Global Surface Temperature(GST)Fluctuation Analysis. 2016/10/8,19,11/3

GST is the most decisive climate variable in the debate,then author search **the cause of fluctuation** from the average value.He observed dominant the **Gaussian pdf** with adding small periodic time ,but rather strong Insolation variation= $\delta I_0(t)$. Observed rapid and larger ±0.25℃/y swing could not be caused by nothing,but **larger fluctuation** in insolation input and cooling radiation output each with that of cloud albedo & humidity permeability.Note heat input into earth is ruled by account balance between solar input with clouds albedo=a(t) <solar ray reflection rate> and Cooling Radiation(CR)output with @(t)<permeability>.
@(t) is CR passing rate into space,which is ruled by GHG concentration.

$C(dT(t)/dt) = \delta F(t) = <1-a(t)> I_0(t) - @(t)\,\sigma\, T(t)^4$.

Global heat capacity × earth temperature rise/year = radiative forcing(= debt heat)
= (solar input − cooling radiation(CR)output)/y。 This is account principle for heat budget.

＊a(t) = albedo of solar reflection rate(=0.3?). ＊@(t) = CR passing rate to space(permeability)
＊$I_0(t) = 342 W/m^2$. solar heat with variation ＊ $\sigma = 5.67 \times 10^{-8} W/m^2K^4$. S&B constant
＊T = GST = Global Surface Temperature(=288K?).
http://www.777true.net/Accounting-principle-verify-reconstruction-the-Past-Climate-Records.pdf
＊ $\delta F(t) = <1-a(t)> I_0 - @(t)\,\sigma\, T^4 = 342 W/m^2 \times 0.7 - 0.618 \times 5.67 \times 10^{-8} (288)^4 = 1.7 W/m^2$.
☞:@(t) = 0.618? is value adjusted to 1.6W/m²

Such climate fluctuation in clouds & humidity distribution{a(t)&@(t)} is ruled by randomness due to **CENTRAL LIMIT THEOREM f**or additive random element variables ,of which original cause is estimated strongly due to macroscopic fluid **TURBULENCE** in climate field(ocean surface with massive evaporation and windy atmosphere with clouds ruling solar heat input and cooling radiation(CR)output)<see APPENDIX_1>..

We could estimate time dependency of climate variables average by a causalstic dynamics.Our another most concern is time dependency of the statistical deviation of climate variables,as for which author wish researcher's trial.

*Data Source.**GISS Surface Temperature Analysis (GISTEMP)**
http://data.giss.nasa.gov/gistemp/
Combined Land-Surface Air and Sea-Surface Water Temperature Anomalies (Land-Ocean Temperature Index, LOTI)

- **Global-mean monthly, seasonal, and annual means**, 1880-present, updated through most recent month: *TXT*, *CSV* ← *at here.*

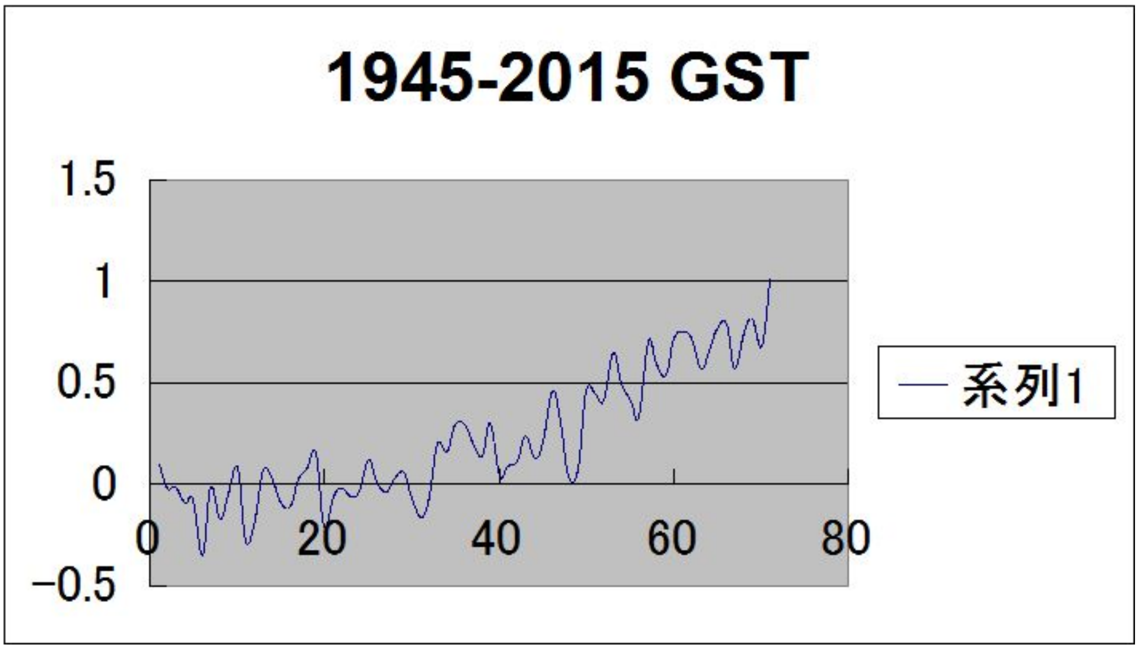
[1] : Temperature Fluctuation in 1945～2015.

The calculation sheets are at here.

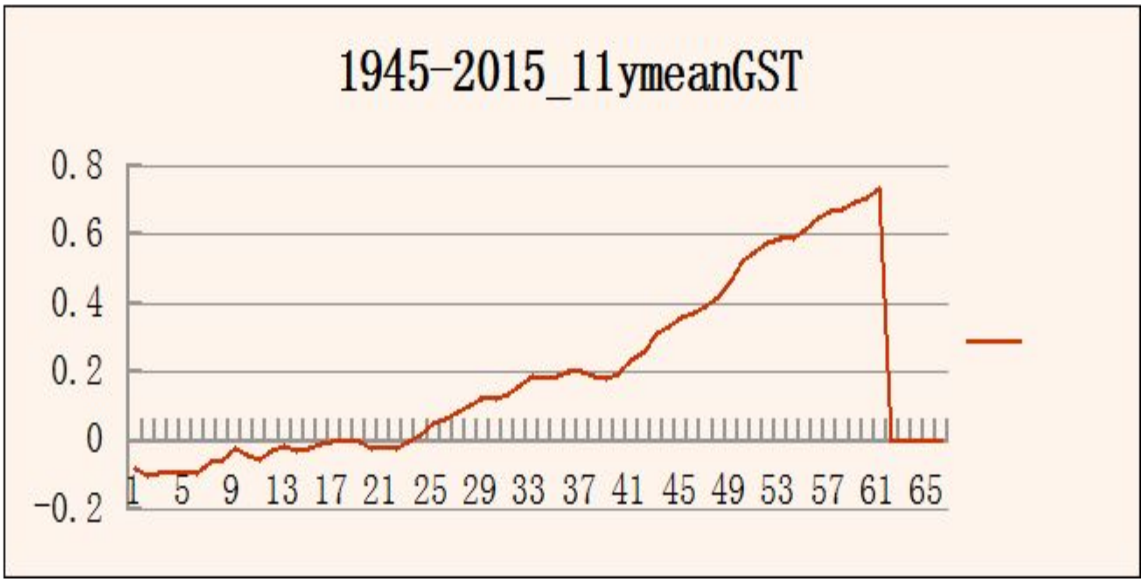
http://www.777true.net/1945_2015GST-data.xls

http://www.777true.net/1880-2015GST-fluctuation-data.xls

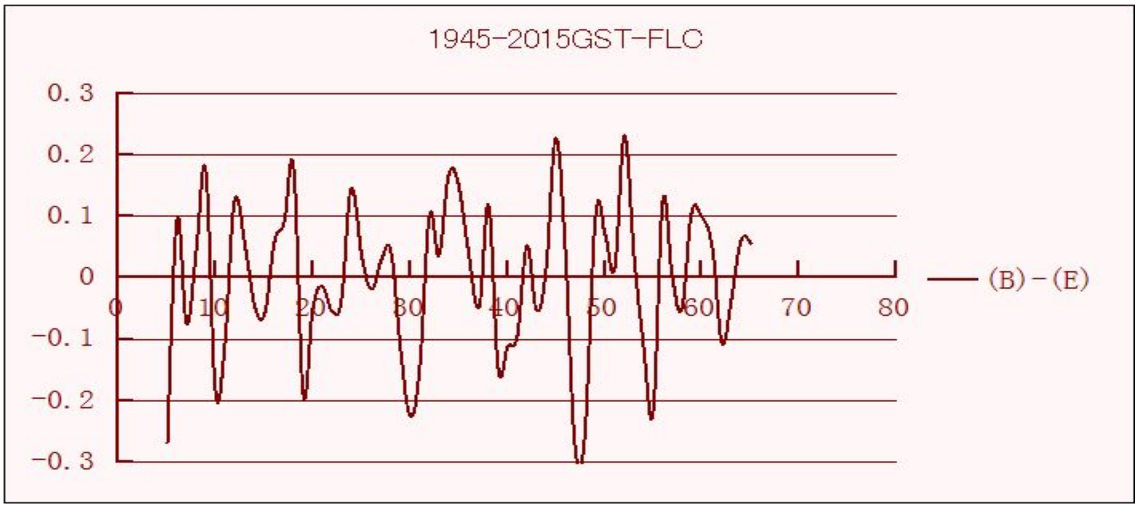
⑴1945～2015GST

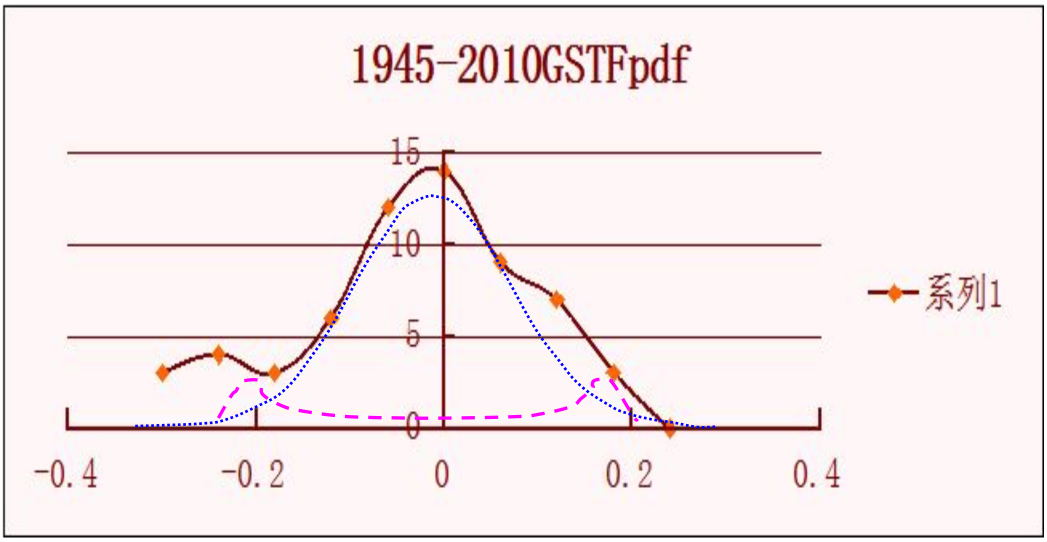


⑵1945～2015GST by 11 years time interval average.



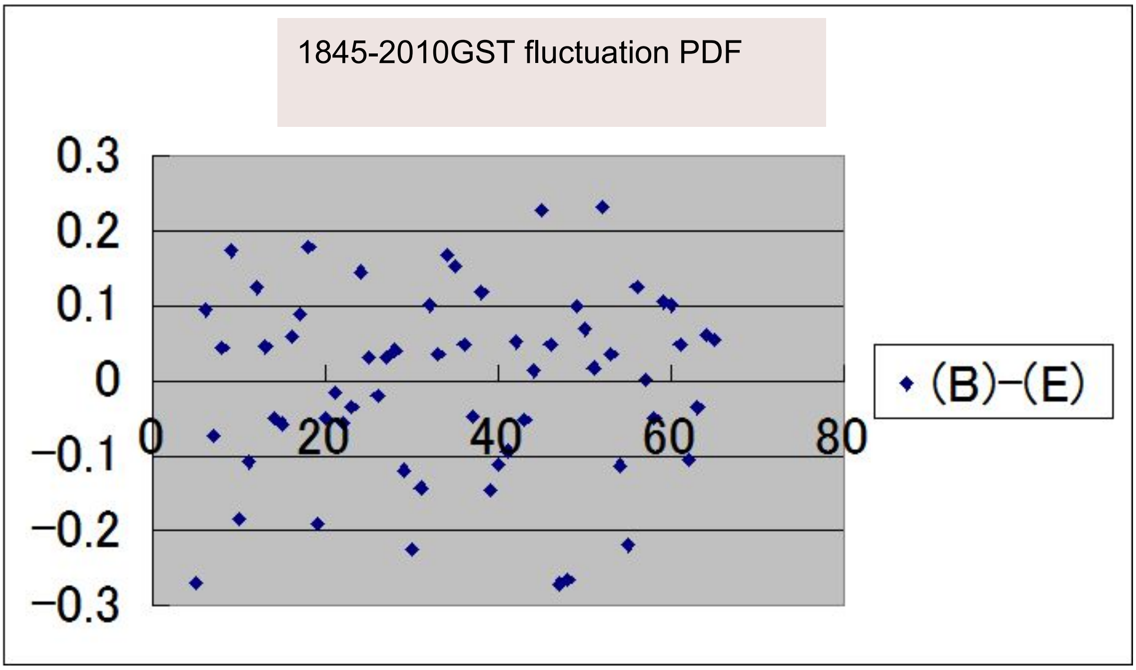
⑶**1945~2015 GST fluctuation from the average value(11years).**





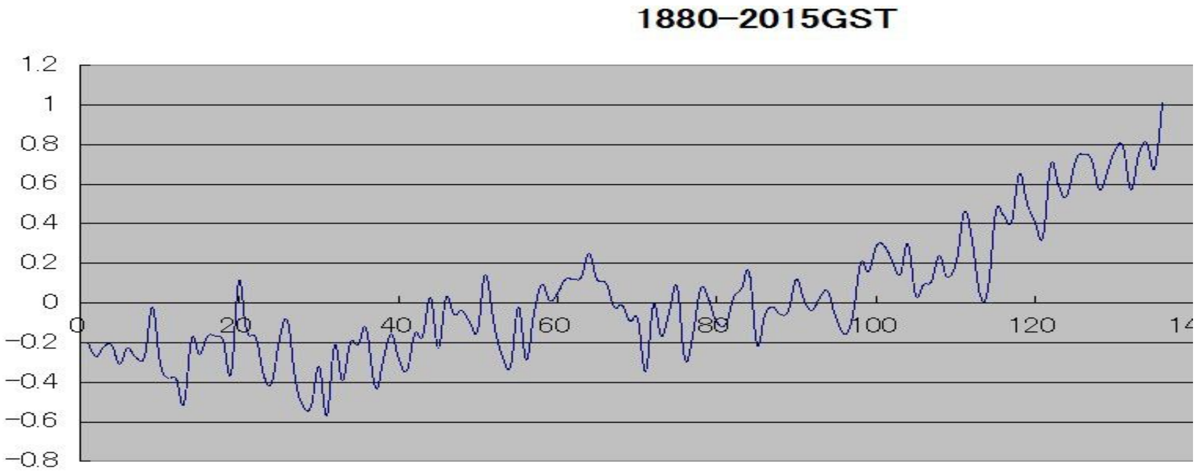
amplitude	interval	accumula	PDFcount	hand count
-0.3	-0.24	0		3
-0.24	-0.18	3	3	4
-0.18	-0.12	7	4	3
-0.12	-0.06	9	2	6
-0.06	0	16	7	12
0	0.06	27	11	14
0.06	0.12	43	16	9
0.12	0.18	52	9	7
0.18	0.24	59	7	3
0.24	0.3	61	2	0

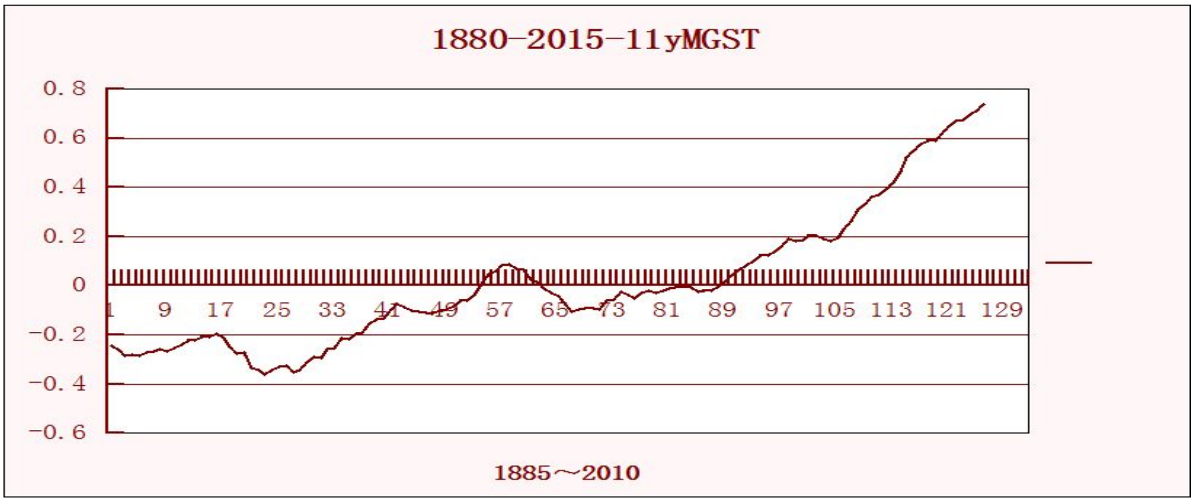
＊The details of pdf shall be mentioned in [２]⑵. Note the pdf has 3points peak,which could be seen also in 1880～2010. The shape is rather vague possibly due to less data amount ?.Also it is not symmetric at 0 center.


1845-2010GST fluctuation PDF
0.3
0.2
0.1
0
−0.1
−0.2
−0.3
0
20
40
60
80
(B)−(E)

[２]：**Temperature Fluctuation in 1880～2015.**

⑴**Temperature change in 1880～2015.**





This is 11 years time interval average.

☞:

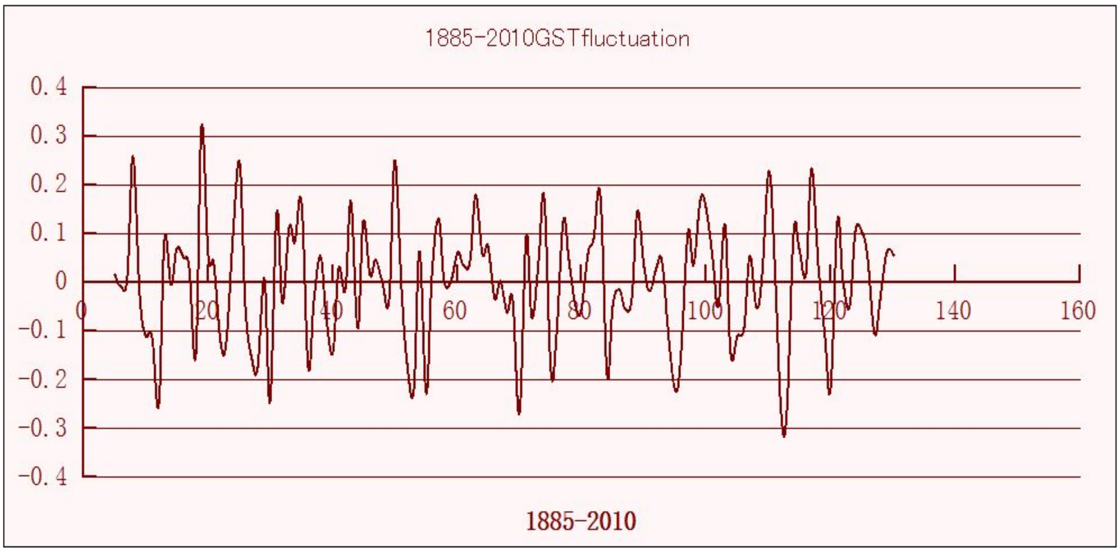
Statistical Analysis at here could not be complete due to the 11 years time interval averaging.

If averaging is **genuine ensemble averaging**,average of fluctuation must be zero.

fluctuation(t)≡original value(t)－<average(t)>.

However averaging on fluctuation in 1890～2005 full time span=0.00045℃

⑵**Temperature Fluctuation Change from 11year average in 1880～2015.**

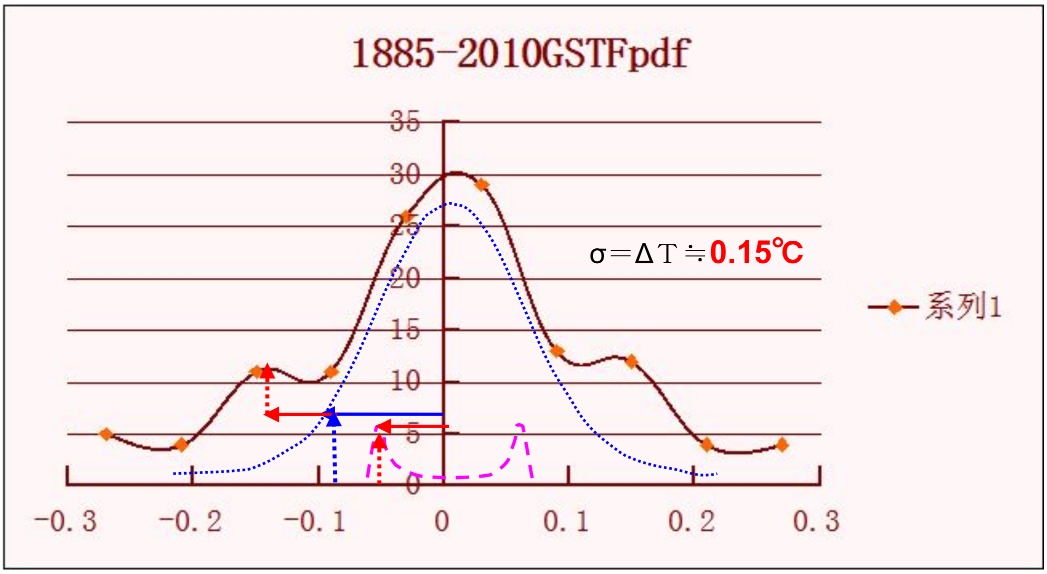


You could see Periodic(about 5years?,10years?)and Amplitude limited nature(±0.3℃).

The cycle could be **exactly measured** by calculating so called correlation function.

See **APPENDIX-7.**

The accurate details is also your study,please !.



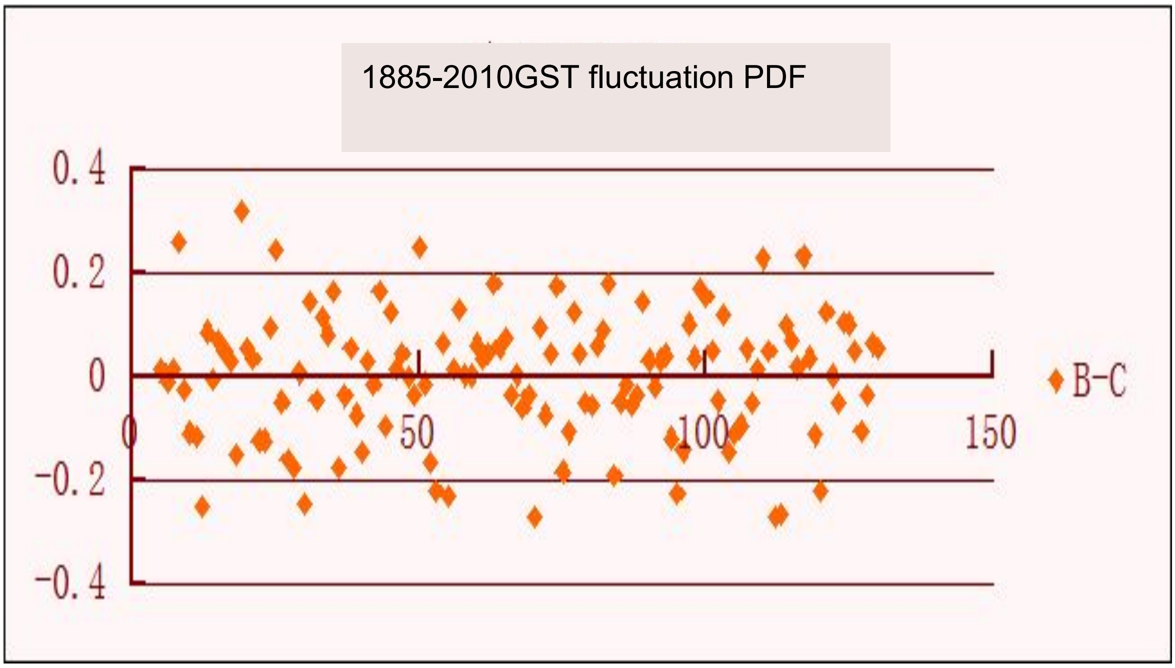
$G(\delta T_C(t)) = \exp[-\delta T_C^2(t)/2\Delta T_C^2(t)]$. **Pure Climate Fluctuation- PDF**

$S(\delta T_S(t)) = N/[1 - <\delta T_S(t)/\Delta T_S(t)>^2]^{1/2}$. **Solar Density with noise-PDF**

(a)The curiosity of above graph is 3 peak points(the two is relatively small). This result is adding of **Gaussian** and Amplitude Density Function=dx/dy=$1/\sqrt{(1-y^2)}$ of y=Asin(ωt).
That is,something periodic amplitude is added to Gaussian.
Then note y is singular at y=1,and such something may be small jitter in Amplitude(also in phase),so pink dot curve was drawn by author's imagined modification. .If the sinusoidal noise cycle is exactly 11years,**the 11years interval averaging** should be vanish it,
*)Real time temperature with periodic variation could not vanish the periodic signal by subtracting by **11years(or 22years) interval averaging**<2016/10/19>.

(b)**THE PDF DATA:**

y	y+δy			N(y, y+δy)	Y=(y+(y+δy))/2
−0.3	−0.24	0	SOFT	5	−0.27
−0.24	−0.18	5	5	4	−0.21
−0.18	−0.12	11	6	11	−0.15
−0.12	−0.06	21	10	11	−0.09
−0.06	0	33	12	26	−0.03
0	0.06	56	23	29	0.03
0.06	0.12	90	34	13	0.09
0.12	0.18	107	17	12	0.15
0.18	0.24	120	13	4	0.21
0.24	0.3	122	2	4	0.27
PDF x axis segmentation			PDF	hand count	T-axis



Author counted the distribution by hand,but not by CALC soft which made error.

*FREQUENCY(Data Array,[y,y+δy])=N(y,y+δy).

⑶**Cyclic Variation Elements in Climate.**

Maybe solar cycle is dominant,As for which,author could not be aware well.

⒜**solar cycle variation by period of about 11years.**

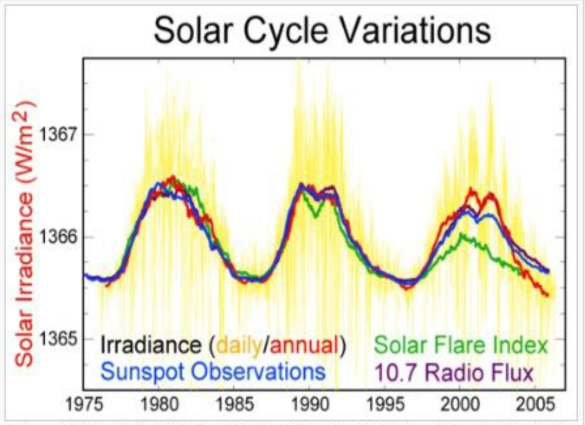
Insolation — Incoming Solar Radiation

https://www.e-education.psu.edu/earth103/node/1004

Do Variations in the Solar Cycle Affect Our Climate System?

http://www.giss.nasa.gov/research/briefs/rind_03/

https://en.wikipedia.org/wiki/Solar_cycle



第21太陽周期から第23太陽周期の太陽黒点の数、合計太陽放射、フレア指数。

☞：Not only 11years,but also the 22 years period is !!

https://en.wikipedia.org/wiki/Solar_cycle

http://www.nature.com/articles/ncomms7491

A 22-YEAR CYCLE IN SUNSPOT ACTIVITY

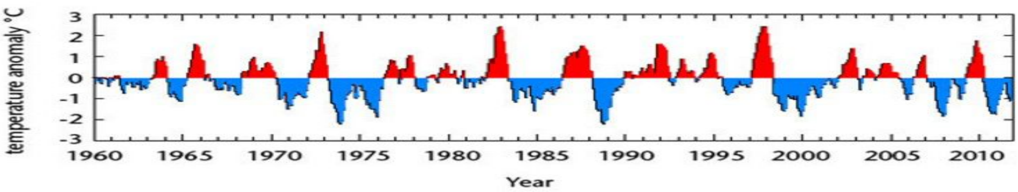
http://cc.oulu.fi/~usoskin/personal/ASR_22.pdf

⒝**El Niño, La Niña and the Southern Oscillation**

http://www.metoffice.gov.uk/research/climate/seasonal-to-decadal/gpc-outlooks/el-nino-la-nina/enso-description

What causes El Niño and La Niña events?

*The increased sea surface temperature influences the **atmospheric winds**, which in turn influence the upper ocean and the thermocline such that the sea surface temperature is increased further - **a positive feedback**. When conditions are favourable, this feedback generates an El Niño event.A La Niña event can arise similarly.*



[2]: GST fluctuation due to that of clouds & humidity a(t)&@(t) fluctuation.

Relating Insolation to Cloud Cover

http://www.instesre.org/GCCE/CloudsVsInsolation/CloudsVsInsolation.htm

(1)***Study of Solar Radiation Change in Japan***

http://www.jses-solar.jp/wp-content/uploads/211.2.pdf

See fig2:**global solar radiation**,which is determined by clouds albedo=a(t)

However this data(13 observing locations)could not completely fit the global temperature data GST,but may be not so much difference.

(2)**Temperature Fluctuation by Global Albedo(insolation input)Change**

$C(dT(t)/dt) = \delta F(t) = a(t)I_0 - @(t)\sigma T^4$. 〈@(t)=CR passing rate to space〉 Earth temperature rise/year=(Insolation input−cooling radiation(CR)output)/y.

http://www.777true.net/Accounting-principle-verify-reconstruction-the-Past-Climate-Records.pdf

$\delta a/a = \Delta S/S \fallingdotseq 0.3(2005y)/13 = 0.023$. ....albedo variation due to clouds distribution

$I_0 = 342W/m^2. \rightarrow I_0 \delta a = I_0(\Delta S/S) = 342W/m2.x0.023 = 7.9Wm^2$.

$C(0.02°C/y) = \delta F = 1.6W. \rightarrow C = [1.6/0.02]$

$C(dT/dt) = \delta F = I_0(\Delta S/S)$。

$\rightarrow dT/dt = \delta F/C = \delta I_0(\Delta S/S)/[1.6/0.02] =$ 0.23℃.This is estimation from solar measure

year	T(y)	<T(y)>average	**Actual Fluctuation**
2005	0.75	0.649090909	**0.10℃**

$\Delta S/S = -0.3(1998)(2005)/13 = -0.023$

$dT/dt = -\delta I_0(\Delta S/S)/[1.6/0.02] = -0.23$℃ This is estimation from solar measure

2000	**0.33**	**0.549090909**	**−0.22℃**

Cooling radiation output $P = @\sigma T(287.5)^4 = 387W/m^2$. → $\delta P = (\delta T/T)4@\sigma T^4 = 7.9Wm^2$.

$\delta T = T.[\delta P/4@\sigma T^4] = 288[7.9Wm^2/4x387W/m^2] = 1.5$℃. Too large this cooling is impossible

Cooling Radiation mechanism could' nt recover the temperature risen by albedo fluctuation,

$C(0.02°C/y) = \delta F = 1.6W. \rightarrow \delta P = (\delta T/T)4@\sigma T^4 = (0.25℃/288)4x387W/m^2 = 1.3W/m^2$,

Only random albedo change of negative swing could recover the average temperature .

(3)**The Clouds Feedback Problem**.<also see APPENDIX_3>

In authors opinion(but not what is exactly examined),**global clouds** could not have strong positive nor negative effect.If not so,positive feedback would cause run away warming,which is not observed in long history,and also negative feedback may be similar.

(a)It is too evident that dense clouds=a(t) intercepts **solar heat** in daytime.

(b)It is also well known that dense clouds= @(t) intercepts **cooling radiation** output in night.

(c)Thereby global clouds has two actions of {a(t) and @(t)} as random climate variables due to the consequence of central limit theorem in fluid turbulence in climate environment.

That is,following equation may be. .This need the proof.

Clouds albedo and CR pass rate as random variables.
{a(t) and @(t)}＝averaged value＋fluctuating one.

Note clouds are those who are randomly generated and terminated in traveling in the sky.

a(t) and @(t) as RV	Dense Clouds	Thin Clouds
day	cooling	warming
night	warming	cooling

Probability No change＝1/2

Probability warming＝1/4

Probability cooling ＝1/4

Thus **cloud albedo fluctuation** could be random variable in above situation.

(4)In observing global temperature fluctuation in short as 1 or 2 yeas,there could be rapid and strong temperature fluctuation between ±0.25℃/year.

It could be realizable only by larger fluctuating global **clouds albedo**＝a(t),,or by larger fluctuating global passing rate @(t).Negative feedback of cooling radiation variation by the temperature ±0.25℃ could not be a sufficient intensity of radiative forcing＝1.3W/m^2 to recover the average temperature. 1.3W/m^2 is less than ±0.02℃/year.

Thereby recovering to average temperature needs once again negative swing of albedo.

(5)**Radiative Forcing Change due to that of Humidity Density in atmosphere.**

Humidity fluctuation could cause larger temperature one by the Radiative Forcing(RF).

Humidity(vapor＝H20)is strong GHG(75W/m^2) more than 2times CO2(33W/m^2),

Thereby,the density fluctuation is remarkable and comparable clouds albedo.

Now we are to estimate the RF intensity variation by that of **humidity density**..

＊**Radiative Forcing**≡Heat input amount(W/m^2)for global Temperature change/year.

＊ 1ppm≡1cm^3/1m^3 gas volume concentration(400ppm＝CO2 concentration at 2016)

＊ Avogadro Number＝any 6x10^{23}molecular/mol in 22.4litter at 1atm and at T＝288K(15℃).

＊ V＝(w/M)RT/P……Gas Volume(litter). ＜R＝0.0821,P(atm)=1,T=288K(15℃)＞.

(w/M)＝(gas weight/Molecule one)＝mol.

(a)**humidity concentration definition.**

＊ 15℃、saturated humidity density＝12.8g/m^3 at P=1atm～1mol.

V=1molx0.0821×288/1=23.6litter＝23600ppm.

(b)**estimation on the radiative forcing of humidity the stronger GHG.**

Calculation at here may be not exact,but our aim is the coarse estimation which would reveal larger temperature fluctuation possibility by humidity density fluctuation..

Cooling Radiation and GHGs trapping.

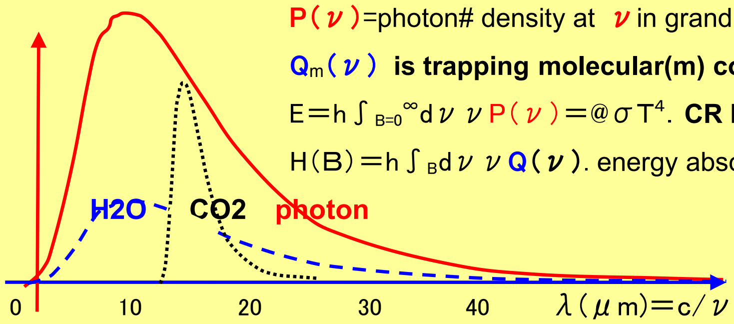
$e = h\nu$,....each infrared photon energy. Frequency ν is varied from 0 to ∞.

$P(\nu)$=photon# density at ν in grand surface emission(Black Body Radiation).

$Q_m(\nu)$ is trapping molecular(m) concentration at ν in atmosphere.

$E = h\int_{B=0}^{\infty} d\nu\, \nu P(\nu) = @\sigma T^4$. **CR heat** of area under graph=$P(\nu)$.

$H(B) = h\int_B d\nu\, \nu Q(\nu)$. energy absorbed by H2O molecular with band=B



$\lambda(\mu m) = c/\nu$.<c=velocty of light>

GHGs contributions		
humidity	75W/m2.	48%
CO2	33	21
clouds	30	19
ozone	10	6
0thers	8W	5

Cooling Radiation(photons emission,$e = h\nu$) is trapped in GHGs ($e = h\nu_m$) by one to one collision.Thereby,the absorption is proportional to GHGs concentration=$Q(\nu)$ in atmosphere.

ν_m is proper resonance frequency of absorbing molecular.

Those are called heat trapping gas(GHG).

*citation:anonymouse.

Note trapped photon is to be re-emitted from the GHG before long.The half go toward space, while others go to ground again. The cascaded downward going is origin of **global warming**.

This is also the origin of @(t). Now we estimate humidity radiative forcing.

CO2 400ppm → RF＝1.6W/m^2.(0.02℃/y) ....Global temperature rise/year by RF=1.6W/m^2.

H20 11800ppm(50% humidity)RF＝(75/33)((0.5x23600)/400)x1.6W/m^2＝107W/m^2

The 10% atmosphere concentration variation＝10.7W/m^2

	50%	100%
RF	107W/m^2	214W/m^2
δRF(10%)	11W/m^2(0.13℃/y)	21W/m^2(0.26℃/y)

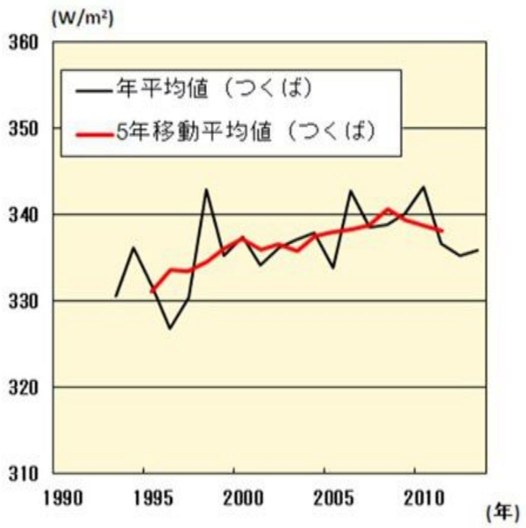
Above value is sufficient to cause rapid and larger temperature fluctuation.

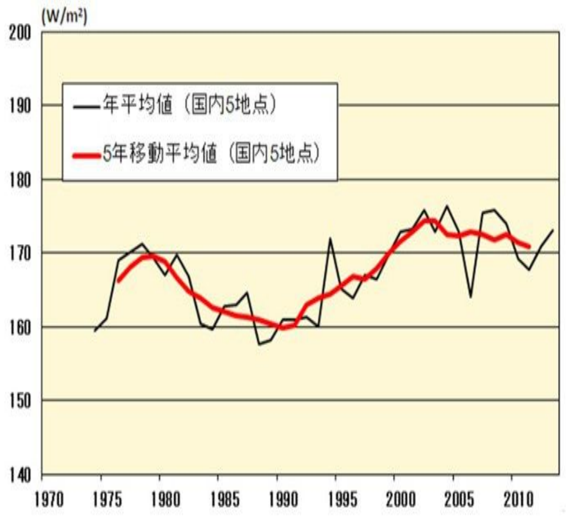
＊Backward Infrared Ray & Insolation Annual Variation.

http://www.data.jma.go.jp/gmd/env/radiation/diag_rad.html

10W/m^2 big Backward Infrared Ray change/few year could be seen in the below left.

10W/m^2 big Insolation change/few year could be seen also in the right.





(c)**humidity is also source of clouds and rain fall.**

Certainly humidity is strong GHG,while it is source for **clouds and rain fall** which are act cooling planet.Clouds intercepts insolation and rain fall radiates condensation heat into space.As the consequence,run away heating(positive feedback)by humidity would not occur.Water cycle by humidity to clouds to rain fall may be important elements in climate stability.If not so,something wild climate phenomenon could have occured in the past.

(d)**Conclusion and the Summary**.

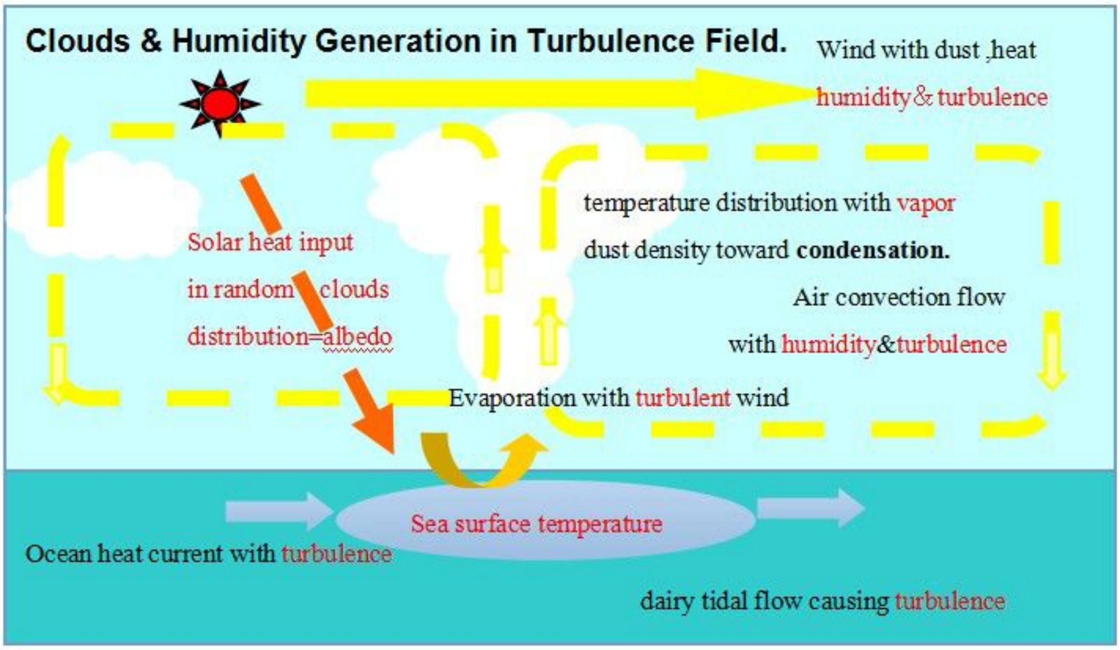
The rapid and larger swing of GST fluctuation could not be realized by nothing, but by **clouds albedo & humidity permeability fluctuations**.The fluctuations may be caused by randomness in atmosphere and ocean fluid, of which fluctuation could not be nothing,but **macroscopic fluid turbulence**.

☞:Thus we could know also rapid planet cooling by cloud albedo engineering.

This is famous also so called **Nuclear Winter**.,but we never wish also it.

APPENDIX-1:Clouds & Humidity Generation in Turbulence Field.

The field seems massive fluid turbulence.Their additive effect causes global albedo fluctuation.



APPENDIX-2:Gaussian Distribution and the Deviation Change Cause.

The most primitive model toward Gaussian is so called **Binominal Distribution**.

1step probability is p,1 back-step is q,then,in N trials,the r step、$P(r)={}_{N}C_{r}\,p^{r}q^{(N-r)}$.

$\langle r\rangle = Np$. $\sigma^2 = Npq$.,where pq is **go & back probability**,the max value is N/4(p=q=1/2).

That is, **“deviation is a measure for total trial times!!”.**Following are examples.

$\sigma^2 \equiv \langle (x-\langle x\rangle)^2\rangle = 2\kappa t$. **Deviation Time Dependency in Diffusion(Random walk).**

Certainly trial times is proportional to time=t in irreversible process.

$\sigma^2 \equiv \langle V^2\rangle = 2k_B T/m$. **Deviation Temperature Dependency in Maxwell Distribution**

$T = 2[m\langle V^2\rangle/2]/k_B$.Temperature is proportional to heat energy of a particle.If we inject heat as time=t,that is T=Wt, $\sigma^2 \equiv \langle V^2\rangle = 2k_BWt/m$. This is just same as random walk.

$*(d/dt)\Omega = (\Delta E/\hbar)\,T\cdot\Omega$**.......This is applicable to non-equilibrium state.**

http://www.777true.net/img007-Quick-Guide-to-Quantum-Stochastic-Mechanics.pdf

Time Change in quantum state density is proportional to **Energy Fluctuation**=ΔE.

Or larger fluctuation accelerate change(d/dt=time sensitivity) of physical state **in general**..

Thus temperature rise would accelerate climate change,if near critical point,the acceleration would be more rapid such as state in **Arctic Ice Melting**.

APPENDIX-3:Temperature Deviation in Equilibrium Statistical Mechanics.

Statistical Mechanics(=SM) is applicable for gas and liquid in our **macro dairy life size**.

The most simple,but pragmatical tool is ideal gas model(air and water) in SM.<2010/10/14>

(1)**ideal gas model.**

$U=3Nk_BT/2$. Ideal gas Internal energy=U of N particles with temperature=T.

$C=\partial U/\partial T=3Nk_B/2$. constant specific heat. → $U=CT=3Nk_BT/2$..

(2)**Canonical Distribution in Equlibrium State.**$\langle\beta=1/k_BT\rangle$.

$G(E)=A\exp(-E/kT)$. energy=E distribution in **Canonical Ensemble** with Temperature wall.

$\langle E\rangle=\int_0^\infty dE.E\exp(-E/k_BT)/\int_0^\infty dE.\exp(-E/k_BT)$.,,.. **average energy**

$\partial\langle E\rangle/\partial\beta=\langle E^2-\langle E\rangle^2\rangle\equiv\sigma^2$........ **energy deviation**(equilibrium state)

$c=\partial\langle E\rangle/\partial T=\partial\langle E\rangle/\partial\beta\cdot\partial\beta/\partial T=\langle E^2-\langle E^2\rangle\rangle/k_BT^2=3k_B/2$. **specific heat for a particle.**

$C=Nc=N^{-1}\langle(NE)^2-\langle(NE)^2\rangle\rangle/k_BT^2=3Nk_B/2=U/T$. **N particles specific heat.**

$NE\equiv U=CT=3Nk_BT/2$. **N particles internal energy.**

(3)**Temperature Deviation in ideal gas and liquid in "*equilibrium state*".**

$C=N^{-1}\langle(CT)^2-\langle CT\rangle^2\rangle/k_BT^2=N^{-1}C^2\langle T^2-\langle T\rangle^2\rangle/k_BT^2$ → $C=N^{-1}C^2\langle\Delta T^2(t)\rangle/k_BT^2$

→ $\langle\Delta T^2(t)\rangle=(Nk_B/C)T^2=(Nk_BT/CT)T^2=(Nk_BT/CT)T^2=(2/3)T^2(t)$.

This is remarkable big temperature fluctuation in ideal gas and liquid,

Note above important relation do not relate with particle number=N.

(4)Global Averaging Temperature Deviation<virtual applying central limit theorem?!>.

Global total heat$=C_GT_G=\Sigma_{g=1}^M C_gT_g\equiv\langle C_g\rangle\Sigma_{g=1}^M T_g$. $*\langle C_g\rangle\equiv\Sigma_{g=1}^M C_gT_g/\Sigma_{g=1}^M T_g$.

→ $T_G=[\langle C_g\rangle/C_G]\Sigma_{g=1}^M T_g$. <this portion must be constant in time>.

Therefore we could derive global average temperature by sum of local ones(g=1,....,M)

The the deviation should be as follows by central limit theorem .

$$\langle\Delta T_G^2(t)\rangle=M^{-1}[\langle C_g\rangle/C_G]^2\Sigma_{g=1}^M\Delta T^2_g=(2/3M)[\langle C_g(t)\rangle/C_G]^2\Sigma_{g=1}^M T_g^2(t).$$

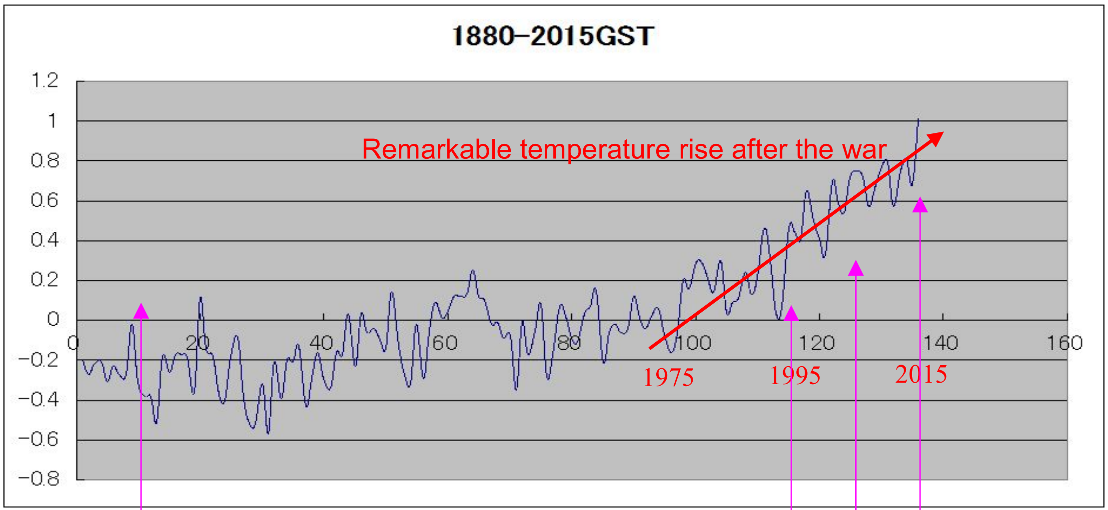
Note $[\langle C_g(t)\rangle/C_G]\sim 1/M$,so right side$\sim\Sigma_{g=1}^M T_g^2(2/3M^3)$. $T_g\sim 288K$ is larger value,while observed $\Delta T_G\sim 0.2$℃, $M^3\sim(2/3)M[288/0.2℃]^2$.→ $M\sim 1200$？,

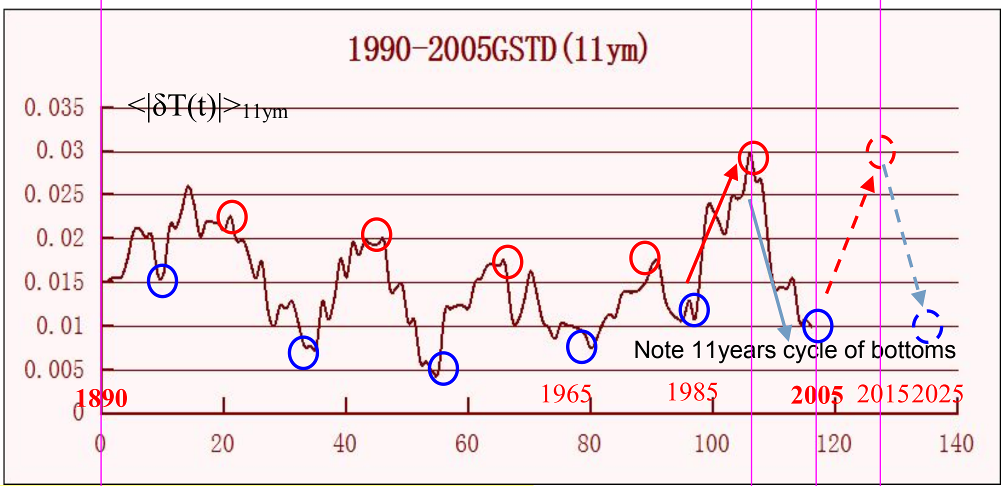
The aim at here is to find what variate $\langle\Delta T_G^2(t)\rangle\sim\Sigma_{g=1}^M T_g^2(t)$.?!.

☞ : Actual$\langle\Delta T_G^2(t)\rangle$ is ruled by fluctuation of {a(t),@(t)} in non equilibrium state,then the analysis would be complicated enough.Following are actual data of temperature fluctuation record.

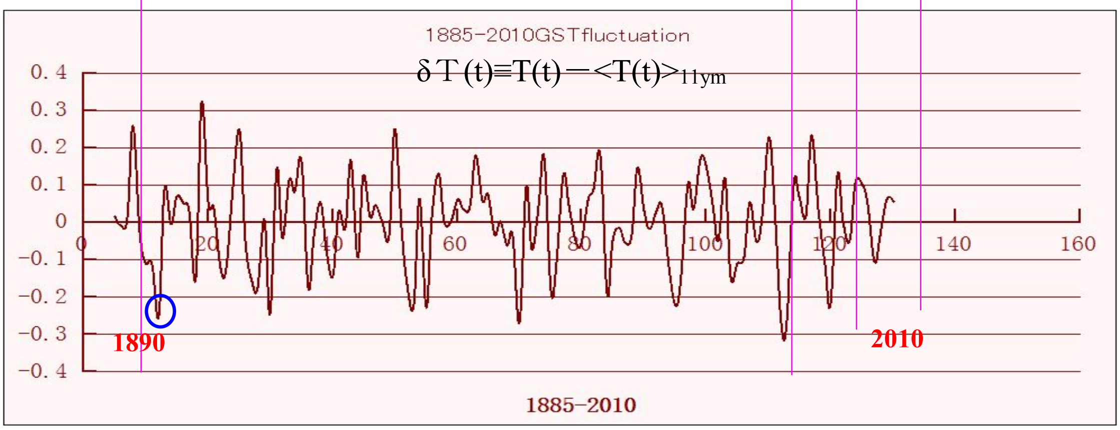
APPENDIX-4:Temperature Prediction for 2016～2027

(1)DATA:Temperature Fluctuation in 1880～2015





It's remarkable cyclic swing by 22years cycle.Thereby 1995+22＝2016,17,18 are highest temperature,of which cause is **+hot fluctuation**,then about at 2027,28,29 would be lowest, then would turn toward higher. Then why 22years,but not 11years of solar cycle ???.



Then you(also author)might doubt the **discrete calculation 11years mean averaging**.

The 11years cycle is due to the solar variation.Then he tried test calculation,of which result is almost nothing error.

http://www.777true.net/Averaging-Error-for-sin_ωt_in-descrete-calculation.pdf

Then where the 22 years period comes from ??

https://en.wikipedia.org/wiki/Solar_cycle

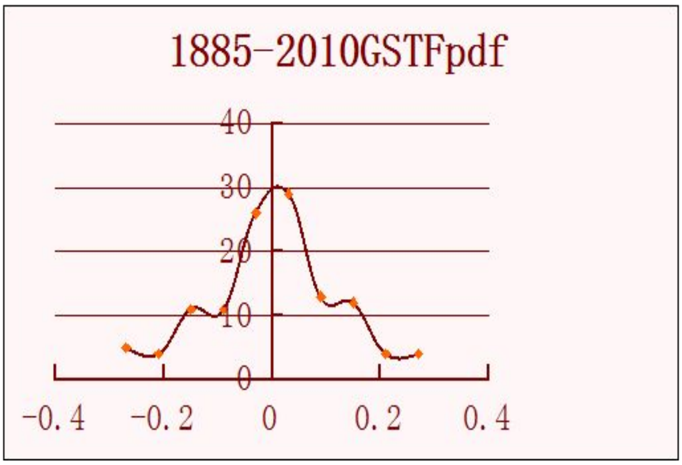
http://www.nature.com/articles/ncomms7491

A 22-YEAR CYCLE IN SUNSPOT ACTIVITY

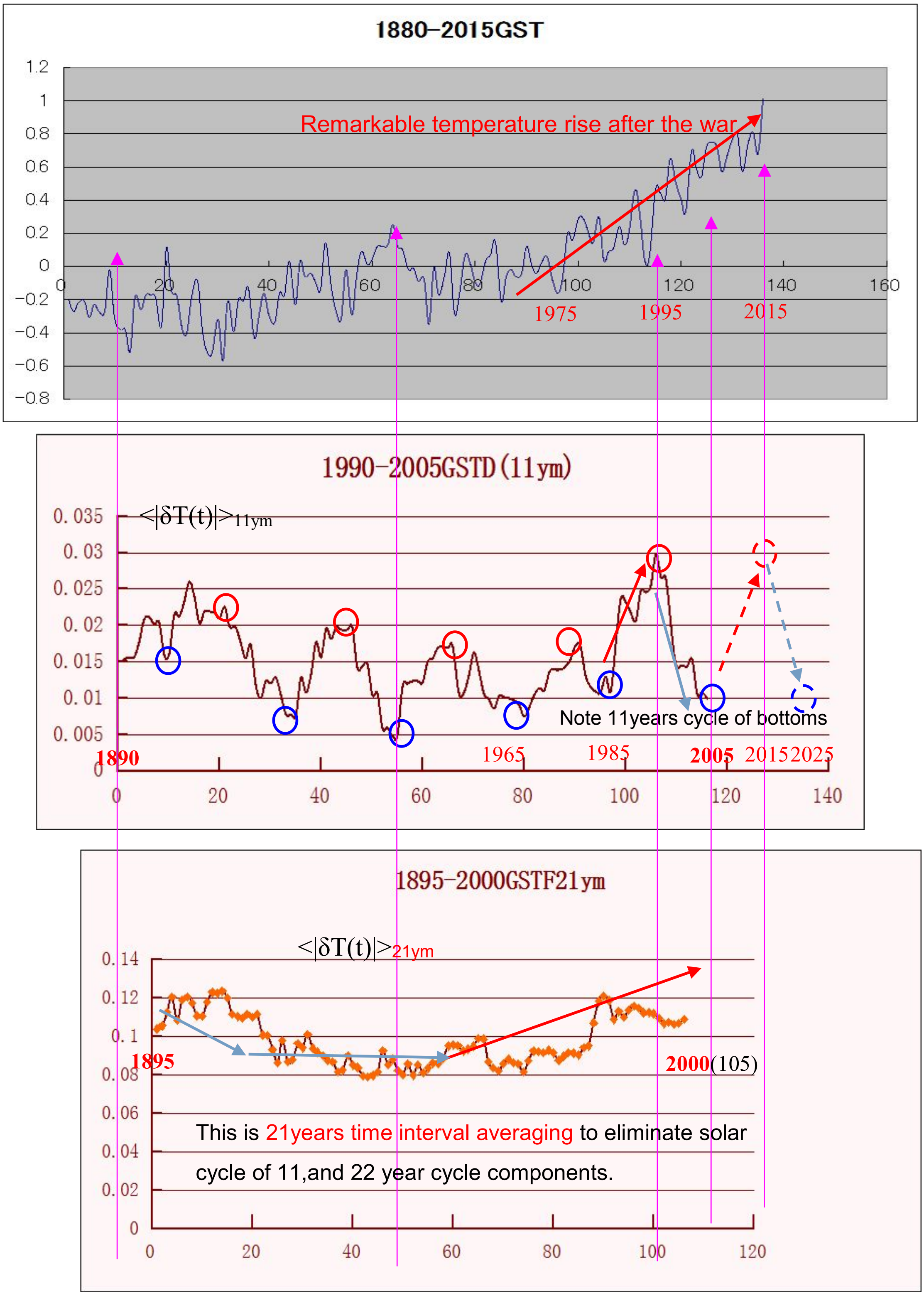
http://cc.oulu.fi/~usoskin/personal/ASR_22.pdf

ABSTRACT *We study the recently presented group sunspot number series and show that a persistent 22-year periodicity exists in sunspot activity throughout the entire period of about 400 years of direct sunspot observations. The amplitude of this periodicity in total cycle intensity is about 20% of the present intensity level. A 22-year periodicity in sunspot activity is naturally produced by the 22-year magnetic dynamo cycle in the presence of a relic magnetic field. Accordingly, a persistent 22-year periodicity in sunspot activity gives strong evidence for the existence of such a relic magnetic field in the Sun. The stable phase and the roughly constant amplitude of this periodicity during times of very different sunspot activity level strongly support this interpretation.*

⑵**The Fluctuation Probability Density Function(PDF) strongly indicates Mixing of cyclic components and Gaussian Noise(the real fluctuation of climate).**



⑶21years time interval averaging to eliminate solar cycle of 11,and 22 year cycle components.

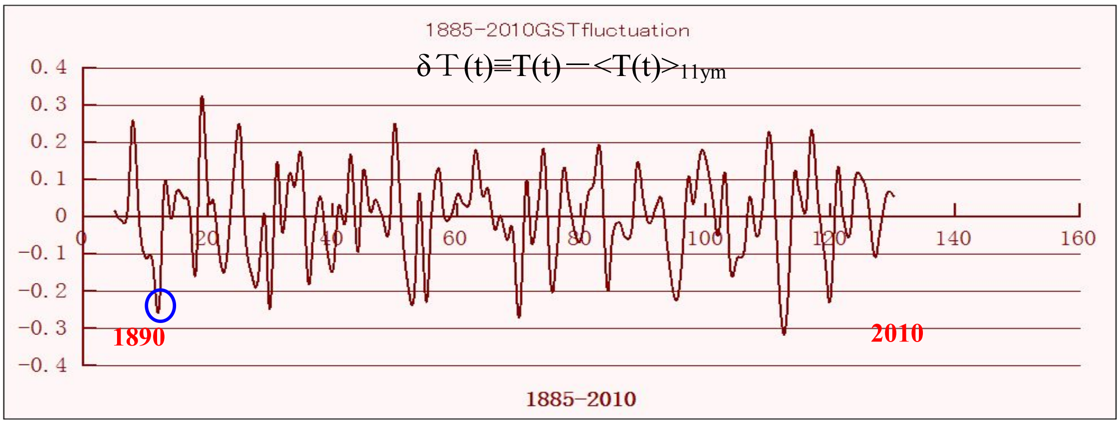


☞: How ever the elimination could not be complete ?!,which could be seen by the amplitude probability density function(201010/18).

⑷**The time trend of d<ΔT$_G$^{2}(t)>/dt may be correlated with d(T^2)/dt trend.**

The absolute value due to **effective climate fluctuation** at least in the past seems small as average about ±0.1℃.However the highest is ±0.3℃,which is not rare.

The actual fluctuation is as follows.



http://www.columbia.edu/~jeh1/mailings/2016/20160926_BetterGraph.pdf

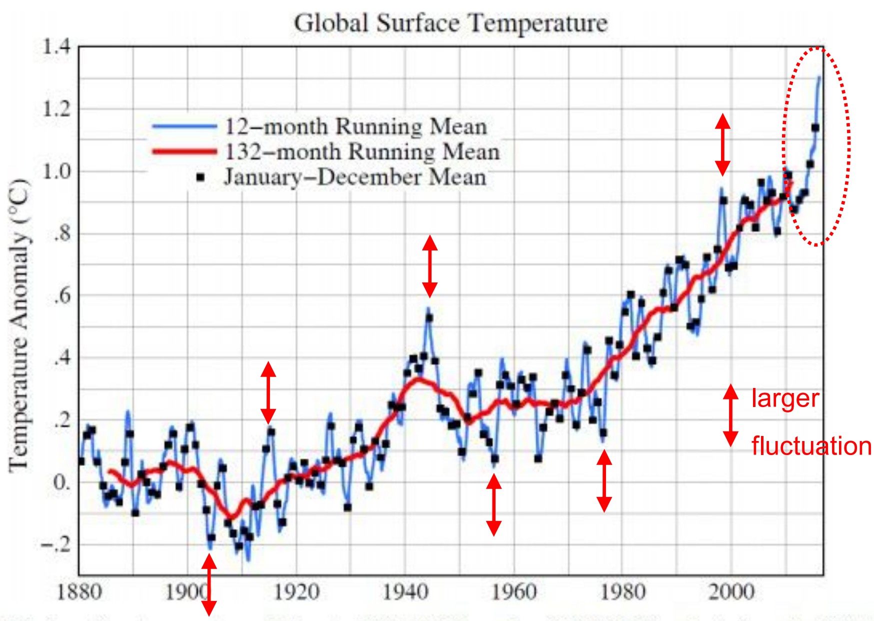


Fig. 1. Global surface temperature relative to 1880-1920 based on GISTEMP analysis (mostly NOAA data sources, as described by Hansen, J., R. Ruedy, M. Sato, and K. Lo, 2010: Global surface temperature change. *Rev. Geophys.*, **48**, RG4004. We suggest in an upcoming paper that the temperature in 1940-45 is exaggerated because of data inhomogeneity in WW II. Linear-fit to temperature since 1970 yields present temperature of 1.06°C, which is perhaps our best estimate of warming since the preindustrial period.

＊recent liner trend(by Suzuki)=<1.15(2015)−0.75(2000)>℃/15y＝0.027℃/y.

<1.10(2015)−0.55(1990)>℃/25y＝0.022℃/y.

APPENDIX-5:About Clouds Feedback Problem.

Chapter 4: Global Energy Transfer, Atmosphere and Ocean Circulation, Climate

http://www.indiana.edu/~geol105/1425chap4.htm

By reflecting solar radiation back to space (the albedo effect of clouds) and by trapping infrared radiation emitted by the surface and the lower troposphere (the greenhouse effect of clouds), clouds exert two competing effects on the Earth's radiation budget. These two effects are usually referred to as the SW (shortwave) and LW (longwave) components of the cloud radiative forcing (CRF). The balance between these two components depends on many factors, including macrophysical and microphysical cloud properties. In the current climate, clouds exert a **cooling effect** on climate (the global mean CRF is negative). In response to global warming, the cooling effect of clouds on climate might be enhanced or weakened, thereby producing a radiative feedback to climate warming (Randall *et al*., 2006; NRC, 2003; Zhang, 2004; Stephens, 2005; Bony *et al*., 2006).

They estimate the cloud feedback from all cloud types to be +0.6 W/m^2°C (with an uncertainty band of −0.2 to +2.0), and continue, "All global models continue to produce a near-zero to moderately strong positive net cloud feedback."[14]

Clouds Likely Created Positive Climate Feedback In Past Decade*12.13.10*

https://www.nasa.gov/topics/earth/features/amplified-warming.html

What is the net feedback from clouds?

http://www.skepticalscience.com/clouds-negative-feedback.htm

Evidence is building that net cloud feedback is likely positive and unlikely to be strongly negative.

Suggestions of "strong negative cloud feedbacks" in a warmer climate

Anthony Watts / June 12, 2009

https://wattsupwiththat.com/2009/06/12/suggestions-of-strong-negative-cloud-feedbacks-in-a-warmer-climate/

Cloud positive feedback is one of the most foolish and anti-common sense claims of the models.This is particularly true of cumulus and cumulonimbus, which increase with the temperature during the day, move huge amounts of energy from the surface aloft, reflect huge amounts of energy to space, and fade away and disappear at night.

APPENDIX-6:Natural Climate Fluctuations

Natural Climate Fluctuations,May 27, 2015

http://www.enr.gov.nt.ca/state-environment/2-natural-climate-fluctuations

Large-scale annual and decade fluctuations in climate and weather are caused by changes in patterns of ocean circulation and atmospheric pressures.

Natural variations in climate

https://www.niwa.co.nz/our-science/climate/information-and-resources/clivar/variations

Climate oscillation

https://en.wikipedia.org/wiki/Climate_oscillation

Natural Causes of Climate Change

http://www.ces.fau.edu/nasa/module-4/causes-2.php

So-called global warming 'pause' is due to natural climate fluctuations

https://www.theweathernetwork.com/news/articles/so-called-global-warming-pause-is-due-to-natural-climate-fluctuations-despite-skeptic-claims/32391%20

1.2.2 Natural Variability of Climate IPCC. *Working Group I: The Scientific Basis*

https://www.ipcc.ch/ipccreports/tar/wg1/042.htm

Due to their large heat capacity, the oceans have a much longer response time, typically decades but up to centuries or millennia.

Above is not correct,but wrong.

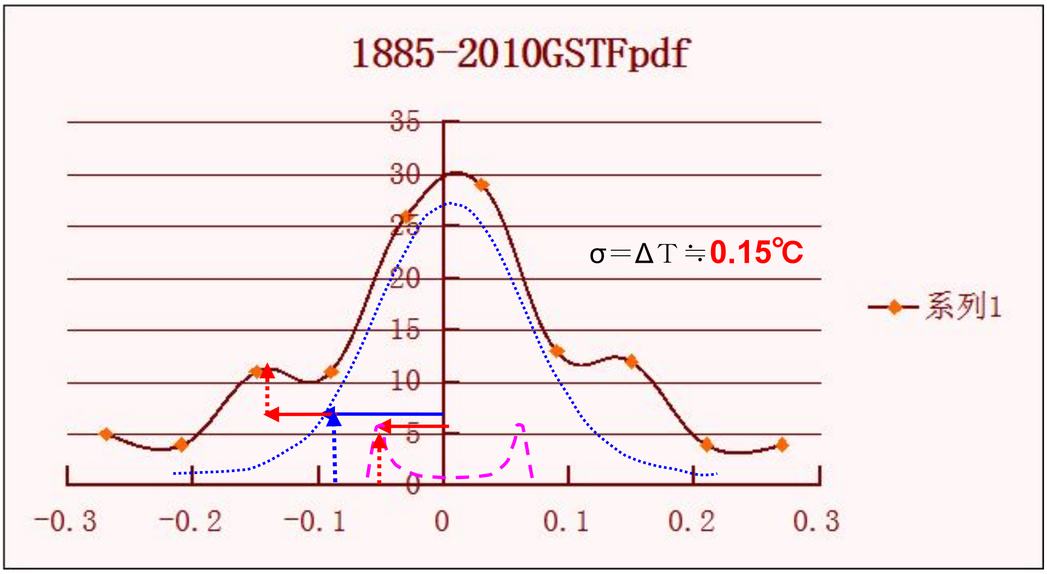
So called **thermocline of depth 600 700m** is rapid as **1year response**.

APPENDIX-7:Convolution Integral between Natural Climate fluctuation PDF and noisy Solar Periodic Variation one of 1/√(1-y²).

This is very important task to determine natural PDF and solar PDF

Meaning of probability density of additive variables of natural and solar fluctuation.

☞:Note the graph could not accurately be drown.



⑴**Gaussian PDF of natural fluctuation=** $\delta T_C(t)$.

$G(\delta T_C(t)) = \exp[-\delta T_C^2(t)/2\Delta T_C^2(t)]$. **Pure Climate Fluctuation- PDF**

$\Delta T_C^2(t) = \langle \delta T_C^2(t) \rangle$.....the deviation

⑵**Solar Periodic variation(with noise~N)=** $\delta T_S(t)$.

$S(\delta T_S(t)) = N/[1 - \langle \delta T_S(t)/\Delta T_S(t) \rangle^2]^{1/2}$. **Solar Density with noise-PDF**

$-1 \leqq [\delta T_S(t)/\Delta T_S(t)] \leqq +1$....This condition may need modification.This is a model.

$*\, d(\delta T)U(\delta T = \delta T_C + \delta T_S)$

$= \int_0^{\delta T} d(\delta T_C)G(\delta T_C)S(\delta T - \delta T_C) \times d(\delta T_S)S(\delta T_S = \delta T - \delta T_C)$

$= d(\delta T)\int_0^{\delta T} d(\delta T_C)G(\delta T_C)S(\delta T - \delta T_C)$

⑶Convolution integral between Gaussian and noisy amplitude density of 1/√(1-y²).

$U(\delta T = \delta T_C + \delta T_S) = \int_0^{\delta T} d(\delta T_C).G(\delta T_C).S(\delta T - \delta T_C)$.

A realized value= δT is possible all sum of each element sum $\delta T = \delta T_C + \delta T_S$ with the each probability.product of $G(\delta T_C) \times S(\delta T - \delta T_C)$.

As for the accurate and concrete details,author wish to ask your study.

APPENDIX_8：**Tiny Solar Activity Changes Affect Earth's Climate** 2013/1/16

Why small periodic insolation variation(~1W/m^2?)could affect larger global temperature fluctuation is explained in following web page.There are amplifying mechanisms.

http://www.space.com/19280-solar-activity-earth-climate.html

Even small changes in solar activity can impact Earth's climate in significant and surprisingly complex ways, researchers say.

....

Sun(insolation=1366W/m^2) varies in the amount of light it emits by only 0.1 percent(~1W/m^2?) over the course of a relatively stable 11-year-long pattern known as the solar cycle.Still, "the light reaching the top of the Earth's atmosphere provides about 2,500 times as much energy as the total of all other sources combined,

. . . .

When researchers look at sea surface temperature data during sunspot peak years, the tropical Pacific showed a pattern very much like that expected with La Niña, a cyclical cooling of the Pacific Ocean that regularly affects climate worldwide, with sunspot peak years leading to a cooling of almost 1 degree Celsius (1.8 degrees Fahrenheit) in the equatorial eastern Pacific. .

Post scrip<2016/10/14>:

By global warming by MASSIVE CO2 EMISSION,what would happen in coming future ??.

For the time being,temperature rise trend shall not cease in few decades(by countermeasure).

Then one of worry-some events are **critical temperature** such as 0℃ ice vanishing in Arctic,and ocean surface temperature (27～31℃)for **cyclone generation**, which are to cause so called phase transition toward disasterous bigger change in climate.

Then the concerned temperature is average one,which is predictable by casalstic theory.

On the other hand,temporal temperature big & rapid fluctuation is also not negligible.

The mechanism is due to insolation input fluctuation due to that of clouds albedo,and the other is cooling radiation output due to permeability fluctuation of humidity the strong GHG. Both are phenomena in **water cycle by sum contributions of regional temperature** in climate fluid field.So long as **climate fluid field with water cycle** seems to act toward climate stabilization.

Rise of humidity by temperature one would be cancelled by rise of clouds albedo.

<However loss in foods production would soar !!!>.Wild cyclone is to act heat output to space by massive rain fall toward surface temperature equalization and cooling<However loss in livelihood would soar !!!, Also chronicle strong drought in some regions is disasterous>.

Hot air mass going up to northern hemisphere from equator is to act Arctic warming.

Also cold air mass going down to northern hemisphere from Arctic is to act Arctic warming.

Cold & hot air mass shall collide with each other to cause **wild climates** in northern hemisphere.Because those are to become **strong heat engine** by **larger temperature gap**.

<Loss in livelihood would soar !!!>.

If nothing massive melting of methane reservor in Arctic,there could not have danger problem.

Then our possible option is unique and only to confine those by larger ice extent.

Now it had become vicious positive feedback,that is,ice melt accelerates solar input into Arctic ocean,which turn to accelerate more ice vanishing.Then our hope is man made **Arctic Cooling Engineering** only at now.

PS(2016,/10/19):Author wrote this paper without previously having gotten exact conclusion, but with real time searching,thereby,some confusions in paragraph could be seen.

Now he revised those points.However,even by those,this paper could not be complete.

The problems left at here is your tasks.