

LOCALIZED GLOBAL WARMING: IS THERE STATISTICALLY SIGNIFICANT EVIDENCE OF CLIMATE CHANGE IN ERIE, PA?

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ABSTRACT

- Biogeochemical data from the surrounding area of Erie, Pennsylvania were collected and mathematically analyzed
- The Pearson correlation method and regression equations were utilized in order to determine whether temperature data and precipitation data over the past sixty years indicate climate change within the Erie region
- Analysis shows the data to be moderately statistically significant, revealing positive correlations between both year and temperature and year and precipitation levels
- This suggests that global warming has had an effect on Erie's own climate over time and allows for further investigation into the area's recent weather events and its relationship with global warming

BACKGROUND

- Global warming has been largely deemed irrefutable by the scientific community
- Localized populations often dismiss the immediate dangers of global warming, with many believing that the Earth's rising temperatures do not significantly affect their own regions
- Evidence of global warming can be found worldwide
- Anthropogenic emissions such as burned fossil fuels have become trapped near the ozone layer; this has caused an overall increase of Earth's average temperature by 1.62 degrees Fahrenheit over the past century (NASA)
- Increased water availability from melting glaciers has led to more precipitation worldwide and more frequent heavy storms (NASA)
- This may explain Erie, Pennsylvania's explosive snowfall in December 2018, when 65.1 inches of snow in 36 hours set the all-time record (Donegan)

HYPOTHESES

- If average temperatures in Erie PA are collected and analyzed from each month over the last sixty years, then they should statistically show an increase because the overall Earth has demonstrated a significant increase in temperatures.
- If average temperature from each month over the last sixty years is collected and recorded, then the temperature should have risen due to the warming of the Earth, which leads to increased ice cap and glacier melting.

METHODS AND DATA

PROCEDURE

1. Obtain all necessary materials.
2. Gather data on average temperature each month in Erie for the past sixty years.
3. Gather data on average precipitation each year in Erie for the past sixty years.
4. Conduct a Pearson correlation test on the temperature data and precipitation data (comparing year to temperature or precipitation).
5. Conduct a regression test on the temperature and precipitation data (comparing year to temperature and precipitation).
6. Analyze results to determine whether or not Erie has demonstrated significant evidence of climate change using an effect size test and analysis of the Pearson's correlation coefficient.

TEMPERATURE

Pearson Correlations

		Year	Average
Year	Pearson's r	—	
	p-value	—	
Average	Pearson's r	0.580	—
	p-value	< .001	—

H₀: no correlation between year and average temperature
H₁: there is a correlation between year and average temperature

PRECIPITATION

Pearson Correlations

		Year	Average
Year	Pearson's r	—	
	p-value	—	
Average	Pearson's r	0.477	—
	p-value	< .001	—

H₀: no correlation between year and average amount of precipitation
H₁: there is a correlation between year and average amount of precipitation

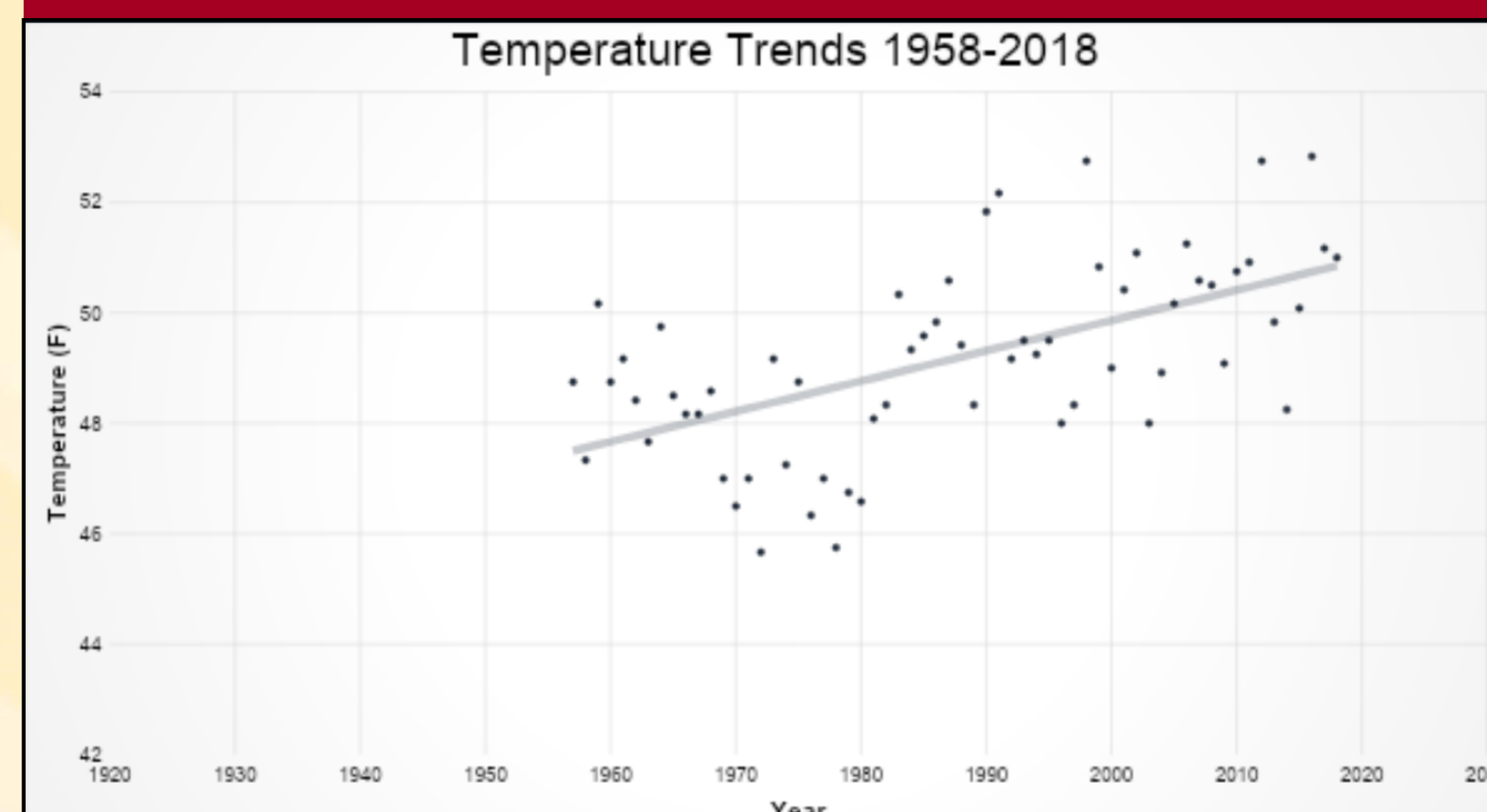
LIMITATIONS

- Data was collected from sources outside of the official NOAA database due to the website being shut down during the duration of the research process
- Calculation errors could have occurred
- External variables could also have affected the data

CONCLUSIONS

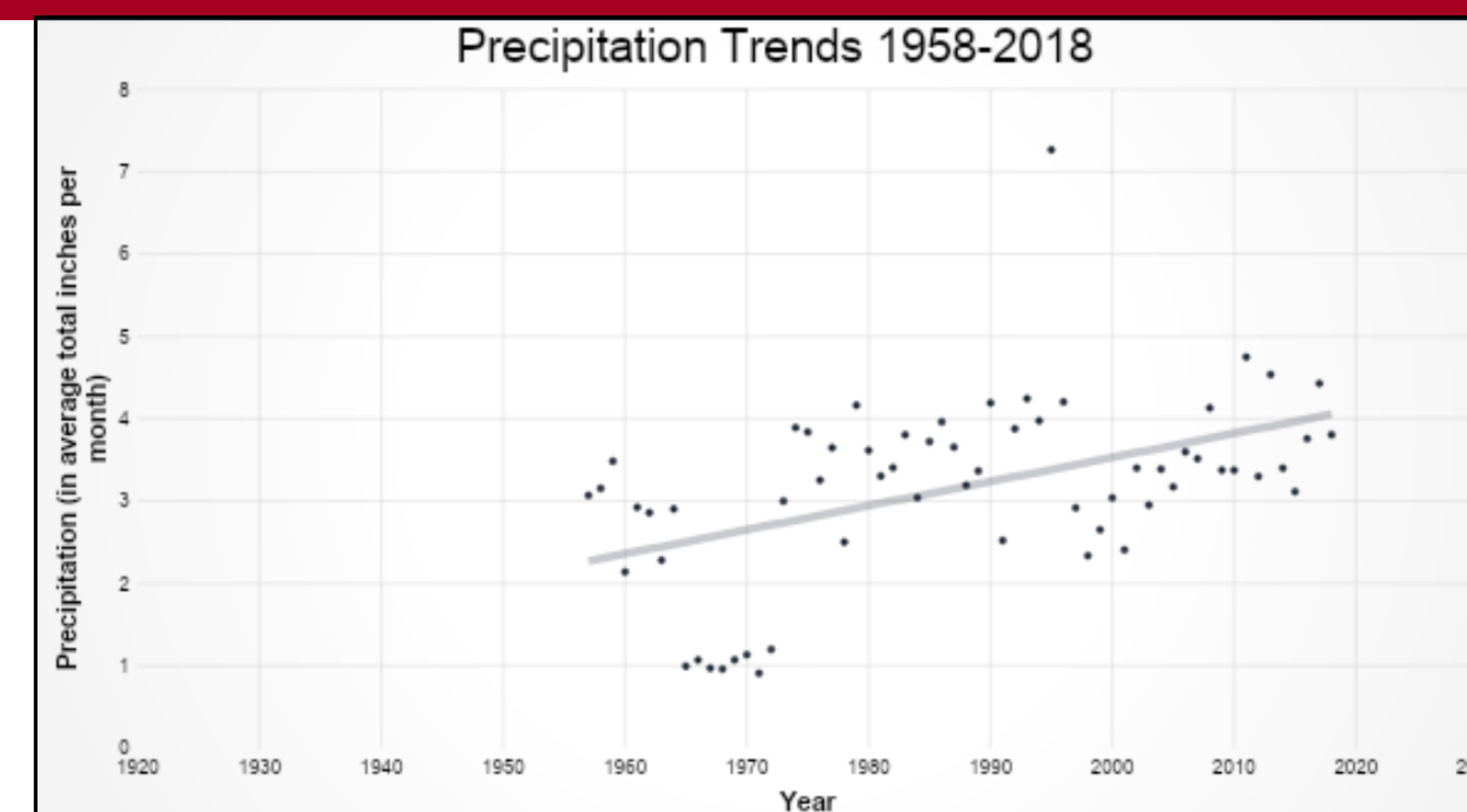
- Both general hypotheses were correct: there is a positive correlation between year and temperature as well as between year and amount of precipitation
- The null hypotheses were rejected for each statistical test, which shows that there are absolutely correlations
- Correlation does not equal causation — this data does NOT prove that climate change in Erie, PA is a direct result of precipitation and temperature increases over time

ANALYSIS



TEMPERATURE

- $r = 0.580$ (relatively strong)
- Positive correlation
- Scatterplot shows linear regression equation
 $y = 0.0549x - 59.952$
- Effect Size: $r^2 = 0.3364$
- 33.64% of temperature variability can be attributed to the year



PRECIPITATION

- $r = 0.477$ (relatively strong)
- Positive correlation
- Scatterplot shows linear regression equation
 $y = 0.0292x - 54.955$
- Effect Size: $r^2 = 0.2276$
- 22.76% of temperature variability can be attributed to the year

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