Rows	Year	Temp (C)	Residuals Temp (C)
1	1880	-0.31	0.02874108
2	1881	-0.27	0.06424748
3	1882	-0.31	0.01975388
4	1883	-0.39	-0.0647397
5	1884	-0.48	-0.1592333
6	1885	-0.41	-0.0937269
7	1886	-0.32	-0.0082205
8	1887	-0.43	-0.1227141
9	1888	-0.37	-0.0672077
10	1889	-0.22	0.07829866
11	1890	-0.45	-0.1561949
12	1891	-0.38	-0.0906885
13	1892	-0.4	-0.1151822
14	1893	-0.43	-0.1496758
15	1894	-0.35	-0.0741694
16	1895	-0.29	-0.018663
17	1896	-0.1	0.16684344
18	1897	-0.08	0.18234983
19	1898	-0.27	-0.0121438
20	1899	-0.12	0.13336263
21	1900	0.01	0.25886903
22	1901	-0.08	0.16437542
23	1902	-0.17	0.06988182
24	1903	-0.3	-0.0646118
25	1904	-0.39	-0.1591054
26	1905	-0.25	-0.023599
27	1906	-0.15	0.07190741
28	1907	-0.35	-0.1325862
29	1908	-0.34	-0.1270798
30	1909	-0.25	-0.0415734
31	1910	-0.25	-0.046067
32	1911	-0.3	-0.1005606
33	1912	-0.21	-0.0150542
34	1913	-0.21	-0.0195478
35	1914	-0.09	0.09595859
36	1915	0	0.18146498
37	1916	-0.21	-0.0330286
38	1917	-0.4	-0.2275222
39	1918	-0.29	-0.1220158
40	1919	-0.16	0.00349057
41	1920	-0.17	-0.011003
42	1921	-0.12	0.03450337
43	1922	-0.2	-0.0499902
44	1923	-0.18	-0.0344838
45	1924	-0.19	-0.0489774
46	1925	-0.12	0.01652896
47	1926	0.07	0.20203535
48	1927	-0.04	0.08754175
49	1928	-0.05	0.07304815
50	1929	-0.22	-0.1014455
51	1930	-0.03	0.08406094
52	1931	0.05	0.15956734
53	1932	-0.01	0.09507374
54	1933	-0.11	-0.0094199
55	1934	-0.02	0.07608653
56	1935	-0.06	0.03159293
57	1936	-0.02	0.06709933
58	1937	0.1	0.18260572
59	1938	0.14	0.21811212
60	1939	0.04	0.11361852
61	1940	0.04	0.10912492
62	1941	0.07	0.13463131
63	1942	0.01	0.07013771
64	1943	0	0.05564411
65	1944	0.15	0.2011505
66	1945	0.06	0.1066569
67	1946	-0.08	-0.0378367
68	1947	-0.05	-0.0123303
69	1948	-0.06	-0.0268239

| Rows	Year	Temp (C)	Residuals Temp (C)
70	1949	-0.06	-0.0313175
71	1950	-0.13	-0.1058111
72	1951	-0.02	-0.0003047
73	1952	0.07	0.08520168
74	1953	0.11	0.12070808
75	1954	-0.13	-0.1237855
76	1955	-0.14	-0.1382791
77	1956	-0.23	-0.2327727
78	1957	0.07	0.06273367
79	1958	0.12	0.10824007
80	1959	0.05	0.03374646
81	1960	0	-0.0207471
82	1961	0.11	0.08475926
83	1962	0.1	0.07026565
84	1963	0.11	0.07577205
85	1964	-0.15	-0.1887216
86	1965	-0.12	-0.1632152
87	1966	-0.02	-0.0677088
88	1967	-0.04	-0.0922024
89	1968	-0.08	-0.136696
90	1969	0.08	0.01881044
91	1970	0.05	-0.0156832
92	1971	-0.1	-0.1701768
93	1972	0.02	-0.0546704
94	1973	0.15	0.07083602
95	1974	-0.11	-0.1936576
96	1975	-0.08	-0.1681512
97	1976	-0.21	-0.3026448
98	1977	0.1	0.00286161
99	1978	0.03	-0.071632
100	1979	0.12	0.01387441
101	1980	0.18	0.06938081
102	1981	0.24	0.1248872
103	1982	0.09	-0.0296064
104	1983	0.31	0.1859
105	1984	0.1	-0.0285936
106	1985	0.07	-0.0630872
107	1986	0.16	0.02241919
108	1987	0.33	0.18792559

Each measurement is the temperature (in degrees Celsius) averaged for the northern hemisphere over a full year. The series begins in 1880 and runs through 1987. All measurements are expressed as differences from their 108-year mean. (Data from P. D. Jones, "Hemispheric Surface Air Temperature Variations—Recent Trends Plus an Update to 1987," *Journal of Climatology* 1 (1988): 654–60.) Is the mean temperature increasing over the 88 years? What is the rate of increase in global temperature over the past century?

Summary of Statistical Findings

The estimate of global warming is an increase of 0.46 degrees Celsius per century. (An approximate 95% confidence interval for the slope is 0.22 to 0.70, adjusted for a serial correlation of 0.452). There is convincing evidence of a trend of increasing mean temperature between 1880 and 1987 (two-sided p-value < 0.0001).

sleuthtemptime- Fit Least Squares

Response Temp (C)

Regression Plot

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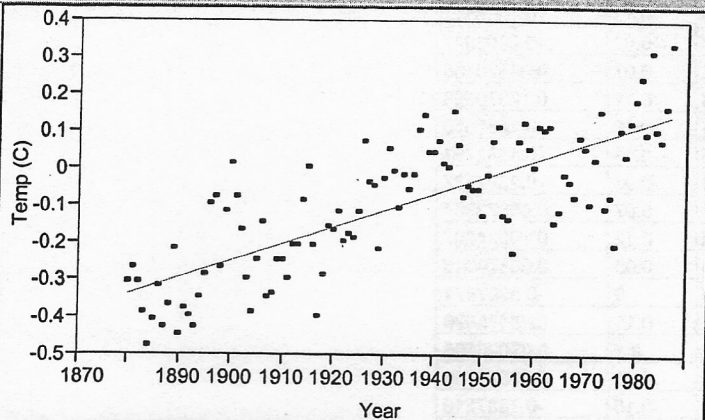
Summary of Fit

RSquare	0.606676
RSquare Adj	0.602965
Root Mean Square Error	0.113858
Mean of Response	-0.09833
Observations (or Sum Wgts)	108

Analysis of Variance

Source	DF	Sum of Squares	Mean Square	F Ratio
Model	1	2.1195425	2.11954	163.4976
Error	106	1.3741575	0.01296	Prob > F
C. Total	107	3.4937000		<.0001

Parameter Estimates

Term	Estimate	Std Error	t Ratio	Prob>|t|
Intercept	-8.786714	0.679578	-12.93	<.0001
Year	0.0044936	0.000351	12.79	<.0001

Effect Tests

Source	Nparm	DF	Sum of Squares	F Ratio	Prob > F
Year	1	1	2.1195425	163.4976	<.0001

Residual by Row Plot
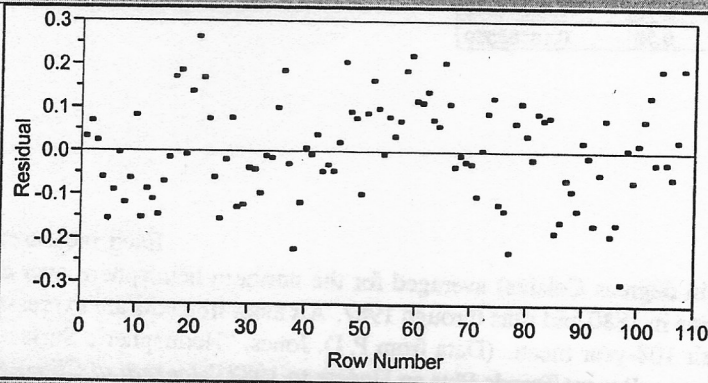
Durbin-Watson

Durbin-Watson	Number of Obs.	AutoCorrelation	Prob<DW
1.068734	108	0.4525	0.0001

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Output obtained using:

- Analyze
  - Fit Model (Select "Minimal Report" option from Emphasis box)

Click on red down arrow next to "Response Temp (C)" and select

- Row diagnostics
  - Plot Residual by Row
  - Durbin Watson Test
    - Click red down arrow next to "Durbin-Watson" to see a probability result.

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Y = Temp (°C)
 = (temperature averaged over the northern hemisphere over a full year) − (108 year average)

X = Year