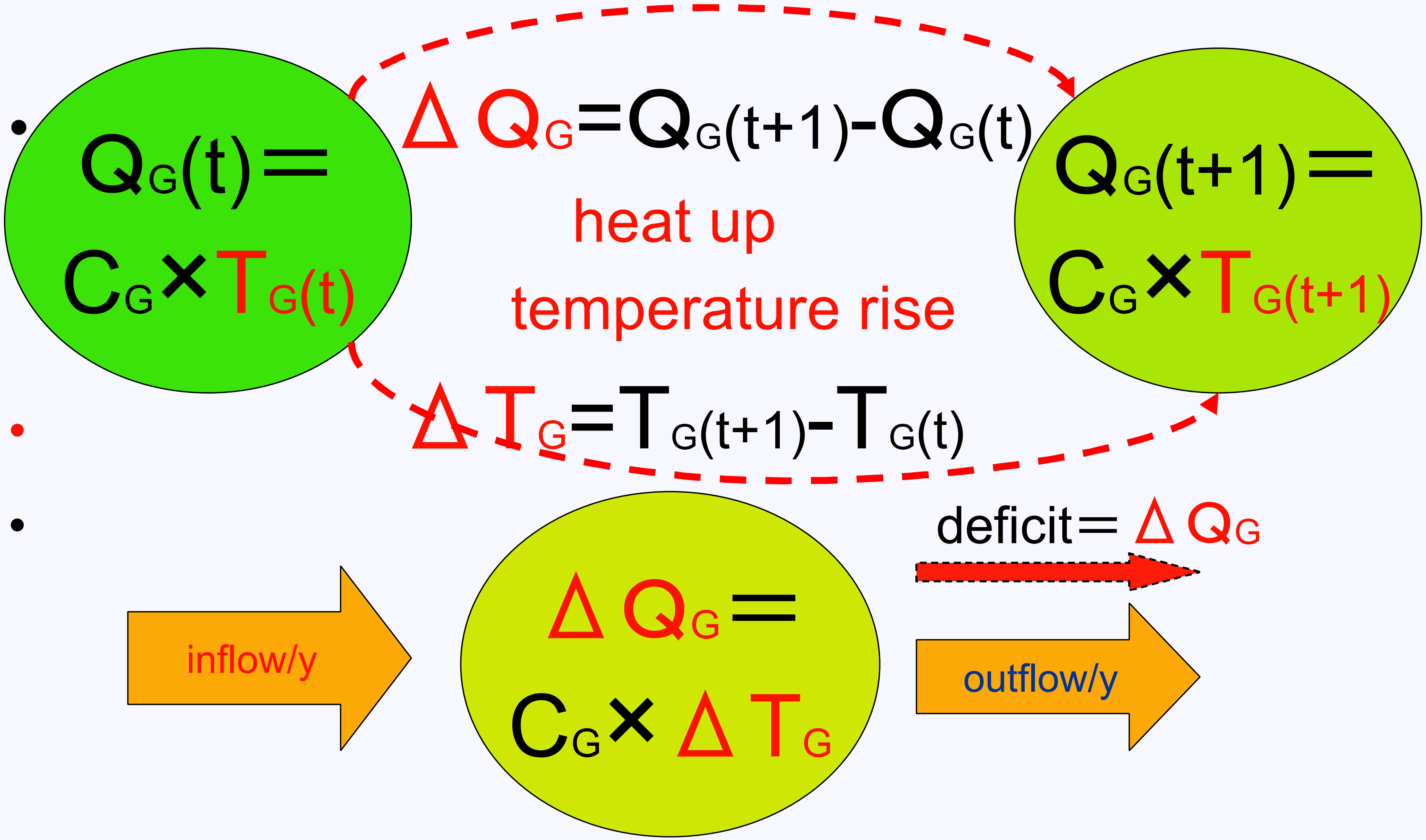
pour amont=water heightxbottom area

heat amount=tempxcapacity

$$Q = T \times C = T_S C_S = T_L C_L$$

$$\rightarrow (Q + \Delta Q) = (T + \Delta T) C \quad \rightarrow \quad \underline{\Delta T = \Delta Q / C}$$

- HEAT BUDGET: inflow/y—outflow/y=surplus/year.



Global Heat Capacity ≡ C_G.

heat(energy) amount for 1℃ temperature rise of globe is

equivalent to **global ocean of depth nealy 1000m depth** for

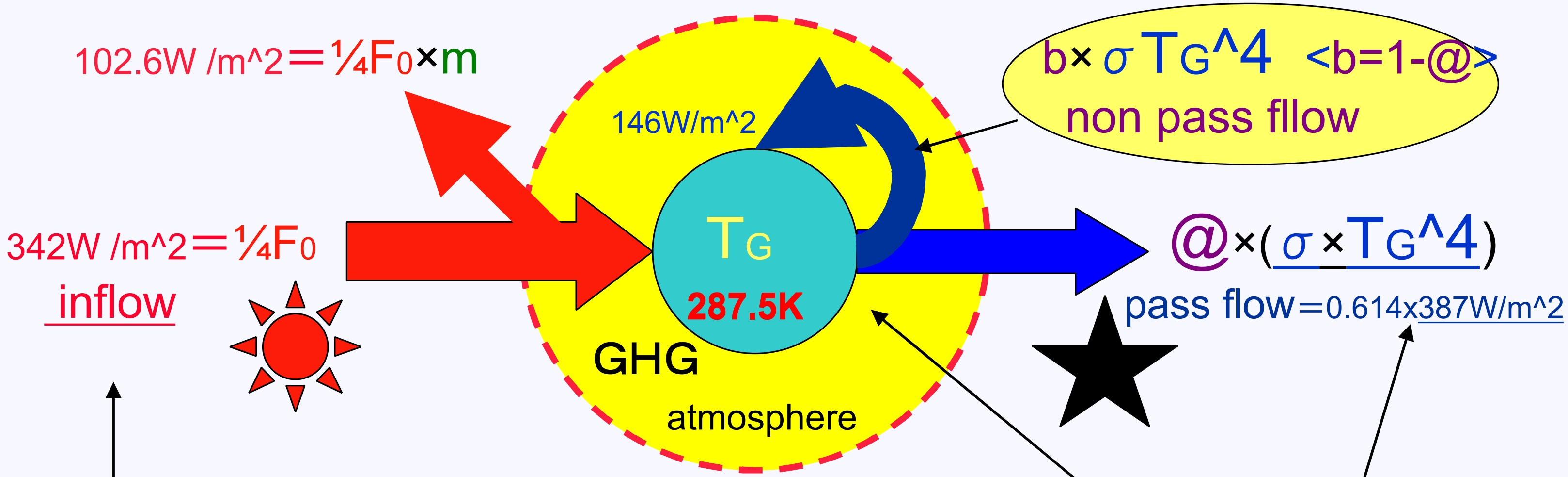
heat "transfer" with solar ray(input) and atmosphere to cosmic space(output).

- specific heat of sea water＝3.85KJ/Kg＝energy for 1℃ celius temperature rise of 1kg＝1KWatt×3.85sec electrical power. (imagine a heat of 100W light bulb).
- global ocean area(361.3x10^12m^2)×depth(1000m)×density(1040Kg/m^3) ＝**heat exchanging ocean weight**(3.76x10^20kg).
- **ocean weight**x**the specific heat**＝**Global Heat Capacity**≡C_G.
  C_G＝0cean weight(3.76x10^20kg)×3.85KJ/Kg＝1.44×10^24J/K.

- Effective dynamic heat capacity C_G derived by annual relation: $\Delta Q_G = C_G \times \Delta T_G$.
- $C_G = \Delta Q_G$(global year input=radiative force(p9))/ ΔT_G (global year T rise=0.02K/y)
- =global area×(year time=3600sx24x365)x(surplus heat input/unit area&time)/(0.02K/y)
- ＝(4πRE^2)×(3.154x10^7s)x(1.6W/s.m^2)/(0.02K/y)＝1.29×10^24J/K.
- R_E=6.38x10^6m；(previous shown value(NASA)=2.7×10^23J/K may be seasonal exchanging heat).
- NOTE: atmospheric heat capa is less than 1/1000 of that of ocean.It's almost ≒0.
- The conclusion 1000m depth is not favorable,because it means rapid heat transfer into sea flor.

Heat Budget EQN(≡HBE) for Earth at top of atmosphere.

blackbody radiation constant: σ=5.67x10^-8 W/m^2.K^4 ; earth radius : R_E=6.38x10^6m



solar ray input×(1－albedo<m=0.3>)＝ <HBE>
(pass rate into space<@=0.614>)×cool radiation output.

(πR_E^2)×F_0×(1—m)＝(4πR_E^2)×@×(σT_G^4). NOTE:{m,@} are rathter uncertain.

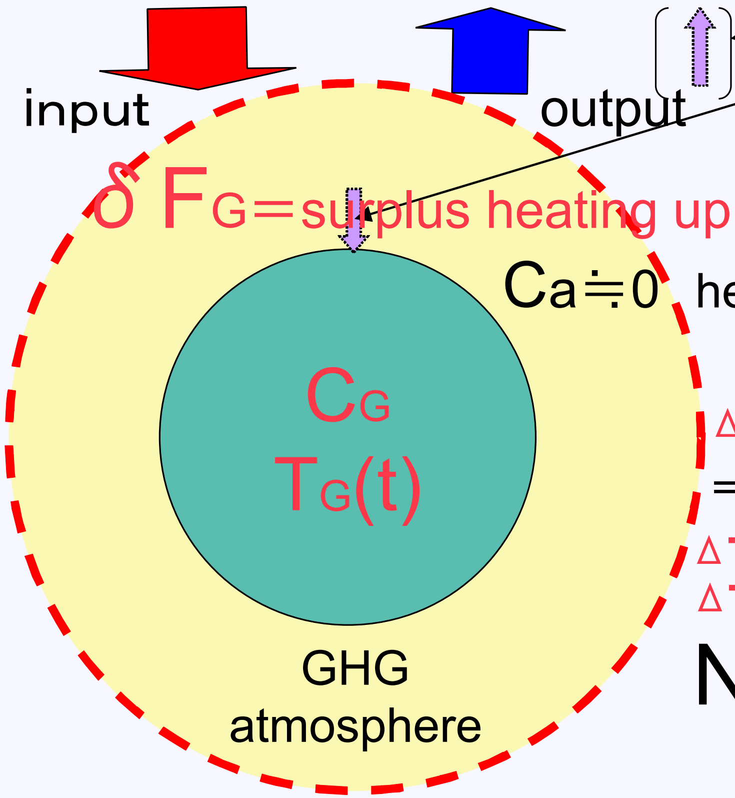
input＝output. <before 1750 prior-industrial revolution>.

input＞output. <Now-from industrial revolution>.

Surplus heat input＝Radiative forcing

(input－output)＝deficit (in the budget) increasing global temperature

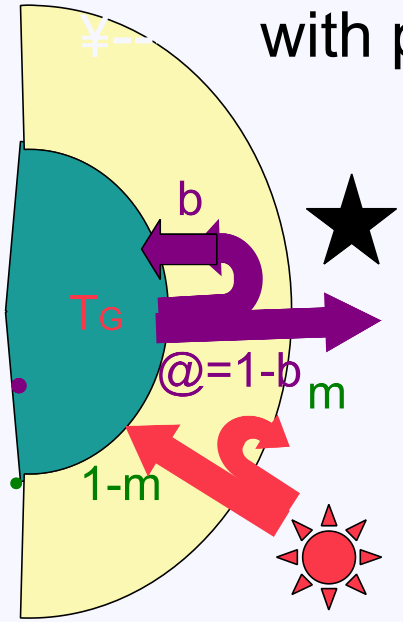
- 342W /m^2 342W － 1.6W/m^2(1.6/342＝1/203 deficit)
- $F_0/4$ $F_0/4 - \delta F_0$(heat deficit/unit time.unit area)



- input output into where does it go ?!→ocean!
- δF_G＝surplus heating up global temperature $T_G(t)$ with C_G.
- $C_a \fallingdotseq 0$ heat capacity of atmosphere $C_a < C_G/1000$.
- ΔF_G＝1.6W/m^2x(global area)xyear time
- ＝4πx(6.38X10^6m)^2x3600x24x365sx1.6W/m^2
- ΔT=temperature rise/year＝(suplus heat/y)/C_G
- ΔT=(2.58x10^22J)/ (1.29x10^24J/K)= 0.02K/y
- Note $\delta F_0 = \delta F_G$.

Albedo & GHG(heat trap gas)

- solar ray(SR) is visible, cooling radiation(CR) is infrared ray. CR is **black body radiation,**output and input $= \sigma T_G{}^{\wedge}4$.
- Albedo is a mirro of reflecting **SR** input. ice & snow surface layer(m=0.9), clouds(m=0.9),ocean(m=0.1).
- ***GHG**(Green House Gas)can pass **CR** from C_G of T_G with probability mesure(@ppm) @(0.61)＝1-b(0.39)



net SR input－net CR output＝ δF_0. (at top of atmosphere)

albedo(=m)＝net SR input/SR input.
larger "m" make T_G down

@ppm(=@)＝net CR output/CR output.
larger "@" make T_G down or
larger "b=1-@ =heat trapp rate" make T_G up!!.

Temperature Prediction Equation

surplus heat flow at top of atmosphere ＝ surplus heat flow at bottom of atmosphere.

- $\delta F_0 \equiv$ surplus heat flow at top of atmosphere ＝ net SR input － net CR output
  ＝$(F_0/4)x(1\text{-}m(t)) - @(t)(\sigma T_G(t)\text{^}4) \equiv F_m - @(t)(\sigma T_G(t)\text{^}4)$.   <$F_m \equiv (F_0/4)(1\text{-}m(t))$>
- $\delta F_0 = \delta F_G \equiv (F_0/4)x(1\text{-}m(t)) + (1\text{-}@(t))(\sigma T_G(t)\text{^}4) - (\sigma T_G(t)\text{^}4)$.

- net C_G input ＝ net SR input ＋ **backward CR input**.
- net C_G output ＝ $\sigma T_G(t)\text{^}4$.   <<CR = blackbody cooling radiation >>

  at top of terrestrial surface(＝atomosphere bottom) with temperature $T_G(t)$.

- $\delta F_0 = \sigma @(t)[(F_0/4\sigma)[1\text{-}m(t)]/@(t) - T_G(t)\text{^}4] \equiv \sigma @(t)[T_A(t)\text{^}4 - T_G(t)\text{^}4]$.
- $(F_0/4\sigma)(1\text{-}m(t))/@(t) \equiv T_A(t)\text{^}4$. : virtual "balance" temp $T_A(t)$ at atmosphere bottom :
- surplus heat flow into C_G/(unit time) : $\delta F_G = 4\pi R_E\text{^}2 \sigma @(t)[T_A(t)\text{^}4 - T_G(t)\text{^}4]$.

  (T rise/unit time**) x Global heat-capa** $\equiv C_G(\Delta T_G/\Delta t)$ ＝(**surplus heat input**/unit time.global area**)**

- **EGT eqn** : $C_G[dT_G(t)/dt] = (4\pi R_E\text{^}2)\,\delta F_G = (4\pi R_E\text{^}2)\,\sigma @(t)[T_A(t)\text{^}4 - T_G(t)\text{^}4]$.

  $C_G[dT_G(t)/dt] = (4\pi R_E\text{^}2)[F_m - \sigma @(t) T_G(t)\text{^}4]$.

  C_G x (T_G change/unit time)＝(global surface)x[heat flow/(unit area x unit time)] .

  Once {m(t),@(t)} determined $T_A(t)$ by us mankind,future $T_G(t)$ could be predicted.

geo-physical constants with EGT

unfortunately,there are several uncertainties in this report.

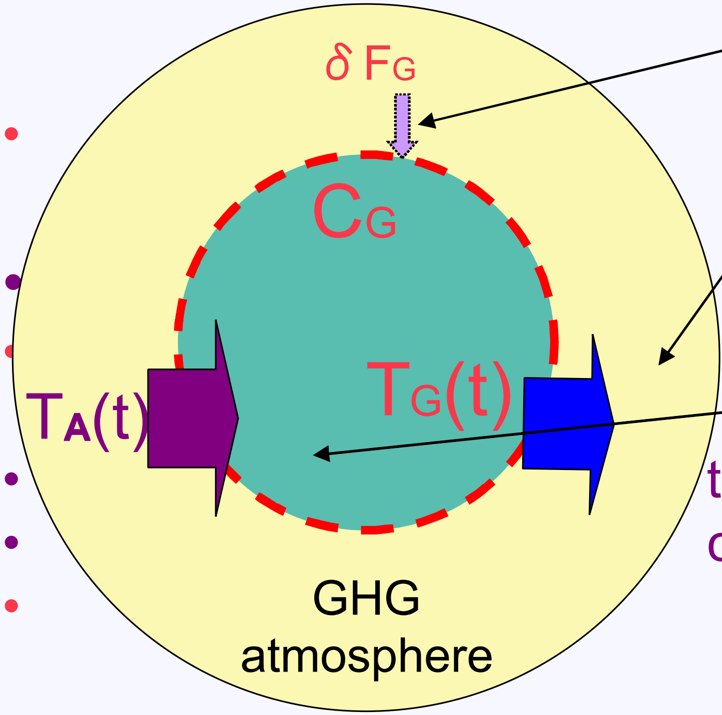
- R_E=6.38x10^6m: earth radius.<S_E=4πR_E^2=5.115x10^14m^2: earth surface>.
- F_0/4＝(1366W/m^2)/4＝342 W/m^2＝solar ray input energy/unit area,unit time.
- δF_0＝1.6W/m^2(IPCC) .surplus heat flow at top of atmosphere(radiative forcing)
- σ=5.67x10^-8 W/m^2.K^4.(Stefan Boltzman constant for blackbody radiation).
- T_G(t=2008)＝287.5K?. <0℃=273.1K(thermodynamic temperature)>.
- σT_G(t)^4＝5.67x10^-8x(287.5)^4＝387W/m^2.(Cooling Radiation from globe)
- m(t)＝albedo=0.3. ?, →δF_0＝(F_0/4)(1-m(t))－@(t)(σT_G(t)^4)
- @(t)＝[(F_0/4)(1-m(t))－δF_0]/(σT_G(t)^4)＝0.614.? (＝@ppm)
- ΔT_G/Δy(＝dT_G/dy)＝global temperature rise/year＝0.02～0.04K/y?.
- C_G＝(4πR_E^2)×(3600x24x365s)x(1.6W/s.m^2)/(0.02K/y?)＝1.29×10^24J/K.？.
  the Global Heat Capacity＝energy amont for global 1℃ temperature rise.
-
- $K_{G/t}$≡(4πR_E^2)σ@(t)/C_G＝1.38x10^-17/s.K^3.?
- $K_{G/y}$≡(3600x24x365s)x(4πR_E^2)σ@(t)/C_G＝4.35x10^-10/y.K^3.?
- note:Watt≡Joule/second,so unit time in physics is by second,however,
  geo-physics,time is mesured by 1year＝3600sx24x365.

Interpretaion of EGT at terrestrial surface.

(input－output)＝surplus (in the budget) increasing global temperature

δF_G＝surplus flow heating up global temperature $T_G(t)$ with C_G.

- C_G x($\Delta T_G/\Delta t$)＝C_G (dT_G/dt)＝$4\pi R_E$^2 δF_G(heat surplus/unit time) .
  ＝global heat capax(T increase/unit time)＝$4\pi R_E$^2.σ@(t){T_A(t)^4)－T_G(t)^4}.
  (F_0/4σ)[1-m(t)] +[1-@(t)] T_G(t)^4－ T_G(t)^4



C_G black body radiation＝σT_G(t)^4.

<<balance temp of atmosphere>>

(F_0/4)[1-m(t)] /@(t)]≡σT_A(t)^4

the man-made factors{ albdo,@ppm}.

concentration of GHG{CO_2,CH_4,..}

EGT Prediction on

Preceeding Temperature $T_A(t)$ with constant {m,a}.

- $[dT_G(t)/dt]=(4\pi R_E{}^2\sigma @(t)/C_G)[T_A(t)^4-T_G(t)^4]\equiv K_G[T_A(t)^4-T_G(t)^4]$.
- $T_A(t)=\{[dT_G(t)/dt]/K_G+T_G(t)^4\}^{(1/4)}=$ **288.0K±**..... .
  [current "T" rise rate] <current "T">
- $K_G\equiv(4\pi R_E{}^2\sigma @(t)/C_G)=4.35\times10^{-10}/(K^3.y)$.$K_G/y\equiv K_G/t\times3600\times24\times365=4.35\times10^{-10}/K^3y$
- $T_A(t)\equiv\{(F_0/4\sigma)[1-m(t)]/@(t)\}^{(1/4)}=$ **288.0K±**..... .
  current albedo current @ppm
- If $T_A(t)=T_G(t)$,then nothing "T" rise($dT_G(t)/dt=0$) : equilibrium final "T".
- Hence,now $T_G(t)$ is increasing toward preceeding $T_A(t)$ which is a function of current {m(t)=0.3?,,@(t)=0.614?} : <$F_0=1366W/m^2$, $\sigma=5.67\times10^{-8}W/m^2K^4$>
- Now prediction on $T_A(t=2008)=$ **288.0K±**..... with $T_G(t=2008)=$ **287.5K**
- $T_A(t)=[\delta F_0/<@(t)\sigma>+T_G(t)^4]^{1/4}=[1.6/0.614\times5.67\times10^{-8}+287.5^4]^{1/4}=288.0K$.
- ☞ : $0.02K/y\leqq dT_G/dt\leqq0.04K/y$. Temperature rise/year are rather uncertain by each data.

The approximated solution $T_G(t)$ with @(t) of the ZERO EMISSION @ppm.

- policy variable:@(t)≡@ppm(passing probabirity of CR into cosmic space)
- fiscal(man made＋natural)emitt and (oceans＋land)sink by photosyntheis.
- ＋man made emission＝7.5(8.5)PgC/y P=10^15. C is carbon standard。
- ＋natural emission ＝1.5PgC/y. For example)
- —Oceans sinks ＝2.3PgC/y CH_4＝16g,but C＝12g.
- —Land sinks ＝2.6PgC/y CO_2＝44g,but C＝12g.
- ＋atmospheric accuumulation＝4.2PgC/y＝+1.9ppm/y
- http://www.globalcarbonproject.org/carbonbudget/07/files/GCP_CarbonBudget_2007.pdf
- Max CO_2 sink /year of ZERO EMISSION＝(2.6+2.3－1.5)＝3.4GtC/y＝1.5ppm/y.
  T_G(20xx)＝288.0K:EGT orienting equilibrium temperature with fixed 385ppm.
  T_G(1750)＝286.7K(280ppm).→T_G(20xx)＝288K(385ppm).→(385-280)/1.5＝70years.
- T_G(2008)＝287.5K.<<current global temperature、0℃≡273.1K>>.
- @(t)(policy value)＝0.613＋0.004(1.5Y/105)＝0.613＋Y∗5.7143x10^(-4).
- warning:above value is a coarse linear estimation on @(t) by CO_2 concentration.
  Deriving @(t)(policy value) is discussed in following page.
- If (1.5ppm) were not sufficient,we must do global hudge forestization !!!.
- ZERO EMISSION ?!.It's a serious possible simulation waring us.

Deriving Policy Variable=@(t).

@ is probability of outgoing CR through GHG atmosphere into cosmic space.

- (1) $\delta F_0 \equiv (F_0/4)x(1-m(t)) - @(t)(\sigma T_G(t)^4) =$ net SR input — net CR output
  $\equiv$ surplus heat flow at top(and bottom) of atmosphere.
- (2)data: $T_G(2008)=287.5$, $T_G(1750)=286.7$, $\delta F_0 \equiv 1.6W/sm^2$, $m(2008)=0.3?$.
- (3) $@(t=2008) = \{(F_0/4)x(1-m(t)) - \delta F_0\}/(\sigma T_G(t)^4) = 0.613$. ←<m(t=2008)=0.3?>.

- (4)CO2 radiative forcing: $\Delta F \fallingdotseq 5.35x\ln(C/C_0)$............IPCC(1990) and Myhre et al.

It's a global surplus heat change= δF due to CO2 concentation change $\{C_0(1750) \rightarrow C(2008)\}$.

$\Delta @383W = \Delta F \fallingdotseq 5.35x\ln(C/C_0)$. → $\Delta @ \fallingdotseq 5.35x\ln(280ppm/385ppm)/383W \fallingdotseq -0.0044$.

$@(2008) = 0.613$、$@(1750) = @(2008) - \Delta @ =$ **0.617.**

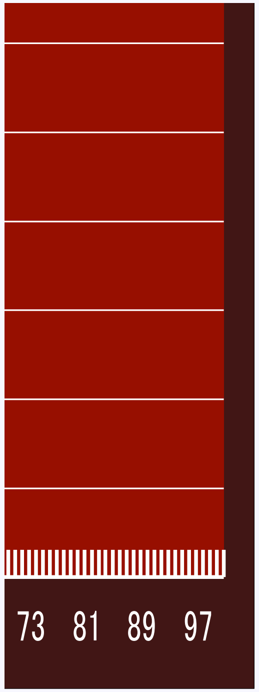
- (5) $\Delta F = \delta F_0(2008) - \delta F_0(1750) = \{(F_0/4)x(1-m(t+\Delta t)) - @(t+\Delta t)(\sigma T_G(t+\Delta t)^4)\}$
  $- \{(F_0/4)x(1-m(t)) \quad - @(t)(\sigma T_G(t)^4)\}$

$= -\Delta m(F_0/4) - \langle @(t+\Delta t) - @(t) \rangle (\sigma T_G(t)^4)\} - @(t+\Delta t))\sigma \langle T_G(t+\Delta t)^4) - T_G(t)^4) \rangle$.

=383 W

- $\delta F = 1.7W = -\Delta$**m**$342W - \Delta$**@383W** $- @(t+\Delta t)4.29W = -342x(0.7 - 0.708) + 1.6W - 2.6W$.
- (6)albedo at Industrial revolution :m(1750)≒**0.29?.**
- (7)policy variable: $@(y) = 0.613 + 0.004[1.5y/(385-280)]$.<linear approximation>

73
82
91
100



73
81
89
97

☞:note on above solution.

- $dT_G(y)/dy = K_G[F_m - @(y)T_G(y)^4]$.
- $K_G \equiv (3600 \times 24 \times 365) \times (4\pi R_E^2 \times \sigma / C_G)$.<the numerical term is due to **sec** to **year** conversion>
- By any handy calculation,above equation will not be solved unless some **approximation**.
- 1st assumption is considering $F_m \equiv (F_0/4)[1-m(t)]$ being constant.
- 2nd assumption is linear approximation on $@(y) = 0.613 + y6.0 \times 10^{(-5)}$.
  {@(385ppm;2008)=0.613,@(280ppm;1750)=0.617,
  then @(y) is linear line from {0.613 to 0.617} of 100ppm change,so a year step increase of @ is by(0.617-0.613) [(1.5ppm/year)/105ppm].
- Solving algorithm(step by step integration method): $y \equiv 0$.
- $T_G(y+\Delta y) = T_G(y) + \Delta y(dT_G(y)/dy) = T_G(y) + \Delta y K_G[F_m - @(y)T_G(y)^4]$.
  $T_G(y+2\Delta y) = T_G(y+\Delta y) + \Delta y K_G[F_m - @(y+\Delta y)T_G(y+\Delta y)^4]$.
  -
  $T_G(y+n)\Delta y) = \ldots\ldots\ldots\ldots\ldots\ldots$
  .
  $T_G(y+(n+1)\Delta y) = T_G(y+n)\Delta y) + \Delta y K_G[F_m - @(y+n\Delta y)T_G(y+n\Delta y)^4]$.
- Caution that max 0.3℃ rise of T_G is not assuring our safety !.Then Arctic "T" rise would be more than three times,which could not prevent full ice diminishing.Then the methan catastrophe possibility never could be neglected.
- A heat flows from higher "T" into lower "T".Hence surplus heat of globe is entirely oriented tonorth regeon,under where dangerous bio-geochemical are reserved.

T_G rise could be stopped,but not down for 30years Even by ZERO EMISSION.

- Our most serious concern is

  the inertia temperature rise ≡□T(≒0.3±0.1℃).

- Because,the temperature rise has possibility to cause more natural(CH3,CO2) emission in **north regoen**.....
- Arctic ice would be vanished in dangerous current momentum,unless we do a drastic couteraction<closing hot sea water gate at Bering strait>.
- It is a most fatal problem that,in Arctic sea flor,Hudge Methan(Clathrate) Eruption by solar ray direct heat input on those could not be stopped uless the counteraction.
- Our final relief would be a more time delay of heat transfer into the sea flor.
- Once those were triggered,T_G would rise more than 6℃ where none could be alive .
- A hopelss is conclusion by not wise.Author still believe a possibility of relief

  if we could be united in actions with a truth.

- **REFERENCE:**
  ⑴ Evolution equation of Global surface Temperature(EGT)with RF.
  http;//www.geocities.jp/sqkh5981g/EGT.pdf
- ⑵RADIATIVE FORCING(the general formulation and interpretation)
  http://www.geocities.jp/sqkh5981g/BP.html
- ⑶Changes in Atmospheric Constituents and in Radiative Forcing
  http://www.ipcc.ch/pdf/assessment-report/ar4/wg1/ar4-wg1-chapter2.pdf
- ⑷Risk of abrupt or irreversible changes Anthropogenic warming could lead to **some impacts that are abrupt or irreversible,** depending upon the rate and magnitude of the climate change. {p53}.
  http://www.ipcc.ch/pdf/assessment-report/ar4/syr/ar4_syr.pdf
- ⑸"No one can say right now whether that will take years, decades or hundreds of years," she said. But onecannot rule out sudden methane emissions. http://www.spiegel.de/international/world/0,1518,547976,00.html
- ⑹http://cdf.u-3mrs.fr/~henry/presentations/hydrates_paris6.pdf
- ⑺What will climate change do to our planet? :This is our future - famous cities are submerged, a third of the world is desert, **the rest struggling for food and fresh water**.
  http://www.timesonline.co.uk/tol/news/science/article1480669.ece
- ⑻Prediction report of ice cover diminishing in 2013 in Arctic.http://www.beyondzeroemissions.org/2008/03/24/Dr-Wieslaw-Maslowski-ice-freesummer-arctic-2013-or-sooner-loss-of-reflectivity-non-linear
  Animation of Arctic sea ice concentration(Jan 2003 to date; AVI format, ~ 20 MB)
  http://www.iup.uni-bremen.de:8084/amsr/amsre.html
- ⑼Unexpected rise in global methane levels.http://www.nature.com/climate/2009/0904/full/climate.2009.24.html
- ⑽http://www.geocities.jp/sqkh5981g/FAQ-QL-MC-catastrophe.pdf
- ⑾Jumping jack flash by the Rolling Stones,1968
- ⑿Save the children by Marving Gaye in album"what's going on".1971, What's shame !,everbody dig it !
- ⒀"Taward flame" by Scriabin in 1914
- ⒁http://www.geocities.jp/sqkh5981g/**OPERATION-GLOBAL-RAMADAN**.pdf
  http://www.yamanashi-nponet.jp/~desert/inochi.html

- ⒂ 0 dimensional global climate model: http://www.wit.pref.chiba.jp/_kikaku/kouza/2005/youshi/HP0602/060225yamaji1pdf
- ⒃ HEAT CAPACITY, TIME CONSTANT, AND SENSITIVITY OF EARTH'SCLIMATE SYSTEM by Stephen E. Schwartz :http://www.ecd.bnl.gov/steve/pubs/HeatCapacity.pdf
- ⒄Abrupt Climate Change(IMPACTS project task) : http://esd.lbl.gov/research/projects/abrupt_climate_change/impacts/tasks.html#
- non-experts oriented site:
- ⒅Jucelino Nobrega da Luz:http://www.jucelinodaluz.com.br/
- ⒆Alex Jones,Prison Planet.com:http://www.prisonplanet.com/
- ⒇Planet extinction.com: http://www.planetextinction.com/planet_extinction_carbon_sink_reversal.htm
-
- other expert oriented sites:
- http://mixing.coas.oregonstate.edu/papers/turbulence_physics.pdf
  http://fram.minato.s.kaiyodai.ac.jp/Arctic/
  http://www.realclimate.org/
- Methane Clathrate:Encyclopedia: http://en.allexperts.com/e/m/me/methane_clathrate.htm

summary note:

- Frankly to tell,it is difficult to get certain kind of geo-scientifical data for not a proffesional.Now author have not yet {(1)(2)(3)(4)} independent **verification by dual or more sources.**

$C_G[dT_G(t)/dt] = 4\pi R_E{}^{\wedge}2\,\sigma\,@(t)[T_A(t)^{\wedge}4 - T_G(t)^{\wedge}4] = 4\pi R_E{}^{\wedge}2\,\delta F_0.$
$dT_G(t)/dt = (4\pi R_E{}^{\wedge}2\,\sigma / C_G)[(F_0/4\sigma)[1-m(t)] - @(t)T_G(t)^{\wedge}4].$
$T_A(t) \equiv \{(F_0/4\sigma)[1-m(t)]/@(t)\}^{\wedge}(1/4).$.<man made temperature>

- (1)global net radiative forcing≡surplus heat input: $\delta F_0 \fallingdotseq 1.6W/m^{\wedge}2$(IPCC).

☞ : if δF_0 was different, $C_G = \{(4\pi R_E{}^{\wedge}2 x3600x24x365x\delta F_0.)/[dT_G(t)/dt]\}$ also be changed.
If δF_0 and C_G were larger, heat penetration into ocean became deeper and ....

(2)global temperature trend: $[dT_G(t)/dt] \fallingdotseq 0.02K/y \sim 0.04K/y.$

- (3)global albedo : $m(t) \fallingdotseq 0.3$. ? <reflectivity of solar ray input>

(4)global @ppm : $@(t) \fallingdotseq 0.613$. ? <pass probability of Cooling Radiation>
*theory on @ppm:http://www.geocities.jp/sqkh5981g/RADIATION-FORCE.pdf

- Especially note on the two factors{m(t),@(t)} in yellow box,which would determine our destiny. motoji-suzuki@key.ocn.ne.jp