

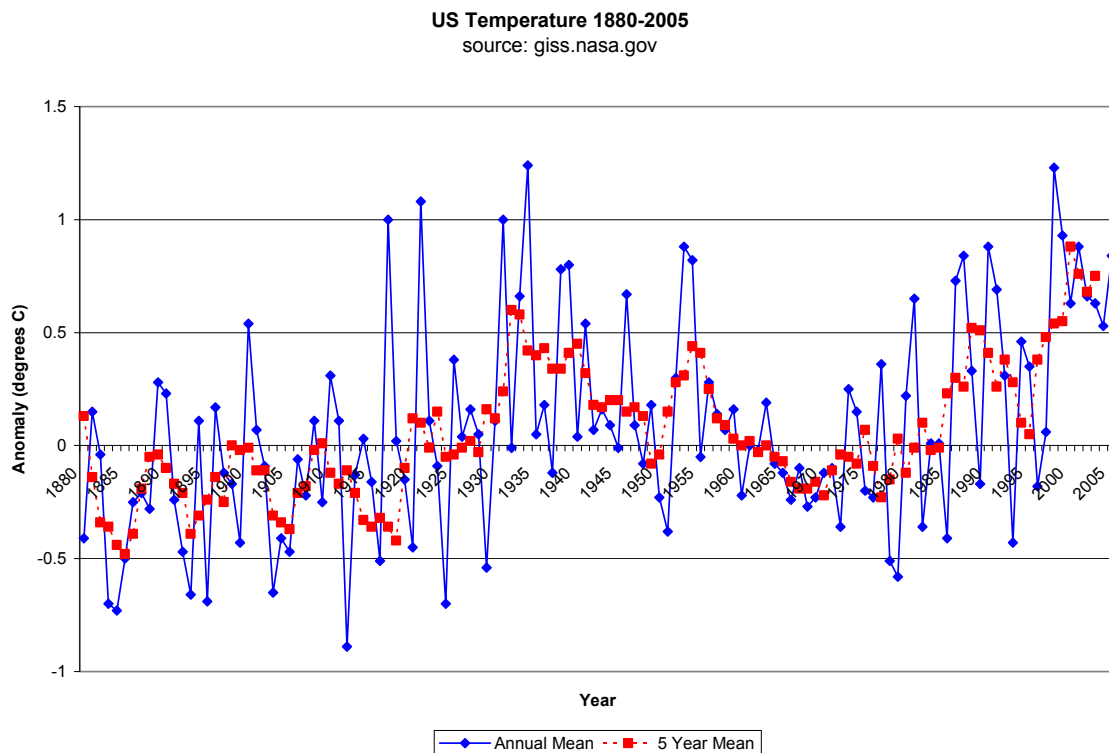


## State of Fear or Country in Denial?

In Michael Crichton's 2004 novel "State of Fear" concern about global warming is polarized. One group, a government agency, believes that there is no global warming and the other, an extreme non-government organization, uses terrorism to demonstrate sudden climate change

Crichton produces a lot of charts like Chart 1 to "prove" that global warming is a beat-up (the anomaly referred to in the chart is the deviation from the average temperature over the period 1951 to 1980). While the book was written in 2004, the chart in the book ends at 2000, which means that warmest 5-year average of the mean temperature in the 48 contiguous US states appeared to be in 1932 rather than in 2000. Artistic license, perhaps. The characters in the book discuss the chart and conclude that there has been net warming of one-third of a degree since 1880. They note the cooling between the early 1930's and the late 1970's, and the subsequent warming but are satisfied that, as there has been no net warming since 1930, global warming is not happening.

Chart 1

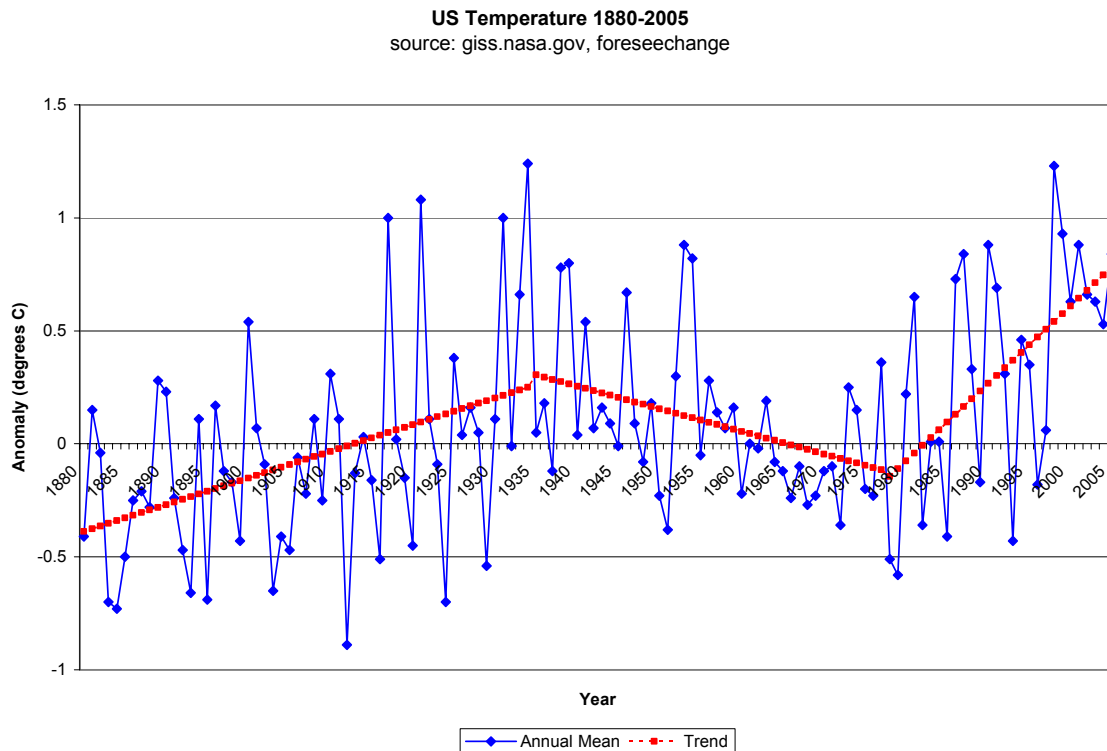


Michael Crichton's fictional characters, or perhaps Crichton himself, do not question why there was cooling between the 1930's and the 1970's. Perhaps doing so would make less interesting fiction.



In Chart 2, I have fitted three separate trends to the data. The first is between 1880 and 1934, the second is between 1935 and 1977, and the third is from 1978 to 2005. All three trends are statistically significant.

## Chart 2



The overall trend is an increase of +0.5 degrees per century. Between 1880 and 1934, the trend was +1.2 degrees per century. The trend reversed to -1.0 degrees per century between 1935 and 1977 and then reversed again to +3.4 degrees per century since 1978.

We now have to find a factor that explains both trend breaks. The most obvious culprit is sulphur dioxide.

Sulphur dioxide is emitted by coal-burning power stations. The direct impact of sulphur dioxide particles in the atmosphere is a cooling effect. Short wave solar radiation is scattered back to space leading to a cooling tendency which is larger than the warming effect due to absorption of long wave reflected radiation by soot particles. Burning of coal by power stations would have increased from the 1930's as the US emerged from depression and as more homes were connected to electricity or bought electric appliances. Action to reduce sulphur dioxide emissions was initiated in the 1970's, in order to reduce the health impact of this pollution and to reduce acid rain. In the USA, the EPA reports a 39% reduction between 1980 and 2000, while in Britain a reduction of 76% has been achieved between 1980 and 2000.

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The impact of increasing sulphur dioxide pollution between the early 1930's and the late 1970's was a net cooling and since then the decline in pollution has allowed the atmosphere to resume warming.

An uncritical trend analysis in Michael Crichton's book allowed the conclusion that global warming was either non-existent or insignificant. But by seeking explanations for the changing trends a very different conclusion has emerged. If the temperature continues to rise at the rate of 3.4 degrees per century, then urgent action to reduce this trend is needed.

Global warming skeptics still use the constant trend model, along with selective subsets of the temperature records, to "prove" that global warming is a fiction and this has meant that the US government in particular has had a false excuse for complacency and procrastination (see [www.co2science.org](http://www.co2science.org) for an instance).

According to New Scientist magazine (18 February 2006) Larry Nation, of the American Association of Petroleum Geologists, recently gave Michael Crichton a journalism award for his State of Fear book. Nation said "It is fiction ... But it has the absolute ring of truth."