



Aerosols Affect on Global Warming

Chris Culler and Gates Begeman

Ottawa Hills High School



Abstract

Our project is focused on a modern issue, global warming, and we wanted to look into how aerosols can affect global warming. Our initial hypothesis was that if more aerosols are present in the atmosphere, then the atmosphere will cool down because aerosols reflect sunlight back which will cool down the atmosphere. Initially we were collecting our data ourselves by hand but the data was disappointing so we decided to research our data, and found a dataset taken by a nephelometer. In the end we found a general trend that as there was more aerosol scattering the temperature was cooler, and concluded that aerosols do help to cool the Earth rather than heat it up.

Research Question

How does the amount of aerosols in the atmosphere affect the earth temperature?

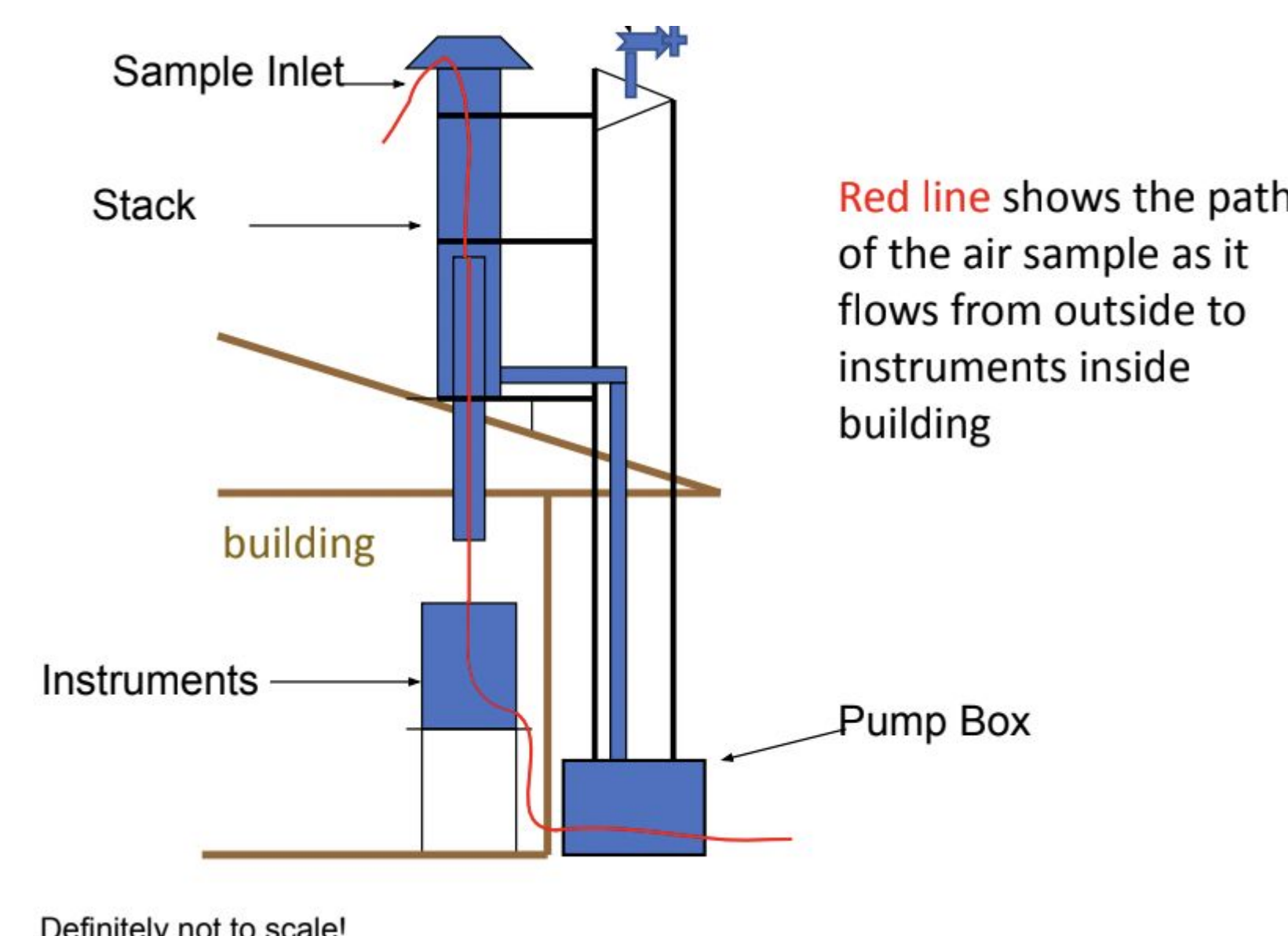
Introduction

How do aerosols affect global warming? Do they help to cool the Earth or do they heat it up further? We believe that if more aerosols are present in the atmosphere, then the atmosphere will cool down because aerosols reflect sunlight back which will cool down the atmosphere. Aerosols are tiny liquid droplets or solid particles that are so light they're almost completely suspended in the air (University of California San Diego). A few common examples of aerosols are hairspray, the fumes that come out of your car, and fog. After recording some data, we were intrigued by aerosols, so we researched what effects aerosols have on the environment and came up with our question.

Some Aerosols are natural and necessary for the environment, and can be created from sea spray, volcanoes, and dust from soil and rocks. Natural aerosols actually help cool the earth and have prevented 50% of global warming from greenhouse gases (Unger). Although one cause of natural aerosols is possibly stronger than any other, volcanic eruptions. This is because of the aerosols released during an eruption, which is mostly comprised of sulfur dioxide gas. This sulfur dioxide gas is launched 33,000 feet into the atmosphere, binding to the water in the atmosphere to create large clouds which stay in the atmosphere for a few years (Aerosols). Sulfur dioxide is light colored which makes it very a good reflector for sunlight. For example, in 1991 Mount Pinatubo erupted in the Philippines, this eruption was so powerful that the aerosols released cooled the atmosphere by 0.7-0.9 degrees fahrenheit. This also resulted in 1992 and 1993 being the two coldest years in the last 35 years. This just goes to show how much of an impact aerosols can have on global warming.

Research Methods

This is a diagram of the Nephelometer which is what was used to acquire our data. The nephelometer will be explained in detail during the carrying out investigations. Basically it pulls in atmospheric particles and shines light on it and measures the amount of light scattered. The data was collected in Illinois near champaign-urbana.

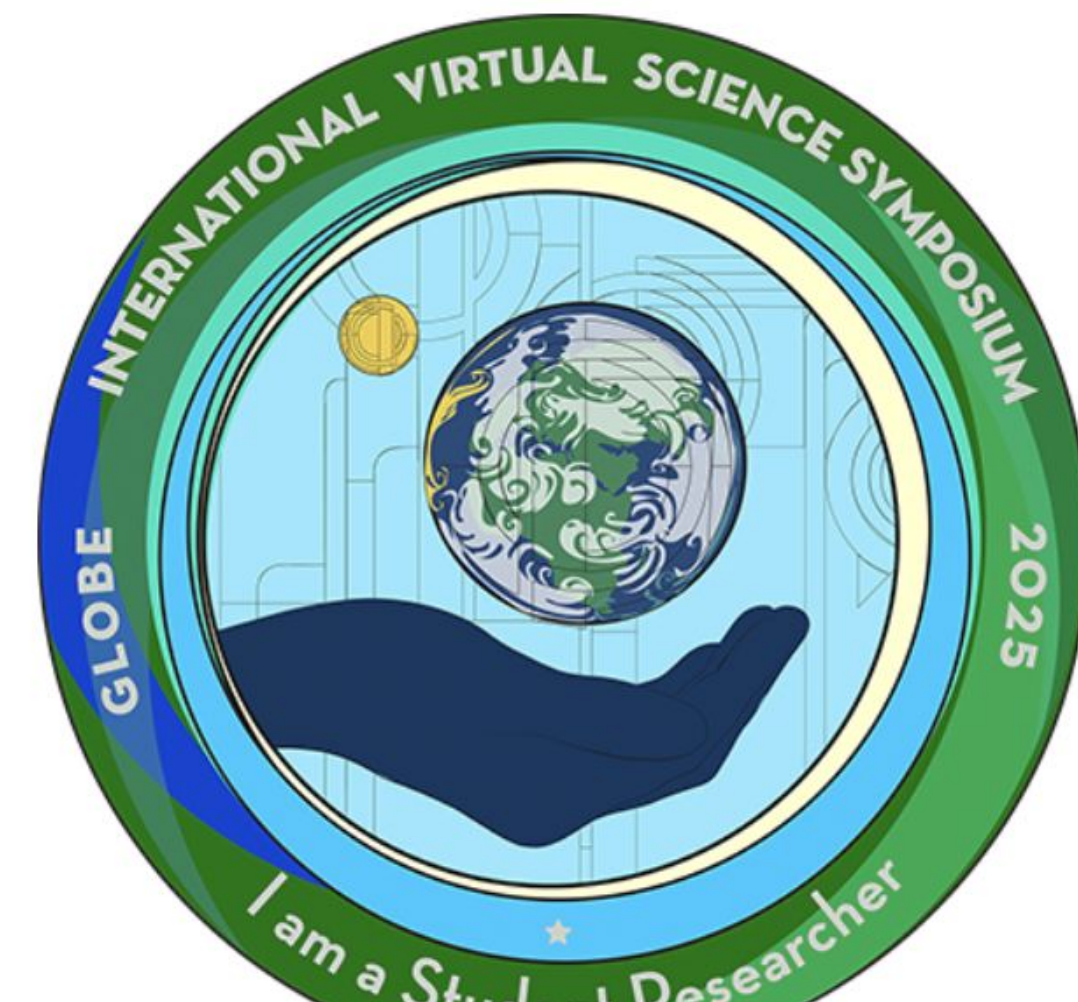
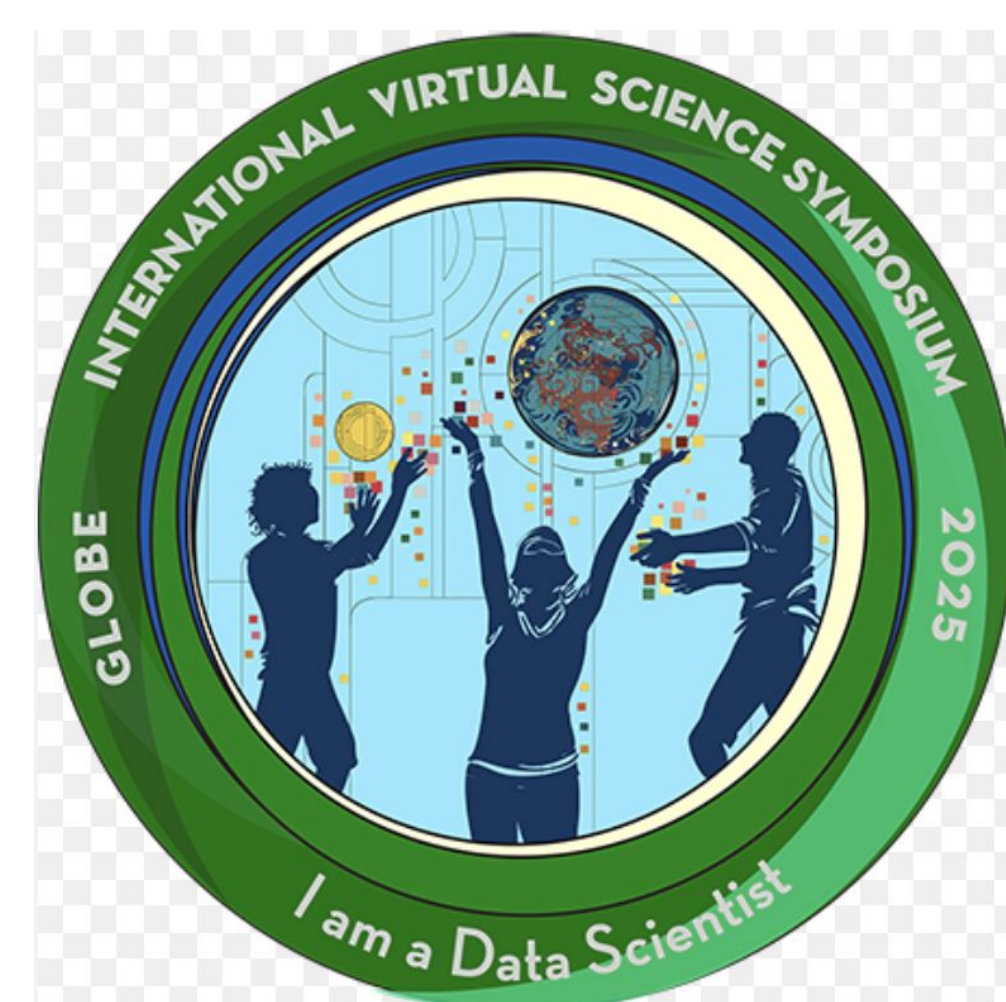


Carrying Out Investigations

- We ended up researching aerosol light scattering. Aerosol light scattering is measured by an instrument called a nephelometer. It sits inside a building the atmospheric particles are pulled into an



GLOBE Badges

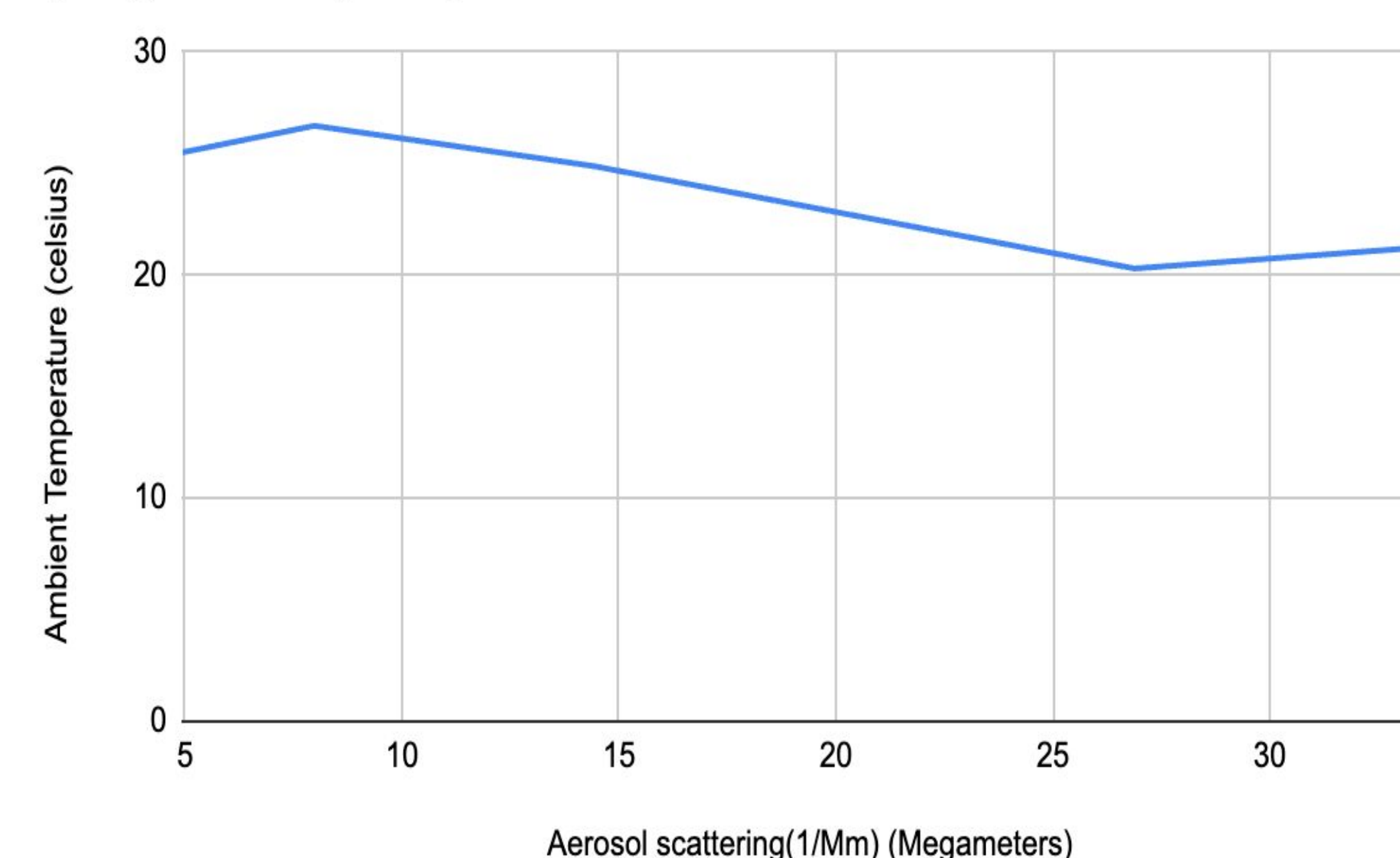


Results

Our finding suggest that more scattering aerosols does decrease the ambient temperature. The data recorded shows a general upward curve in temperature, when there are less scattering aerosols. This supports our hypothesis which is, if more aerosols are present in the atmosphere, then the atmosphere will cool down because aerosols reflect sunlight back which will cool down the atmosphere. Other studies also showed that there was an upward curve in temperature when there was less aerosols, and a decrease in temperature when there is more aerosols. I believed we attained these results because we learned that most aerosols present in the atmosphere scatter sunlight. Some experimental errors is that the environmental factors that can affect temperature weren't the same every time. For example the wind currents were different on different days, but by choosing data that is 4 consecutive days in a row we believe that there shouldn't be too much of a difference. If we did this experiment again we would create an enclosed environment where all the environmental factors could be controlled. Even through all the possible errors, I believe that this experiment accurately tested our hypothesis because many articles and other research support our with findings. Our data is shown as the amount of aerosol scattering per megameter against the temperature in celsius. There are a few bumps where the temperature goes back up after the aerosol scattering goes up, but that's simply because aerosols aren't the only thing that can affect the temperature. We attempted to get rid of other sources of temperature changes by taking our data at 8pm, where as few other factors cool/heat the earth as possible.

Figure #1

Ambient Temperature (celsius) vs. Aerosol scattering(1/Mm) (Megameters) at 8pm



Discussion

Interpreting Data

The fact that aerosols help to cool down our planet is important because we don't have to worry about them now, before doing this research they were a possible cause of global warming, whereas now they aren't a consideration. If we repeated this project then I would take many many more data points as to better be able to see the graph and direct cause of the aerosols cooling down the planet. It would also be useful if more places recorded data about aerosols, because it is very difficult to make aerosol data, and almost as difficult to find it online. Most other sources completely agree with our findings.

Conclusions

This experiment's purpose was to determine whether aerosols in the atmosphere increase or decrease the temperature of the atmosphere. It's a commonly held belief that most aerosols reflect sunlight except for a few like soot that absorb it, and that there are many more that scatter rather than absorb. So, many sources like NASA believe that aerosols do decrease the temperature of the atmosphere. Furthermore, our own results support this because the data obtained from NOAA in aerosol scattering particles that shows a correlation between the more aerosols in the atmosphere and the lower the temperature. Therefore, because aerosols do cool down the atmosphere, then they are fighting against global warming.

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