Air Quality Data Correlations
Claire Fisher

Introduction

The air quality of a location has significant impacts on the plants and animals present in the area. Poor air quality can lead to disease, stunted growth, or shorten the life spans of the population. It is also an indicator of the overall health of the surrounding environment. It is possible to quantify and measure the air quality in a certain location with the help of sensors. The sensors that were deployed in this study provided air quality data in two different ways. One form was measuring the presence of volatile organic compounds (VOCs). VOCs are chemicals in the air that are typically given off by man-made products. These organic chemicals are used to measure air quality because overexposure to them may lead to negative health impacts in humans, animals, and plants. A second type of data collected by the sensors was the amount of particulate matter in the air. The amount of dust presented is measured by how often the sensor was obscured by particles in the air and is useful because high amounts of dust in the air can have negative health and growth impacts on the organisms who breathe it. In this experiment, the goal is to determine to what extent there is a correlation between VOC presence and dust particle concentration in the air at a given site. This information can then be used to aid researchers in future air quality data collection and experiments.

Methods

The data collected for this study was obtained by the sensors included in the Particle Air Quality Monitoring kit. Specifically, the Shinyei PPD42 Dust Sensor collected information on particulate matter in the air and the Seeed Studio Grove Air Quality Sensor v1.3 with metal-oxide sensor measured the presence of VOCs. In class, each sensor was coded and calibrated to correctly collect the desired data, and was then deployed in a location in the West Lafayette area. Unfortunately, due to technical issues the sensor that was initially going to be used for this particular study did not collect the data as planned. Because of this, the data referenced in this paper was actually taken in the Spring of 2020 by a previous class. The sensor was deployed outdoors at 29.656 latitude, -82.315 longitude and the data was provided in a table that included temperature, humidity, pressure, VOC presence, and dust ratio.

Results

To analyze the data for a correlation between dust ratio and VOC level, the first 150 data sets collected by the sensor were examined. For VOC levels, the minimum was 100 and the maximum was 128, with the average being 113.67. This indicates that the VOC levels changed relatively little as time went on. The dust ratio had a minimum of 0.0622 and a maximum of 5.9393, with an average of 1.75. This shows that the dust ratio fluctuated somewhat more than the level of VOCs. In order to check for any correlation, VOC levels were plotted on the y-axis and the dust ratio was plotted on the x-axis. The resulting graph was as follows.

Dust Ratio vs VOC Level
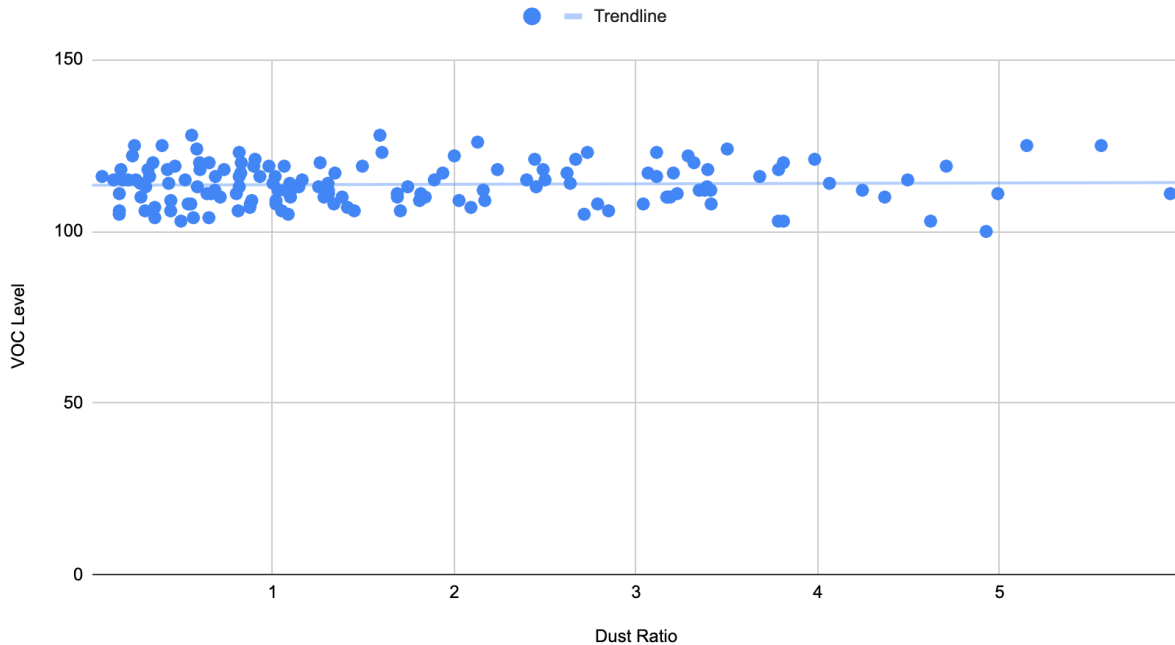
According to the graph, it appears that there was little correlation between the dust ratio and VOC levels collected by the sensor. As the dust ratio values increased or decreased, the VOC level values did not seem to be impacted. This lack of a correlation is also shown by the flat trendline on the graph.

Conclusion

According to the data analyzed in this study, there is no major correlation between the amount of particulate matter in the air and the level of VOCs present. This conclusion seems logical because the dust ratio and level of VOCs are separate variables. Because one changes does not necessarily mean that the other will. However, in order to ensure that this result is correct, larger amounts of data should be collected and analyzed from many different sites. This will ensure that there truly is no correlation between dust and VOC levels in the air. The information determined from this analysis can be helpful for future researchers because they are able to rule out the idea that the level of VOCs and dust have an impact on one another when measuring air quality.

References

Hosen, J. D., Barrett, M., Cunningham, C., Ebrahimi, A., Gulbranson, K., Hale, J., Hayes, T., Heltzel, A. N., Park, S., Rivera, B., Savage, D., Sosa, B. M., Walker, G., Williams, S. (2020). 2020 Purdue FNR Ecological Sensors Class Air Quality Data. Purdue University Research Repository. doi:10.4231/VF0B-B644