TEMPERATURE OSCILLATION: GLOBAL, REGIONAL AND LOCAL

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Abstract

Schlesinger and Ramankutty (1994) (hereafter SR94) identified an oscillation in the temperature of the global climate system of period 65-70 years by applying singular spectrum analysis to four detrended global-mean temperature records and to records from 11 geographical regions.

This paper shows that this oscillation has continued for the more recent surface records, and it can also be identified in a number of global, regional and local temperature records besides those studied by SR4. Although the surface records show a steady temperature increase imposed on the oscillation, this additional temperature increase is not present in many other records such as those shown here. It therefore seems likely that this background steady temperature increase is an artifact of the methods used in the collection and processing of the surface temperature data rather than an indication of warming from increases in anthropogenic greenhouse gases.

The climate seems currently to have reached the peak of the oscillation identified, so this would seem to be the main reason for currently experienced warmer global temperatures. If the oscillation proceeds, it would be expected that temperatures will fall as they enter the downward phase.

A plausible mechanism for this oscillation involving synchronous behaviour of ocean events has recently been suggested by Tsonis et al (2007). Since it may not involve solar changes it could mean that there is an oscillating energy emission from the earth whose intensity would be mitigated by solar radiation..

Keywords: global temperature, local temperature, temperature variability, temperature oscillation

INTRODUCTION

SR94 applied a statistical technique called "singular spectrum analysis" to four global-mean surface temperature records which had been detrended by means of a simple climate/ocean model based on the supposed radiative forcing due the increase in atmospheric greenhouse gas concentration. The result of this exercise as applied to the surface temperature record reported by Folland et al (1992) is given in Figure 1.

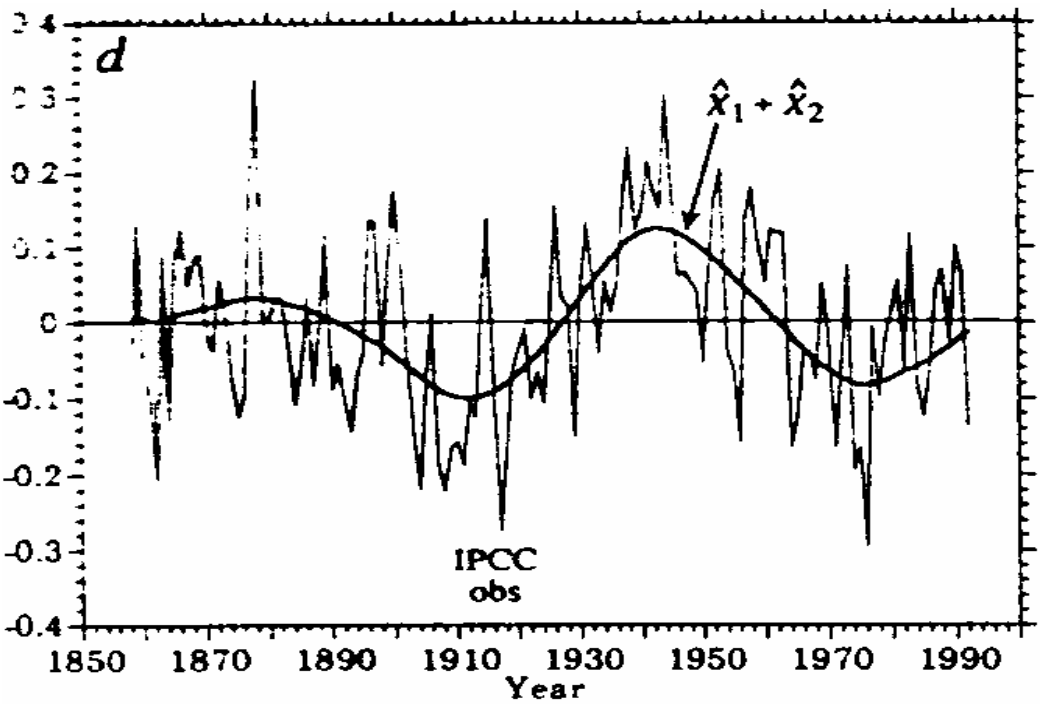

Figure 1. Global-mean surface temperature record (Folland et al 1992) detrended by a simple climate/ocean model; compared with singular spectrum analysis of the same data. (Schlesinger and Ramankutty 1994)

The mean length of the oscillation identified was estimated as 65, 66, 70 and 69 years for the four temperature records studied.

SR94 also applied the technique to 11 geographical subsets of the data of Jones et al. (1991). Similar results were obtained for all regions, with the best agreement shown by North Atlantic, North America, and Eurasia.

In a later paper Andronova and Schlesinger (2000) removed the modelled effects of the supposed anthropogenic warming, volcanoes and the sun from the updated record of Jones (1999) and confirmed the presence and further progress of the previously identified oscillation shown in Figure 1 to 1999.

Klyashtorin and Lyubishin (2003) have recently independently confirmed this "quasi-cyclic fluctuation with about a 60 year period" in the surface record of Jones et al (2001), and they have demonstrated the existence of a variation of 50-60 years interval in reconstructed temperatures for the past 1000 years..

The oscillatory behaviour often appears to be discontinuous. For example, Trenberth (1990) identified a "climate shift" in the Northern Hemisphere between 1976 and 1977. Karl et al (2000) identified climate shifts in 1912, 1945 as well as the 1976 shift. All of these features are apparent in Figure 1 and it is a matter of opinion whether they should be considered sudden, or part of an more regular oscillation.

SR93 and Andronova and Schlesinger (2000) ignored the important climatic effects of the various ocean oscillations. Trenberth et al. (2000) focused on the most important one, the El Niño-Southern Oscillation of the Pacific and derived a linear equation which was used to remove El Niño from the surface record of Figure 2. This corrected record retains the oscillation of Figure 1, but fails to remove the very large El Niño of 1998 and for subsequent years.

This paper shows that the oscillation identified by Schlesinger and Ramankutty (1994) can be seen in a range of temperature records, both global, regional and local. In many oif these the postulated anthropogenic contribution is .not evident.

GLOBAL TEMPERATURE

The updated surface temperature record of that used for used for Figure 1 (Brohan et al 2006), shown in Figure 2., confirms the 65-70 year oscillation for the more recent measurements where the expected peak of the oscillation seems now to have been reached and thereafter would be expected to decline in the next few years. The steady temperature increase supposedly due to anthropogenic causes seems, however to have ceased since 2002 .

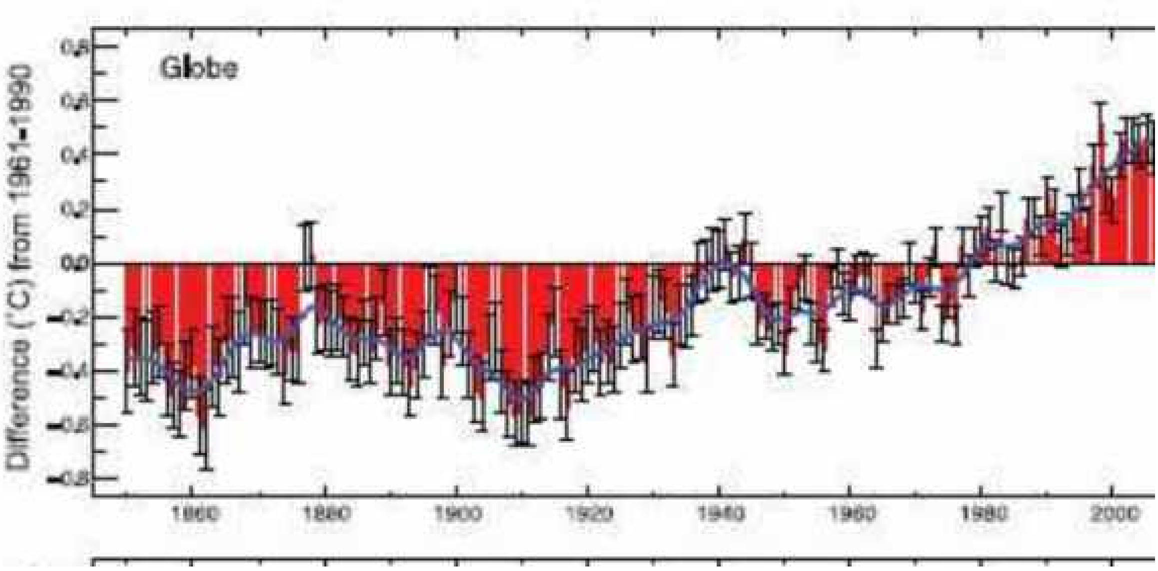

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Figure 2. Mean annual global surface temperature anomaly record (Brohan et al 2006) showing 95% confidence levels.

.There are no alternative global instrumental records that extend as far back as 1850. The only alternative record going back to 1958 is that from radiosonde measurements in the lower troposphere. Figure 3 shows the radiosonde record currently available from the Hadley Centre (Thorne et al 2004).

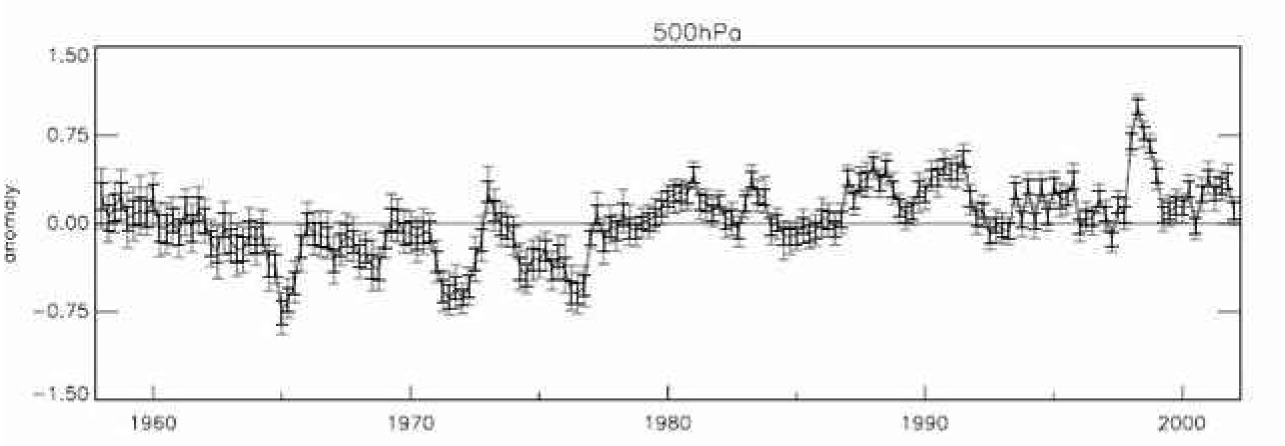

Figure 3 Global mean temperature record in the lower troposphere (500hPg) indicating 95% confidence levels

Figure 3 fits fairly well to that part of Figure 1 since 1958 and confirms that the expected peak global temperature anomaly may already have been reached. It shows a "climate shift" in 1976. It does not display evidence of an additional steady rise which could be attributed to anthropogenic greenhouse gas forcing.

The most reliable and most accurate comparatively recent measure of globally averaged temperature anomalies is from the measurements in the lower troposphere of Microwave Sounder Units (MSUs) on NASA satellites since 1979. (MSU 2007) The most recent monthly global anomaly monthly record is shown in Figure 4.

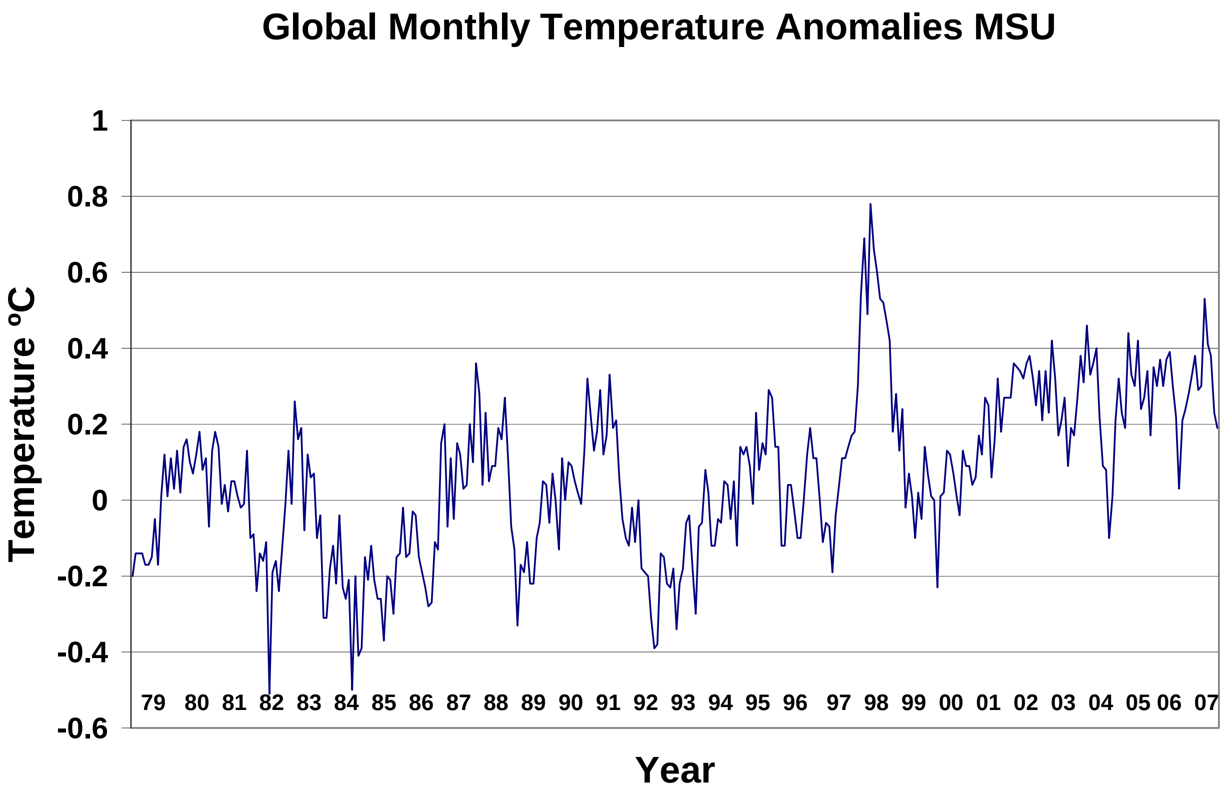

Figure 4. MSU (satellite) monthly global temperature anomaly record since 1979 for the lower troposphere. (MSU 2007).

Figure 4 shows little temperature change from its inception in 1979 until the large temperature anomaly caused by the El Niño ocean oscillation event of 1998. The period since then appears to correspond with the expected final peak of the oscillation depicted in Figure 1. There was a "climate shift" in 2001 after which steady temperatures have persisted until the present. Again, this record shows no evidence of a long-term upwards temperature trend which could be attributed to anthropogenic greenhouse gas forcing.

REGIONAL TEMPERATURE

SR94 already showed that the temperature oscillation they have identified can be seen in regional records,. These can now be updated, The latest corrected record for the continental USA is shown in Figure 5 (NOAA/NCDC 2007)

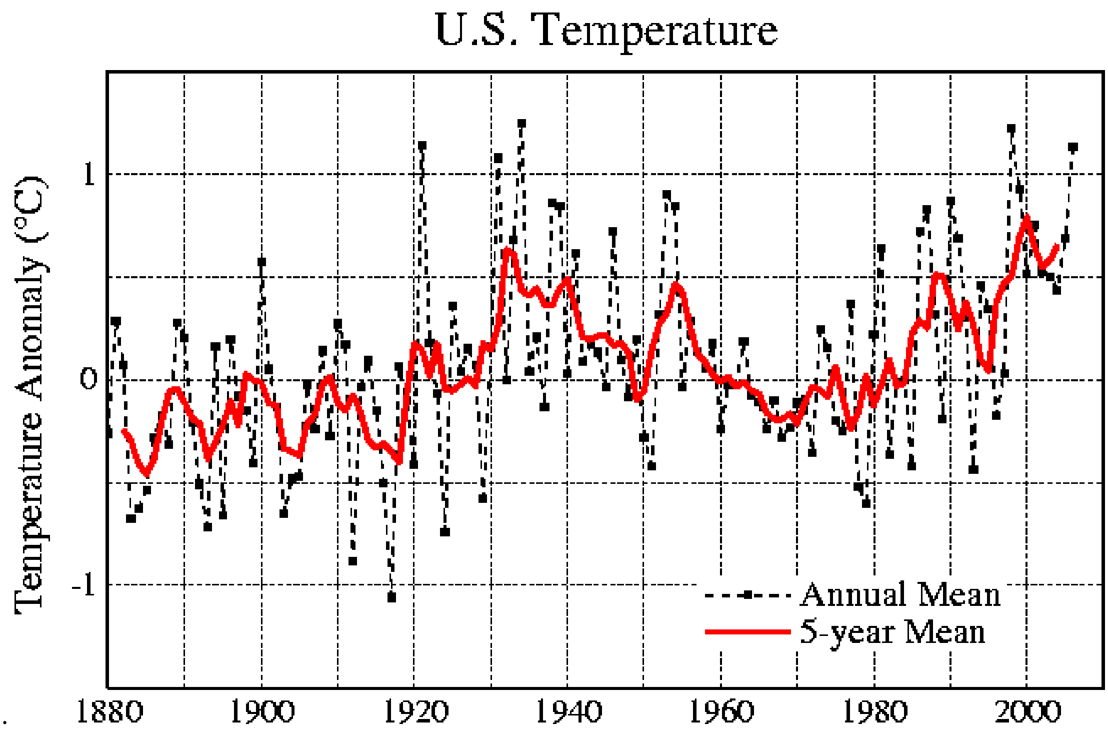

Figure 5 United States temperature anomaly record (Hansen. Goddard Institute of Space Studies, 2007) ..

A comparable record for China is shown in Figure 6 (Zhao et al 2005). It incorporates the earlier records from Wang and Gong (2000) and also shows a subset of an early version of Figure 2 as the bold line graph PJO8SCN. (Jones personal communication),

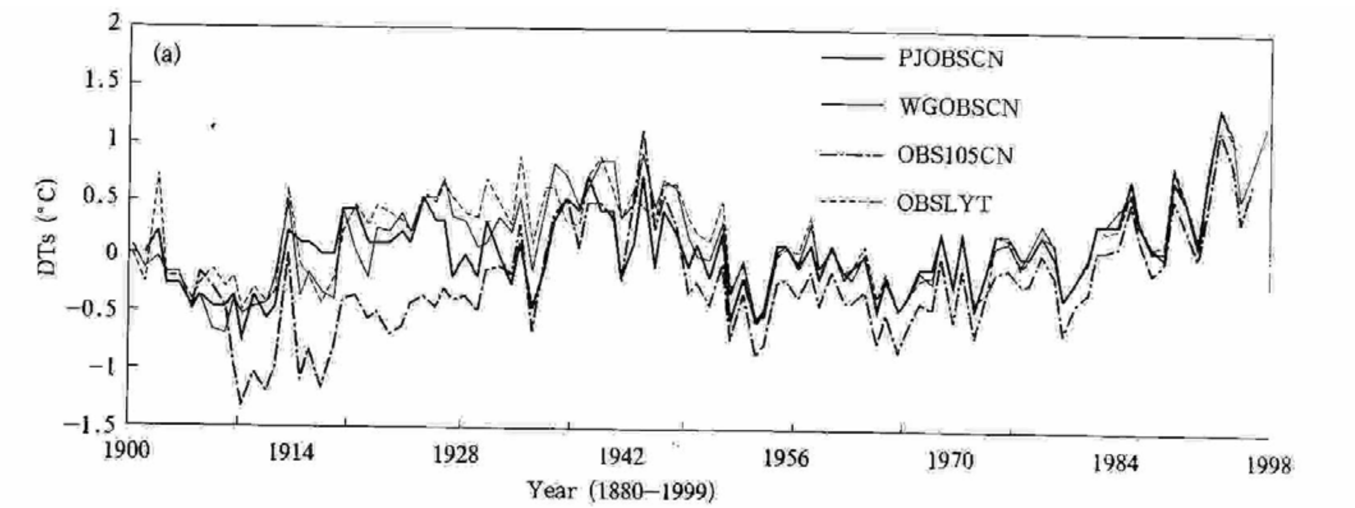

Figure 6 Temperature anomaly record for China (Zhao et al 2005).
Black curve from Jones (personal communication) the other curves from different Chinese investigators.

Both Figure 5 and 6 confirm the existence of the temperature oscillation identified in Figure 1 and they confirm that it has continued towards a likely current peak. They also show no signs of the supposed steady increase attributed to greenhouse forcing of Figure 2 for the 19th century.

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LOCAL TEMPERATURES

There are a few long-lived individual local temperature records where the local bias may have remained fairly steady and which give records that show the oscillation identified in Figure 1. This effect is particularly evident in land regions in the Arctic. A number of these more reliable long-term local records are available on John Daly's website (Daly 2007).

Figure 7 shows two examples, for Reykjavik and Akureyri in Iceland.

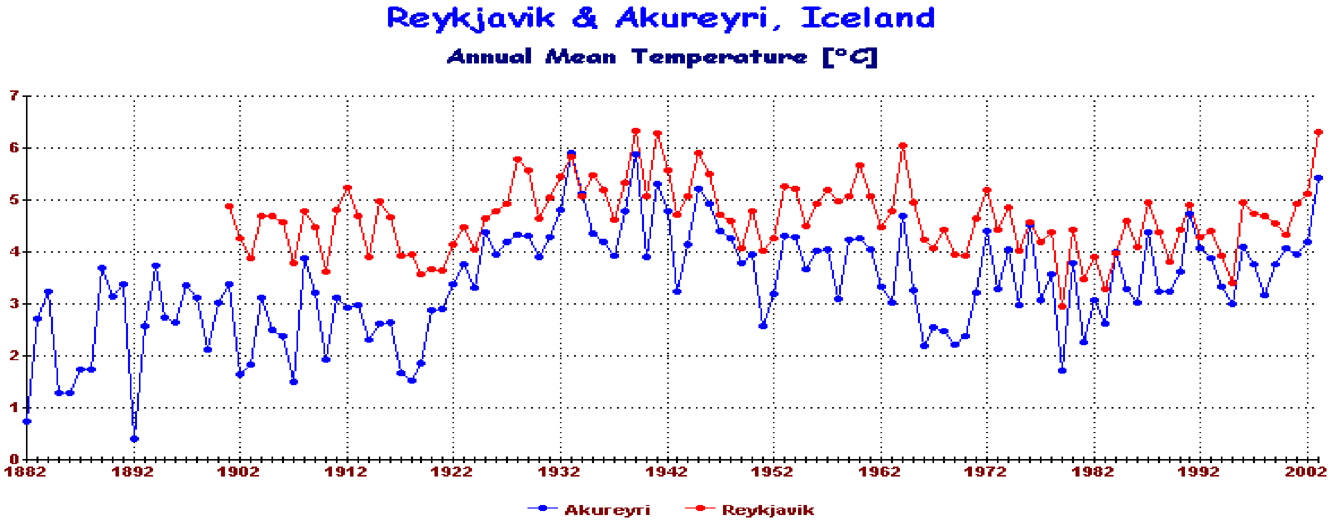

Figure 6. Temperature records from Reykjavik and Akureyri, Iceland. (Daly 2007).

An example from the Southern Hemisphere is Figure 7, from Pudahuel in Chile. (Hansen 2007)

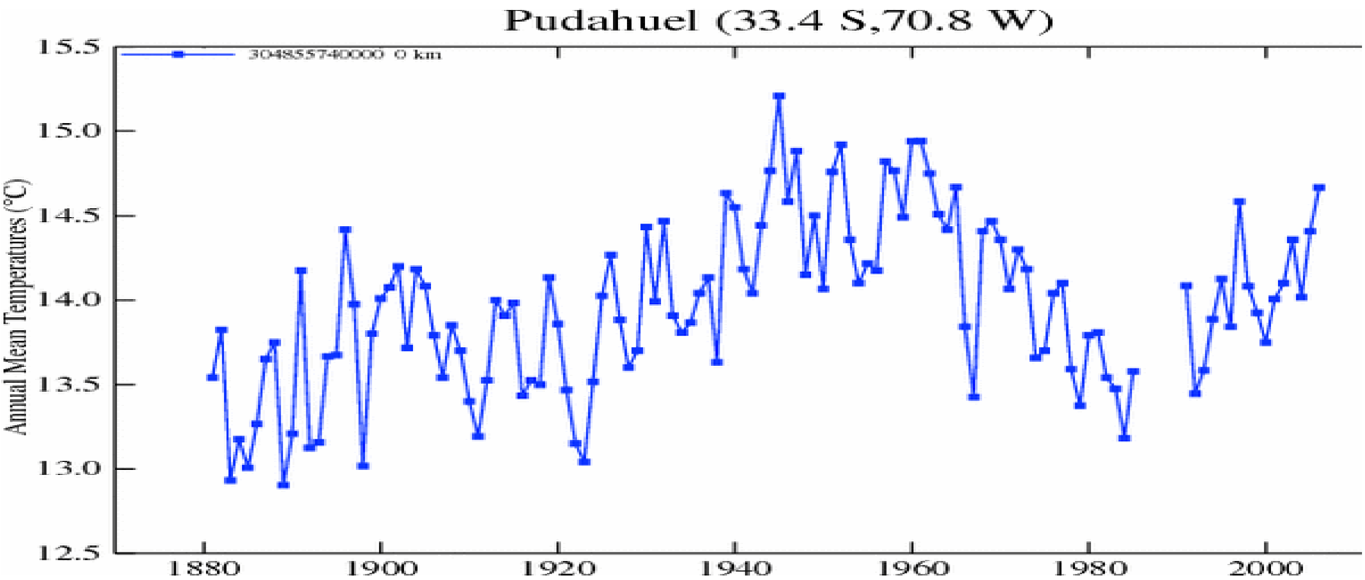

Figure 7 Temperature Record, Pudahuel, Chile Hansen 2007)

DISCUSSION

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Recent surface temperature records, global, regional, and local, lower troposphere, have confirmed the existence of the oscillating global temperature regime with a repeat period of about 65-70 years identified by SR94. The peak of the oscillation, which has now been reached, is therefore likely to be responsible for the warmer temperatures recently experienced , and the continuation of the oscillation after that means that global temperatures should fall within the next few years.

Most of the additional records shown here do not show the steady temperature increase that is superposed on the oscillation in the surface records which is generally assumed to be due to anthropogenic increases in greenhouse gases. Since this rise is missing from most of the other records, its attribution to greenhouse gas forcing must be wrong. .The rise most probably results from the biases and uncertainties connected with the compilation of the surface record.

Tsonis et al (2007) have shown that synchronous behaviour of the various ocean oscillations can provide an explanation for this 65-70 year global and local oscillation in temperature. The various climate shifts can be related to particular changes in the El-Niño –Southern Oscillation (ENSO), the North Atlantic Oscillation (NAO), the Pacific Decadal Oscillation (PDO) and the North Pacific Oscillation NPO).

A periodic temperature change on or above the earth's surface might be expected to lead to a periodicity in the radiative intensity of energy emitted from the earth . There is currently no evidence for such a periodic behaviour in earth's emission of energy. Keihl and Trenberth (1997) give a summary of measurements made for which they claim good accuracy, but reveal no trend. On the other hand Trenberth et al (2002) show much Interannual variability in energy emission, and considerable seasonal and regional variability as well, so a periodic tendency may be difficult to identify.

The oscillation hypothesis would expect higher than average energy emission from the earth at the peak of the oscillation, now present. Hansen (2005) claims that for the present higher temperature, the opposite is true, based on models assuming anthropogenic greenhouse-gas and other forcings. He considers that his model is confirmed by the increasing heat content of the ocean, but this quantity does not show a simple linear increase, but is influenced by the oscillation of Figure 1. A definitive measurement of energy emissions from the earth over an extended period could decide between these theories, as would the rise or fall of global temperature over the next few years.

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