

Climate

A Cooling Earth?

Problem Set Solutions

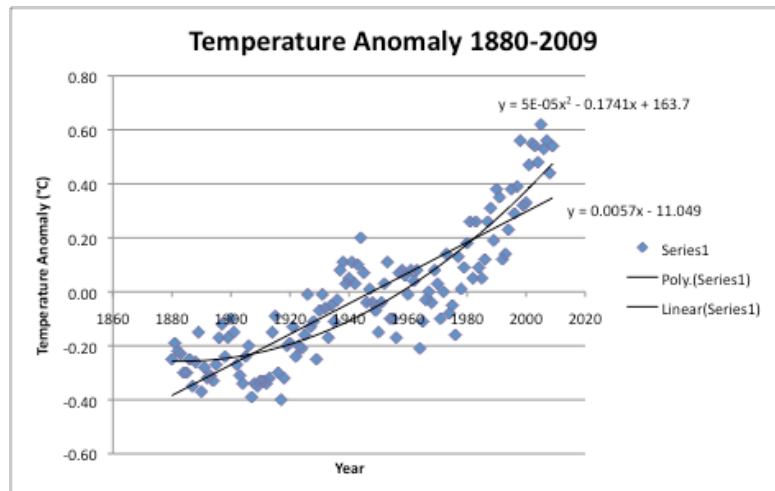
Problem 1: In the 'A Cooling Earth?' article, data from <http://data.giss.nasa.gov/gistemp/graphs/> is plotted to show that the trend of global temperature change is the same in the last 10 years and in the last 30 years ($0.16^{\circ}\text{C}/\text{yr}$). The data is available from 1880.

- Create a plot from 1880 to the present and compare the slope of the graph to the slopes from the last decade and the last 30 years. Use the Global Annual Land and Ocean Surface Temperature Anomaly data, available in tabular form:
<http://data.giss.nasa.gov/gistemp/graphs/fig.A2.txt>
- If the slopes are not similar, try other mathematical forms to see which fit the best and observe how predications for 2030 and 2050 depend on what form you choose.

Solution:

From *A Cooling Earth?* The slope of Temperature Anomaly against year for 1999-2009 is $0.17^{\circ}\text{C}/\text{year}$ and for 1980-2009 is $0.16^{\circ}\text{C}/\text{year}$.

When the data is plotted from 1880 – 2009, the slope is considerably less at $0.06^{\circ}\text{C}/\text{year}$. The anomaly is calculated by subtracting the average temperature in a given year from the average temperature between 1951-1980. Thus the anomalies from 1880-1950 do not represent an accurate measure of the deviation of the temperature that year from the average temperature during that time period.



This also suggests that in the long term the data are not linear. Thus a polynomial was used to fit the data. If the curve is extrapolated to the years 2030 or 2050, it can be seen that the temperature anomaly will rise more sharply than it would if the trend were linear.

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