Solar wavelengths and their effect on pollution in Edison, NJ

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INTRODUCTION

Who We Are:

- 8th-grade students at The Wardlaw+Hartridge School in Edison, New Jersey
- Science enthusiasts who are passionate about learning about the world around us
- Topic that spiked our curiosity

Why This Topic Matters:

- Helps us predict and understand air quality changes, even on cloudy days
- Helps us learn more about pollution so we can find ways to prevent it

Background Information

- Measure the optical thickness of different wavelengths of the Sun's particles
- Sun ejects white light into Earth's atmosphere
- Made up of the visible spectrum– wavelengths visible to our eyes as colors
- Sun Photometer records the optical thickness measurements for the wavelengths of red, green and blue.
- The optical thickness how visible the aerosol particles are (the greater the optical thickness, the less the sun's particles are visible, meaning more pollution)

Research Question

Research Question:

How does the sun’s wavelengths influence air pollution in Edison?

Hypothesis:

The optical thickness would be low, showing less pollution, and the blue wavelength would be the most directly correlated to the Air Quality Index (AQI) of that day because the color blue is most scattered throughout the sky.

Research Methods

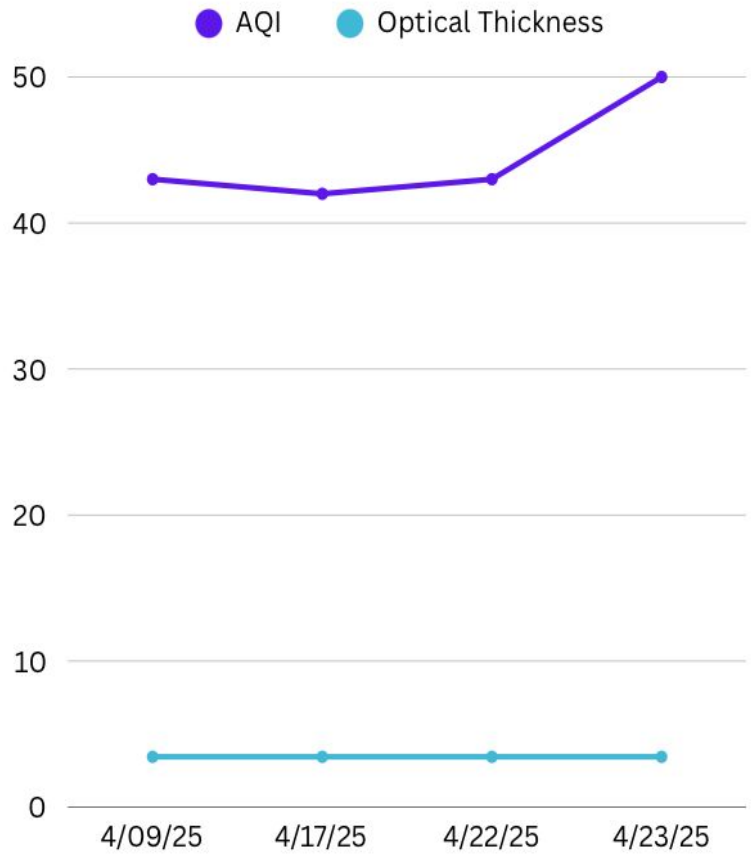
1. Our data was collected in the Wardlaw Hartridge School.
2. Utilized a sun photometer to measure the optical thickness
3. Cross referenced those with AirNow air quality maps
4. Compare the data we found to the Air Quality in Edison, NJ, on that day
5. Looked for patterns to connect the optical thickness values we recorded to the Air Quality Index (AQI) for that day
6. Our data was collected over the course of two weeks.

Light wavelengths vs AQI– what we measured:

We measured red, blue, and green solar wavelengths for the following dates and compared them to AQI data:

Date	Red (R)	Green (G)	Blue (B)	AQI
04/09/2025	3.446	3.446	3.446	43
04/17/2025	3.446	3.446	3.446	42
04/22/2025	3.446	3.446	3.446	43
04/23/2025	3.446	3.446	3.446	50

Optical Thickness of Wavelengths vs. Daily AQIs



What the results tell us (discussion)

Main Findings:Wavelength Intensity

- Red, Green, and Blue intensities stayed at 3.446 for all dates
- Optical thickness was consistent in all the colors' wavelengths

What we saw:

- Optical Thickness
  - 3.446 everyday for all three wavelengths
  - Noticed blue or light blue skies– either clear or clear with some clouds
  - Connect data collected to clear skies we observed
- AQI didn't change much over the days we have recorded
  - Supports our data staying constant
  - AQI changed whereas optical thickness stated the same

Discussion- Continued

- Despite sunlight wavelengths being stable, AQI rose (43 to 50 on 04/23).
- This shows other factors than sunlight wavelength intensity (like aerosols, particulate matter, and pollution sources) caused AQI variations.
- AQI didn't change much over the days we have recorded
    - Supports our data staying constant
    - AQI changed whereas optical thickness stated the same
    - Despite sunlight wavelengths being stable, AQI rose (43 to 50 on 04/23).
    - This shows other factors than sunlight wavelength intensity (like aerosols, particulate m pollution sources) caused AQI variations.
- Sunlight wavelengths (Red, Green, Blue) remained constant at 3.446 across all dates
- AQI was mostly similar
- AQI had a large jump on the last day

Discussion- Continued

- AQI was mostly similar
- AQI had a large jump on the last day
- Local Environmental factors, not sunlight, caused changes in air quality during the study period
- Wildfires in Ocean, NJ that day
- Made air quality worse

Next Steps

Limitations:

- Data was limited to specific locations
- May not represent broader regional conditions.
- Short duration of study (April 2025) did not capture long-term trends
- Two weeks of research.

Future Research:

- Expand data collection to include more locations and longer timeframes.
- We will investigate the impact of other atmospheric variables, such as humidity and wind speed, on sunlight penetration through the atmosphere.

Predictions:

- Predict air quality to go down in week of 4/27/25
- Wildfires in Ocean County, NJ
- Predict optical thickness to go up (= more pollution)
- Pressure would increase

Accuracy issues that may have occurred

- The Sun Spot may not have been centered, or maybe we didn’t have it pointing the sun directly
- Lack of maintenance likely caused incorrect or "stuck" sensor readings, leading to possibly false constant values in our data
- Could have been inaccurate because the photometer had not been

References

-https://www.globe.gov

-AirNow (https://www.airnow.gov)

-https://scied.ucar.edu/learning-zone/air-quality/how-weather-affects-air-quality

- https://www.canva.com/?msockid=06dc861adae56b82259e979adb876a0

-https://spaceplace.nasa.gov/blue-sky/en/

Solar Wavelengths and Their Effect on Pollution in Edison, NJ

- Optical thickness = less, then less pollution
- 3.446 = clear skies with less pollution
- Pollution doesn't change much in Edison
- Air Quality
- Pressure, a side variable:
  - Less pollution in areas of Low pressure
  - More windy, storms, precipitation wash out and move pollutants to new area