Los Angeles and Global Temperature Change Observations: Getting Hot in Here

# Summary

Los Angeles is hotter than the global average and the difference has been consistent over time. The city is of a Mediterranean climate which is a dry subtropical climate. It has relatively modest changes in temperature throughout the year, however, the temperature has been increasing for the area. It has for the rest of the planet as well.

# The Queries

The first step of the process was to find the city where I am located. To do this, I had to query for the city in the city\_list table. I had to be specific about the city name and the country it was in since Los Angeles is a Spanish name which other cities can share around the world such as Los Angeles, Chile. To get the right Los Angeles, the United States had to be in the same entry in the table, so the query began as follows:



Now that I received a direct result of Los Angeles in the United States from the city\_list table, it was time for the next step which was to get the yearly temperatures. To do this, I would be querying the city\_data database. It shared several columns with the city\_list such as the country and city. You could do a join of both tables based on those, but that wouldn’t be necessary for the purposes of this exercise. The query used to get the Los Angeles, USA temperatures is as follows:



If we decided to get two more cities to compare Los Angeles with such as Novobirsk located in Siberian Russia to see inland extremes and Kuala Lumpur, Malaysia to see tropical weather:



After this, it was time to get the global temperatures. The data returned from Los Angeles went from the years 1849 – 2013. The global data at first query with:



This query produced far more data than what was needed since it had data from many years that were not in the Los Angeles data. This would not be a good data analysis if we had one set with years that the other did not have. The query then had to be adjusted for the years 1849 – 2013 so data analysis could properly get done:



After this, we had a good dataset to start working with so we can compare Los Angeles with Novobirsk, Kuala Lumpur, and the global average. Please note that some of the earliest entries for Kuala Lumpur are marked “N/A”because there is no data for that year.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Year** | **LA Avg** | **Novobirsk Avg** | **Kuala Lumpur Avg** | **Global Avg Temp** |
| 1849 | 15.71 | -0.29 | N/A | 7.98 |
| 1850 | 15.28 | -1.17 | 26.06 | 7.9 |
| 1851 | 15.53 | -0.74 | 26.13 | 8.18 |
| 1852 | 15.61 | -0.38 | 26.02 | 8.1 |
| 1853 | 16.27 | -1.88 | 26.26 | 8.04 |
| 1854 | 15.74 | 0.16 | 25.98 | 8.21 |
| 1855 | 15.94 | 0.13 | 26.12 | 8.11 |
| 1856 | 15.52 | 0.09 | 26.21 | 8 |
| 1857 | 16.19 | -1.37 | N/A | 7.76 |
| 1858 | 15.67 | 0.01 | 26.21 | 8.1 |
| 1859 | 15.29 | 1.1 | 26.27 | 8.25 |
| 1860 | 15.41 | -2.38 | 25.97 | 7.96 |
| 1861 | 16.51 | -0.7 | 25.93 | 7.85 |
| 1862 | 16.05 | -1.8 | N/A | 7.56 |
| 1863 | 15.88 | 0.64 | 26.11 | 8.11 |
| 1864 | 16.62 | -0.91 | 25.95 | 7.98 |
| 1865 | 15.89 | -0.61 | 26.22 | 8.18 |
| 1866 | 16.33 | 0 | 26.22 | 8.29 |
| 1867 | 16.51 | 1.56 | 26.12 | 8.44 |
| 1868 | 16.09 | -0.37 | 26.14 | 8.25 |
| 1869 | 16.05 | -0.43 | 25.95 | 8.43 |
| 1870 | 15.64 | -0.78 | 25.59 | 8.2 |
| 1871 | 15.89 | -0.08 | 25.68 | 8.12 |
| 1872 | 15.66 | -2.38 | 26.23 | 8.19 |
| 1873 | 15.7 | -0.15 | 26.47 | 8.35 |
| 1874 | 15.33 | 1.15 | 26.16 | 8.43 |
| 1875 | 16.19 | -0.51 | 25.59 | 7.86 |
| 1876 | 15.7 | -0.84 | 25.75 | 8.08 |
| 1877 | 16.24 | -0.19 | 26.31 | 8.54 |
| 1878 | 15.44 | 0.22 | 26.61 | 8.83 |
| 1879 | 15.55 | -0.05 | 25.88 | 8.17 |
| 1880 | 14.36 | 0.17 | 26.21 | 8.12 |
| 1881 | 15.65 | -0.31 | 26.6 | 8.27 |
| 1882 | 14.85 | -0.96 | 26.18 | 8.13 |
| 1883 | 15.52 | -1.26 | 26.05 | 7.98 |
| 1884 | 15.28 | -0.59 | 25.98 | 7.77 |
| 1885 | 16.44 | -0.99 | 26.36 | 7.92 |
| 1886 | 15.74 | -1.05 | 26.35 | 7.95 |
| 1887 | 15.62 | 0.27 | 25.71 | 7.91 |
| 1888 | 15.91 | 0.23 | 26.33 | 8.09 |
| 1889 | 16.22 | -1.6 | 26.47 | 8.32 |
| 1890 | 15.8 | -1.97 | 25.94 | 7.97 |
| 1891 | 15.63 | -1.47 | 26.17 | 8.02 |
| 1892 | 15.33 | -1.27 | 25.94 | 8.07 |
| 1893 | 14.95 | 0.42 | 25.89 | 8.06 |
| 1894 | 14.83 | -0.48 | 26.08 | 8.16 |
| 1895 | 15.36 | -0.55 | 26.16 | 8.15 |
| 1896 | 16.1 | -0.27 | 26.61 | 8.21 |
| 1897 | 15.32 | -1.44 | 26.59 | 8.29 |
| 1898 | 15.65 | -0.78 | 26.36 | 8.18 |
| 1899 | 15.59 | 0.64 | 26.24 | 8.4 |
| 1900 | 16.08 | 0.06 | 26.56 | 8.5 |
| 1901 | 15.72 | -0.1 | 26.12 | 8.54 |
| 1902 | 15.08 | -0.67 | 26.11 | 8.3 |
| 1903 | 15.49 | -0.85 | 26.18 | 8.22 |
| 1904 | 16.24 | 1 | 25.95 | 8.09 |
| 1905 | 15.52 | -0.57 | 26.7 | 8.23 |
| 1906 | 15.74 | -0.4 | 26.22 | 8.38 |
| 1907 | 15.46 | -0.97 | 26.34 | 7.95 |
| 1908 | 15.17 | -0.58 | 26.26 | 8.19 |
| 1909 | 15.01 | -0.36 | 26.44 | 8.18 |
| 1910 | 15.94 | -1.41 | 26.08 | 8.22 |
| 1911 | 14.82 | -0.31 | 26.31 | 8.18 |
| 1912 | 14.84 | -1.82 | 26.47 | 8.17 |
| 1913 | 15.2 | 0.43 | 26.13 | 8.3 |
| 1914 | 15.65 | 0.3 | 26.72 | 8.59 |
| 1915 | 15.43 | 0.51 | 26.72 | 8.59 |
| 1916 | 14.6 | -0.84 | 26.33 | 8.23 |
| 1917 | 15.59 | 0.07 | 25.87 | 8.02 |
| 1918 | 15.65 | -0.18 | 26.02 | 8.13 |
| 1919 | 15.34 | -1.08 | 26.59 | 8.38 |
| 1920 | 15.06 | -0.58 | 26.46 | 8.36 |
| 1921 | 15.76 | 0.77 | 26.27 | 8.57 |
| 1922 | 15.31 | 0.59 | 26.35 | 8.41 |
| 1923 | 15.39 | 0.93 | 26.32 | 8.42 |
| 1924 | 15.69 | 0.33 | 26.45 | 8.51 |
| 1925 | 15.72 | 0.59 | 26.26 | 8.53 |
| 1926 | 16.6 | 0.16 | 26.57 | 8.73 |
| 1927 | 15.41 | -0.69 | 26.45 | 8.52 |
| 1928 | 15.98 | -0.52 | 26.56 | 8.63 |
| 1929 | 16.1 | -1.27 | 26.58 | 8.24 |
| 1930 | 15.99 | -0.54 | 26.86 | 8.63 |
| 1931 | 16.6 | -0.74 | 26.86 | 8.72 |
| 1932 | 15.4 | 1.6 | 26.53 | 8.71 |
| 1933 | 15.4 | -1.56 | 26.48 | 8.34 |
| 1934 | 17.03 | -0.34 | 26.32 | 8.63 |
| 1935 | 15.5 | -0.56 | 26.56 | 8.52 |
| 1936 | 16.6 | 0.23 | 26.67 | 8.55 |
| 1937 | 15.68 | -1.5 | 26.78 | 8.7 |
| 1938 | 15.89 | -0.34 | 26.72 | 8.86 |
| 1939 | 16.3 | 0.6 | 26.62 | 8.76 |
| 1940 | 16.53 | 0.04 | 26.97 | 8.76 |
| 1941 | 15.62 | -1.03 | 27.34 | 8.77 |
| 1942 | 15.77 | 0.34 | 26.95 | 8.73 |
| 1943 | 16.12 | 0.4 | 26.58 | 8.76 |
| 1944 | 15.03 | 0.95 | 26.73 | 8.85 |
| 1945 | 15.7 | -0.42 | 26.74 | 8.58 |
| 1946 | 15.65 | -0.31 | 26.85 | 8.68 |
| 1947 | 15.98 | -0.75 | 26.92 | 8.8 |
| 1948 | 15.09 | 0.67 | 26.79 | 8.75 |
| 1949 | 15.36 | -0.22 | 26.71 | 8.59 |
| 1950 | 16.2 | -0.21 | 26.62 | 8.37 |
| 1951 | 15.76 | 0.56 | 26.77 | 8.63 |
| 1952 | 15.33 | -0.77 | 26.84 | 8.64 |
| 1953 | 15.68 | 0.72 | 26.85 | 8.87 |
| 1954 | 16.05 | -1.85 | 26.62 | 8.56 |
| 1955 | 15.34 | 0.43 | 26.64 | 8.63 |
| 1956 | 15.7 | -0.31 | 26.57 | 8.28 |
| 1957 | 15.8 | 0.2 | 26.88 | 8.73 |
| 1958 | 16.7 | -0.32 | 27.18 | 8.77 |
| 1959 | 17.05 | -0.43 | 26.96 | 8.73 |
| 1960 | 16.31 | -1.57 | 26.94 | 8.58 |
| 1961 | 16.21 | 0.68 | 26.77 | 8.8 |
| 1962 | 15.62 | 1.57 | 26.69 | 8.75 |
| 1963 | 15.73 | 1.22 | 26.91 | 8.86 |
| 1964 | 15.28 | 0.28 | 26.77 | 8.41 |
| 1965 | 15.34 | 0.94 | 26.73 | 8.53 |
| 1966 | 15.99 | -1.41 | 26.89 | 8.6 |
| 1967 | 15.92 | 0.94 | 26.62 | 8.7 |
| 1968 | 15.89 | -0.72 | 26.84 | 8.52 |
| 1969 | 15.79 | -2.17 | 27.05 | 8.6 |
| 1970 | 16 | -0.3 | 26.97 | 8.7 |
| 1971 | 15.26 | 0.74 | 26.55 | 8.6 |
| 1972 | 15.96 | -0.81 | 26.94 | 8.5 |
| 1973 | 15.51 | 1.34 | 27.03 | 8.95 |
| 1974 | 15.85 | -1.39 | 26.73 | 8.47 |
| 1975 | 15.12 | 0.71 | 26.56 | 8.74 |
| 1976 | 16.18 | -0.59 | 26.6 | 8.35 |
| 1977 | 16.26 | 0.41 | 26.95 | 8.85 |
| 1978 | 16.01 | 1.11 | 26.99 | 8.69 |
| 1979 | 15.88 | 0.11 | 27.08 | 8.73 |
| 1980 | 16.23 | 0.53 | 26.98 | 8.98 |
| 1981 | 16.89 | 1.4 | 26.95 | 9.17 |
| 1982 | 15.44 | 1.84 | 26.86 | 8.64 |
| 1983 | 16.2 | 2.61 | 27.35 | 9.03 |
| 1984 | 16.76 | -1.39 | 26.59 | 8.69 |
| 1985 | 15.96 | -0.33 | 26.83 | 8.66 |
| 1986 | 16.5 | 0.19 | 26.93 | 8.83 |
| 1987 | 16.09 | 0.06 | 27.27 | 8.99 |
| 1988 | 16.44 | 1.19 | 27.15 | 9.2 |
| 1989 | 16.36 | 1.75 | 26.85 | 8.92 |
| 1990 | 16.37 | 1.84 | 27.21 | 9.23 |
| 1991 | 16 | 1.36 | 27.04 | 9.18 |
| 1992 | 16.79 | 1.3 | 27.05 | 8.84 |
| 1993 | 16.36 | 0.56 | 26.99 | 8.87 |
| 1994 | 16.29 | 1.34 | 27 | 9.04 |
| 1995 | 16.64 | 2.69 | 27.05 | 9.35 |
| 1996 | 17.08 | -0.39 | 27.04 | 9.04 |
| 1997 | 16.93 | 2.05 | 27.29 | 9.2 |
| 1998 | 15.37 | 0.57 | 27.89 | 9.52 |
| 1999 | 16.12 | 1.44 | 26.95 | 9.29 |
| 2000 | 16.64 | 0.69 | 27.14 | 9.2 |
| 2001 | 16.47 | 1.4 | 27.24 | 9.41 |
| 2002 | 16.43 | 2.52 | 27.57 | 9.57 |
| 2003 | 16.94 | 1.61 | 27.36 | 9.53 |
| 2004 | 16.55 | 1.47 | 27.35 | 9.32 |
| 2005 | 16.43 | 1.48 | 27.59 | 9.7 |
| 2006 | 16.62 | 0.74 | 27.29 | 9.53 |
| 2007 | 16.7 | 2.5 | 27.23 | 9.73 |
| 2008 | 17.01 | 1.93 | 27.12 | 9.43 |
| 2009 | 16.68 | -0.09 | 27.47 | 9.51 |
| 2010 | 15.89 | -0.88 | 27.69 | 9.7 |
| 2011 | 15.87 | 1.28 | 27.27 | 9.52 |
| 2012 | 17.09 | 1.07 | 27.36 | 9.51 |
| 2013 | 18.12 | 2.31 | 27.8 | 9.61 |

# Moving Averages

Now that we had our data, it was time to start making the moving averages. Since we were dealing with a period of 164 years. This could have also been done for 4-year increments which would have included every data point, but it would mean that there would be 41 data points which might not provide the most concise presentation. 10- year increments seemed approachable since 10 years would leave us with 16 entries for the chart to make it concise yet descriptive. The tradeoff, however would mean that our dataset would end in the year 2008. This seemed to still be the better approach to give us a more readable table and chart. The resulting table is as follows:

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Period** | **LA Running Avg** | **Novobirsk Running Avg** | **Kuala Lumpur Running Avg** | **Global Running Avg** |
| 1849 - 1858 | 15.746 | -0.544 | 26.12375 | 8.038 |
| 1859 - 1868 | 16.058 | -0.347 | 26.10333333 | 8.087 |
| 1869 - 1878 | 15.784 | -0.399 | 26.034 | 8.303 |
| 1879 - 1888 | 15.492 | -0.454 | 26.165 | 8.031 |
| 1889 - 1898 | 15.519 | -0.941 | 26.221 | 8.143 |
| 1899 - 1908 | 15.609 | -0.244 | 26.268 | 8.28 |
| 1909 - 1918 | 15.273 | -0.361 | 26.309 | 8.261 |
| 1919 - 1928 | 15.626 | 0.05 | 26.428 | 8.506 |
| 1929 - 1938 | 16.019 | -0.502 | 26.636 | 8.59 |
| 1939 - 1948 | 15.779 | 0.049 | 26.849 | 8.744 |
| 1949 - 1958 | 15.792 | -0.177 | 26.768 | 8.607 |
| 1959 - 1968 | 15.934 | 0.15 | 26.812 | 8.648 |
| 1969 - 1978 | 15.794 | -0.095 | 26.837 | 8.645 |
| 1979 - 1988 | 16.239 | 0.621 | 26.999 | 8.892 |
| 1989 - 1998 | 16.419 | 1.307 | 27.141 | 9.119 |
| 1999 - 2008 | 16.591 | 1.578 | 27.284 | 9.471 |

This looked left a result of 16 entries which would give a nice, clean chart:

If we wanted to check out the correlations and their accuracy, we can see the fits below:

A linear fit was chosen so that it was simple. The correlation coefficient was higher for Los Angeles compared to the rest of the world. Both again clearly show an upward trend.

# Los Angeles Observations

* The city has enjoyed warm yet mild temperatures throughout the years.
* The temperatures are trending upwards though and the data seems to indicate that this will continue.
* The total change has been 0.845 degrees C.
* The pace has been steady though it seems to be less dramatic of changes compared to the rest of the globe. This can be related to the influence of the maritime climate. Other regions that are more inland, elevated, or at different latitudes might have more dramatic changes.

# Others Cities Observations

* Both Novobirsk and Kuala Lumpur have been getting warmer
* Novobirsk warmed up 1.034 degrees and Kuala Lumpur warmed up 1.16025 degrees.
* Los Angles has had milder of a heat increase compared to these two. Most likely from its special geography as these places tend to have special climates as well.

# Global Observations

* Globally, the temperature has increased through the past few centuries as well.
* The change has been 1.433 degrees which is a bit more pronounced than the Los Angeles changes as well as the other noted cities. The city that warmed up the closest to the average was Kuala Lumpur.
* It can be noted that the warming process is starting to move at a higher rate in the past half of the century.

# Observations Summary

Los Angeles is hotter than the global average and the difference has been consistent over time. The city is of a Mediterranean climate which is a dry subtropical climate. It has relatively modest changes in temperature throughout the year, however, the temperature has been increasing for the area. It has for the rest of the planet as well from what we learned today in observing two other cities in addition to the global average. The causes of this are likely from growing human population and demands of the planet. The change has been increasing more in the most recent decades, so it will be interesting to see if the environmental awareness with things such as banning certain fuels are helping mitigate the changes.