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ACG36-12 Room:103 Time:May 21 14:00-14:15

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

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The earth air temperature change (T) in the past 110-years was analyzed using NASA/GISS temperature data base (1896-2010), and got the result as shown in Fig. 1. Among 7646 observation points, only 473 points whose jurisdiction population is less than 1,000 were used to remove the heat island effects which may give the effect to the air temperature.

The air temperature changes during this period can be classified into 4 periods. Temperature ascended in the 1st and 2nd periods, and descended in the 3-th and 4-th(begun in 2003 and continued to the present days) periods. The temperature change T can not be explained only by the concentration change (C) of the atmospheric carbon dioxide.

The solar activity change (S) was introduced to explain such T.SIDC sunspot data base (1750-2010) was used. We employ a assumption that the radiated energy is constant(E) during one sun spot cycle. Based on this assumption, the velocity of the upward transportation of energy in the convection layer inside the Sun is in proportion to 1/AT (we call it solar activity endpoint S.A.I). (AT has been used as The Solar Activity Index in some articles:1.2).S.A.I of 1896-2010 has high correlation (more than 0.7 correlation coefficient) with T, and shows the pattern similar to 1-4 periods of above-mentioned T.T seems to have a delay (o) to S.A.I., which satisfies the cause-effect rule.

A parameter "x" is introduced to estimate contribution of S and C to T where x is a contribution of C to T and 1-x is that of S. A composed model temperature Tcomp is now defined as Tcomp(t,x)=x*Tc(t)+(1-x)*Ts(t) where Tc and Ts are basic pattern of the change of C and S. The physical transformation coefficients are necessary to find Tc and Ts from C and S.A.I, but such transformation coefficients can not be obtained under the present research level. Therefore, Tcomp is calculated by the pattern matching method. Because there is a delay (o) in Tc and Ts as mentioned above, o is involved in this calculation process. Thus, the optimum solution which gives the maximum correlation coefficient on (x, o) plane is searched. Fig. 2 shows an example of relation between Tcomp and x.

In this example, correlation coefficients are 0.85-0.91 when x equals to 0.3-0.5.The air temperature change pattern of 1-4 period speared in Tcomp is expressed comparatively well. This is only an example, but the optimum solution will be searched from now on.

Supplement:

We got some interesting findings by this research as shown below.

1) The comparatively clear period of 40-60 years appeared in S.A.I. A period of the lowest S.A.I appeared precisely during the Dalton Little Ice Age and that of the highest appeared just after that age.

2) The mechanism that a change of S.A.I brings an air temperature change is not apparent by the current science. According to V.Hoyt (1993), the irradiation is 1368-1373W/m2, and the width of change 5W/m2 is 0.4%.

The temperature change corresponding to this width is 1.1K, when we consider the mean temperature of the earth.

3) The minimum S.A.I after 1750 is 0.06 (cycle5) and the maximal is 0.13 (cycle8).The former is in about 1835 after the Dalton Little Ice Age and the later is in about 1800 during that age. The difference of about 2 times is unexpectedly.

4) After 1970, the concentration of carbon dioxide (C) increased rapidly. However, the sun activity (S.A.I) also increased rapidly (over in about 2003). We cannot deny that this accidental phenomenon confused our scientists.

5) When we assume S and C are impulse, T is response, and the global climate system (E) is transfer function, E may include amplify and delay function (for example, in the case of an annual change, there is delay of about two months). It may be an interested problem of the future sun - earth system science.

Keywords: Global Temperature, Solar Activity, CO2 Level

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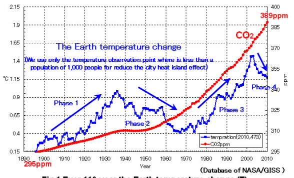

Fig.1 Ever 110-year the Earth temperature change (T)

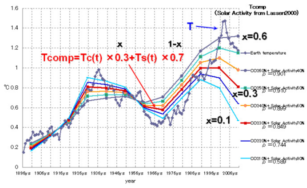

Fig.2 Observation temperature (T) and synthetic temperature (Tcomp),
τ = 0 years