Japan Geoscience Union Meeting 2012
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ACG36-P11 Room:Convention Hall Time:May 21 15:30-17:00

The Earth Temperature Changes of the Last 110 Years and it's Relationship to the CO2 Level and Solar Activity - Methods

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Firstly the authors referee the database of NASA/GISS "Surface Temperature Analysis (GISTEMP)". This database includes records of temperatures at 7364 observation points in the world (Figure 1 and 2). However, very few data were recorded to analyze the global temperatures before 1896. Then the temperatures recorded after 1896 are employed in the following calculations. At the same time, the authors utilize those at 473 observation point only. This is because these 473 observation points are located in the city whose population is no more than 1000. The other points are most likely located in urban city area where the temperatures may be influenced by heat island effect. Though the most of observation points are in such urban cities, the areas of the urban cities are about less than 1- 3 % in the world. Then it is not appropriate to utilize the records of the temperature concentrated in the urban cities. The cities whose population is no more than 1000 now would have had the less population in the last 110 years.

The global temperatures are estimated by the data at 473 observation points after 1896 as follows

1)The changes of temperature DT(i,j) of i year from the i-yeara at i point are calculated as follows

$$DT(i,j)=T(i,j)-T(i,j-1) \quad (1)$$

2)Then the average e of the changes DTj are calculated in i year as follows

$$DTj=\sum_{j=1}^{n} DT(i,j))/n, \text{ here } n = 473 \quad (2)$$

3)Then the global temperature of Tt of i year is calculated referring 0 degree at 1896 as follows

$$Tt=\sum_{i=1896}^{t} DT(i)) \quad (3)$$

4)Now the global temperature T(^)(t) of i year is estimated by as the 11 year running average as follows

$$T(\hat{})(t)=(T(t-5)+T(t-4)+...+T(t)+...T(t+4)+T(t+5))/11 \quad (4)$$

Figure 3 shows the estimated global temperatures T(^)(t) for the last 110 years. The figure also shows the change of CO2 level C(t) (not CO2 emission) and solar activity index S.A.I S(t). S(t) is estimated based on the data from SIDC. S(t) is calculated as reciprocal of period of sunspot activity DTS(t)

As shown in the figure, T(^)(t) increase after 1896, starts decreasing after 1940, start increasing after 1970 and decreeing after 2003

On the other hand, C(t) is only increasing in the last 110 years. This shows that C(t) cannot explain well the change of temperatures in the last 110 year. However, the pattern of the changes of S(t) is well accordance with that of T(^)(t) though some time delay cans exits.

The authors calculate the some indexes as follow and the results are shown in the one other paper submitted to the same symposium

$$tc(t)=a0+a1*C(t) \quad (5)$$

$$ts(t)=b0+b1*S(t) \quad (6)$$

$$T(\hat{})(t)=Tcomp(t,u)=x*Tc(t)+(1-x)*Ts(t-u) \quad (7)$$

Keywords: Global Temperature, Solar Activity, CO2 Level

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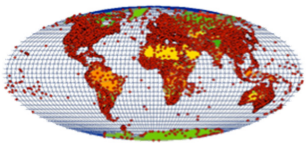

Fig.1 The temperature Database of NASA/GISS,7364 places,1896-2010

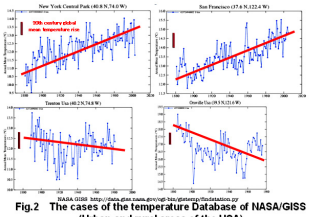

Fig.2 The cases of the temperature Database of NASA/GISS (Urban and rural areas of the USA)

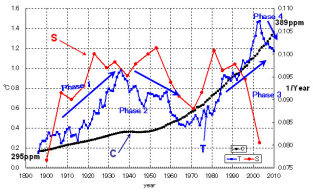

Fig.3 The CO2 Level and the solar activity and global temperature(1896-2010)

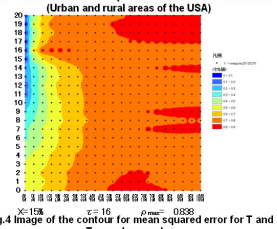

Fig.4 Image of the contour for mean squared error for T and Tcomp by x and τ