Fiker Zewdie

All temperature data was taken from NASA’s databases. To track differences in urban areas and suburban areas in the New York area, two sample locations were used. These two locations representing urban and suburban areas were Times Square and Ardsley, respectively. This research aims to look at temperature differences between Times Square, an urbanized area of Manhattan and Ardsley, a suburban area in Westchester County, NY. The temperature data from these two areas contained daily maximum temperatures during the 67-year period from 1950-2016. In order to plot and interpret the data, Python’s Matplotlib and NumPy packages were mainly used.

In climate science, a heat wave is generally defined broadly as days when temperatures reach higher than normal. This research aims to understand the intensity, changes, frequency, and timing of heat waves. It also predicts what a heat wave will look like in the coming years assuming that the rate of the release of emissions and urbanization continues. This research is aimed to answer if urbanization amplifies warming trends in Times Square more than it does in Ardsley

For the purpose of this research, the 90th percentile is used as an arbitrary threshold to define the minimum temperature for a day to be considered an extreme heat day in both locations. The 95th percentile is also used for comparisons and the understanding of the extremes. The use of the 90th percentile allows for the use of a threshold appropriate for local climatic variability (CCSP 2008).

In understanding the interaction between the urban heat island and global warming trends, temperatures were divided into two 30-year time periods. The first time period was from 1951-1980 and the second time period was from 1987-2016. The temperature distribution was plotted for both 30-year time periods in both locations. These time periods were used to track the shift in temperatures overtime and the impact of global warming on both locations, as well the impact that the Urban Heat Island has on Times Square temperatures in comparison to Ardsley temperatures. By plotting temperature probability distributions one can understand the extent of the shift in temperatures. Probability distributions were plotted for Times Square’s two time periods, Ardsley’s two time periods, and a comparison between the two locations’ temperature distributions during the years 1951-2016. The number of extreme heat days was also tracked based on the 90th percentile as an extreme heat day threshold. Similarly, the temperature for the hottest day of the year was tracked to see if there was an increase in these temperatures overtime as expected due to the urban heat island and global warming.

To understand the temperature anomalies in both Times Square and Ardsley, the threshold for normal was set as the average of all summer temperatures for each respective location. If the plotted line fell above the threshold, it represented how many degrees warmer in Celsius Times Square is in comparison to Ardsley. If the urban heat island intensity is represented by a positive number, then Times Square is warmer than Ardsley.

In order to understand the given time period and predict what extreme heat temperature data will look like for the future, linear regression models were used with the Python library SciPy. The timing of these extreme events was also plotted and by using a linear regression model, a linear model can be used as a predictive method to understand how early in the year the first day above the 90th percentile threshold will fall. This linear regression model works as a predictor for future trends related to the first day above the 90th percentile, average summer temperatures, and the number of extreme heat days for a given temperature. By using the linear predictor for average summer temperatures this can help interpret the number of extreme heat days for a given temperature.