# Introduction



More and more different atmospheric events seem to affect how the temperature really feels when humans are outside. Do surface temperatures of different objects consistently show the same temperature when different atmospheric conditions are present, such as cloud cover, high winds, or precipitation?

For living things, wind chill is a reality, but are surface temperatures affected in the same manner? Do these temperatures change over time because of atmospheric conditions?

This investigation was intended to research these and other questions that may arise from a review of historical research and from current data collection.

The purpose of this research is to determine if surface temperatures are affected by atmospheric conditions such as cloud cover, high winds, geographic location, precipitation, or contrails present in the sky.

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Relevant literature suggests that the type of surface measured will predict its ability to change or remain the same when different atmospheric conditions are present.

The hypothesis states: that if atmospheric conditions are present, then surface temperatures will be affected. Cloud cover and high winds may decrease surface temperatures. Contrails and warmer air temperatures may increase surface temperatures.

In order to determine if the hypothesis was valid, data from surface temperatures would need to be collected and a plan developed.

## Experimental Design

## Materials

The main equipment necessary for this experimental design was a Fluke 63 non-contact IRT thermometer. IRT is what scientists called it. It uses an infrared laser beam to measure the temperature in either Celsius or Fahrenheit degrees. The researcher measured in Celsius. By using this device, it was not

necessary to touch or even be particularly close to any object to obtain an accurate reading.



Sites were selected for comparison: a grassy space, the street, sidewalk, a particular vehicle, and the front of a house. These would each be checked daily and temperatures measured at the same time. In this manner, only the atmosphere would provide the variable being manipulated. Atmospheric conditions would be the determining variable as everything else would remain unchanged.

Air temperature at the site would be obtained as well and compared between cloudy and non-cloudy days. The timeframe would be 30 days.

There were only 9 sunny days and 15 cloudy days. These temperatures were compared and cross-checked with weather temperatures to validify the temperatures taken with the infrared thermometer (IRT).

The temperatures taken of the same surfaces consistently showed higher temperatures when the days were sunny. Increased temperatures were always acquired on the eight sunny days. The cloudy days were consistently decreasing in temperature measurements for these same

surfaces. The time these temperatures were taken were the same each day.

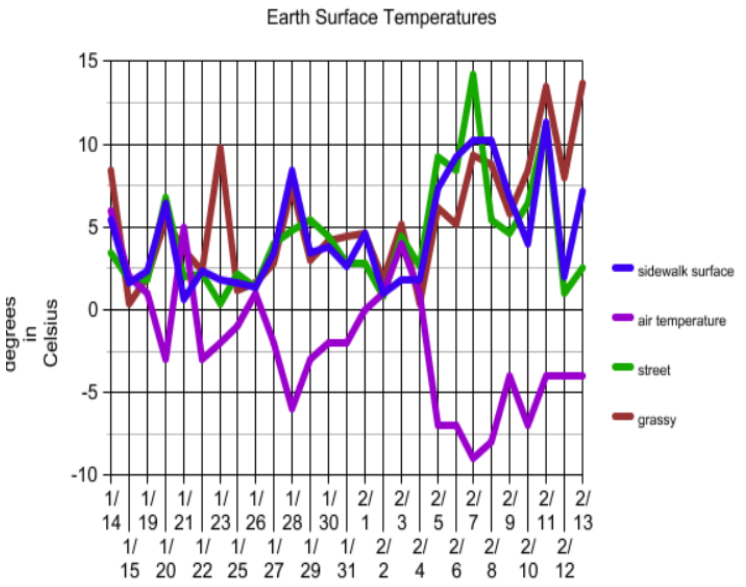
It appears that the data supported the hypothesis, that temperatures would decrease on cloudy days and increase when the sun was shining.



## Results

There were days that had the same air temperature. These days were selected and the surface temperatures graphed for analysis.

The data showed that on the two cloudy days, all surface temperatures were lower than the sunny days, even with the same air temperature!




These daily graphs show the variance between surface temperatures throughout the time tested. It is interesting to note that the surface temperatures all

measured higher than the actual air temperature.



## Conclusions, Limitations, RWE

The data does show that clouds affect the surface temperatures. Atmospheric data does prove a factor in surface data.

It should be noted that this sample is very small and only four days were found with the same air temperature that could be compared. Although there were more sunny days, there were no comparative temperatures between sunny and cloudy.

A much longer time frame needs to be developed to fully validate the hypothesis. Four days of data is not enough for a strong support but neither is it enough to disprove the hypothesis either.

Technically the data would be considered inconclusive on a larger study. Further research is necessary. Next steps would be to compare historical data to determine if any changes over time have occurred. This might help to find methods for cooling urban areas that are efficient and cost effective as well.

# Conclusion

In conclusion, for this research, the data does support the hypothesis. In a larger study, the data might change. It is unknown. However, enough evidence is present that merit further study

This data would be useful for a number of organizations where temperature and the lack of cooling methods would be an issue. This data would serve to prove that clouds are a necessary functional part of climate and weather, not just a pleasant way to spend a lazy afternoon.

It would be prudent for city planners to find other ways to create shadows that might help cool an urban environment, such as trees or canopies to help keep places cool without expending as much energy.

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