

CMSE 202 Final Project

# **How have carbon emissions affected climate change?**

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## Background and motivation

The purpose of this project is to explore the relationship between carbon emissions and climate change.

Carbon emissions are known to be a leading contributor to climate change, which has significant impacts on the environment and human society. Therefore, understanding the relationship between these two variables is crucial.

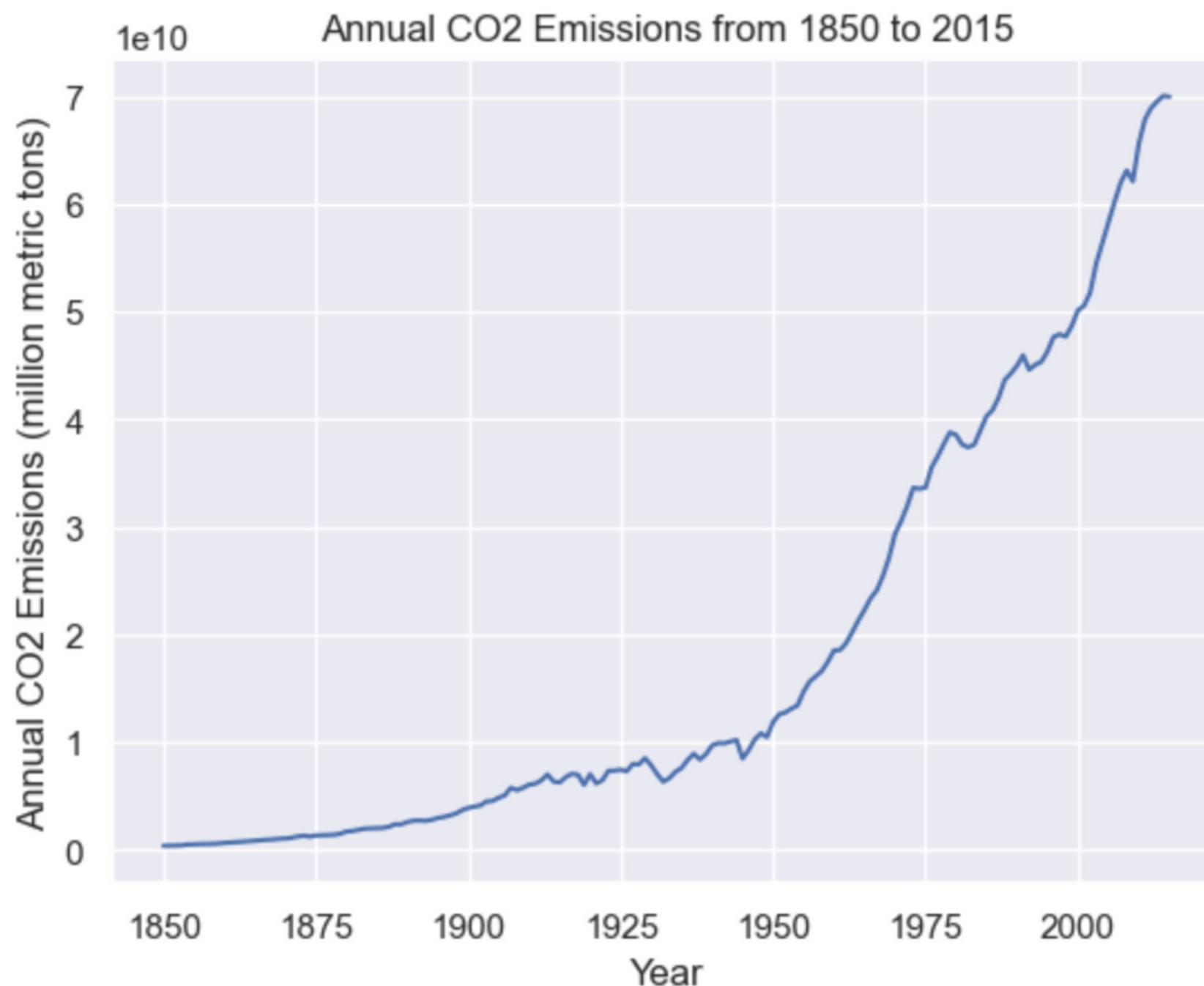


# Project Overview

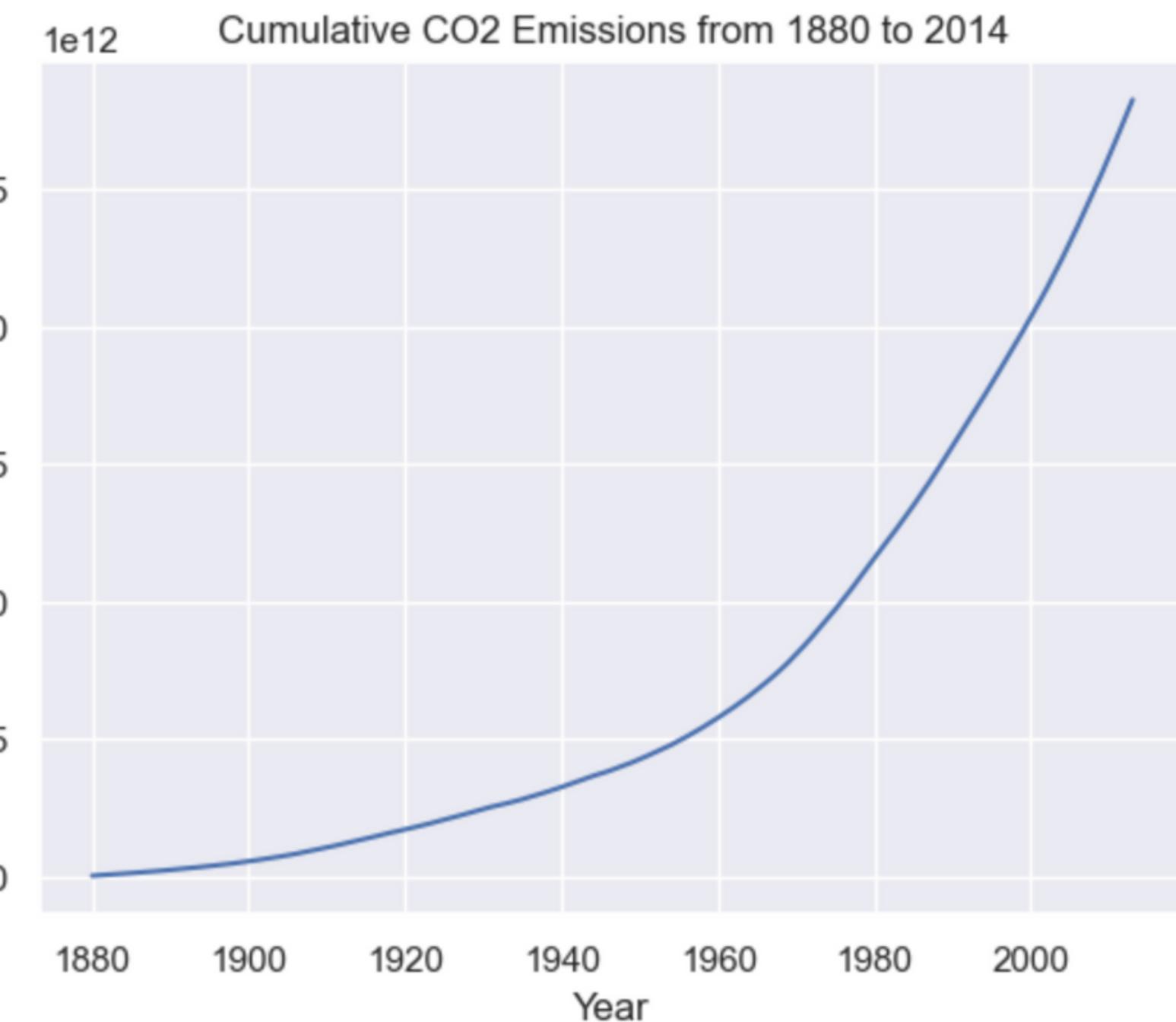
This project aims to analyze the historical trends of carbon emissions and climate change, specifically examining the relationship between carbon emissions and rising temperatures, the impact of carbon emissions on extreme weather events, and the role of carbon emissions in sea level rise.



## Line plot of annual CO<sub>2</sub> emissions over time



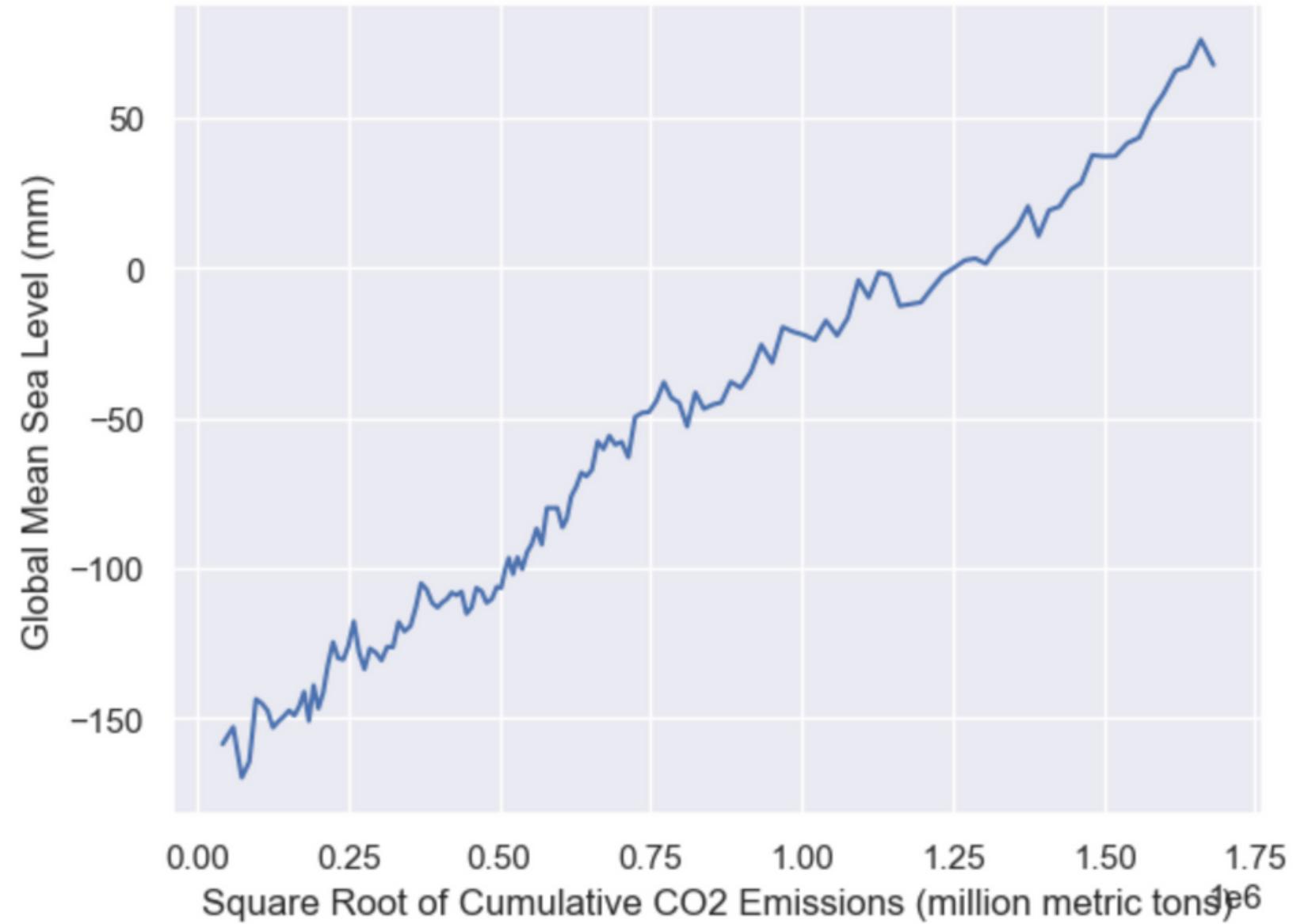
## Cumulative CO<sub>2</sub> Emissions : An Exponential Upward Trend



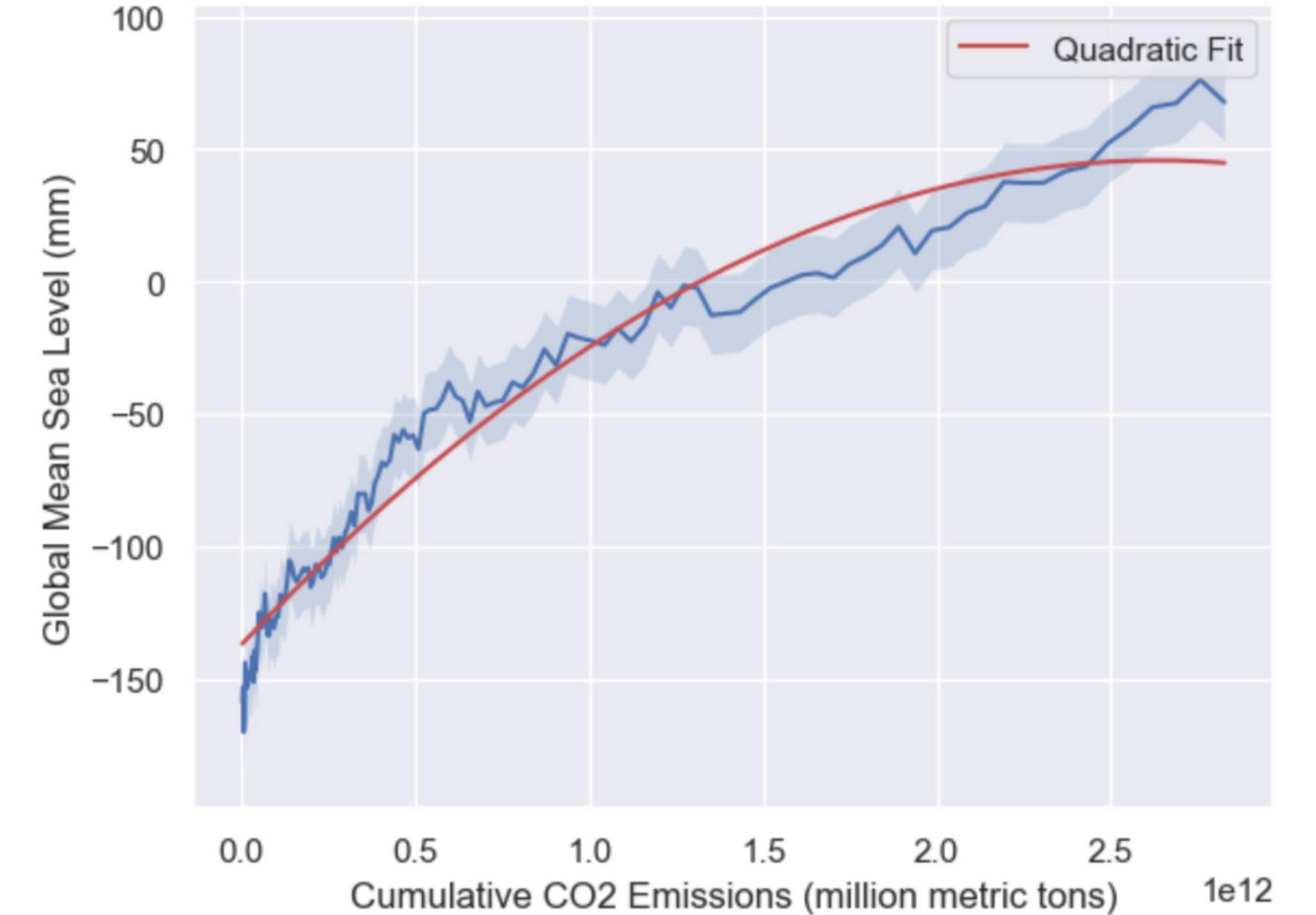


# Square Root of Cumulative CO2 Emissions

Relationship between Square Root of Cumulative CO2 Emissions and Global Mean Sea Level

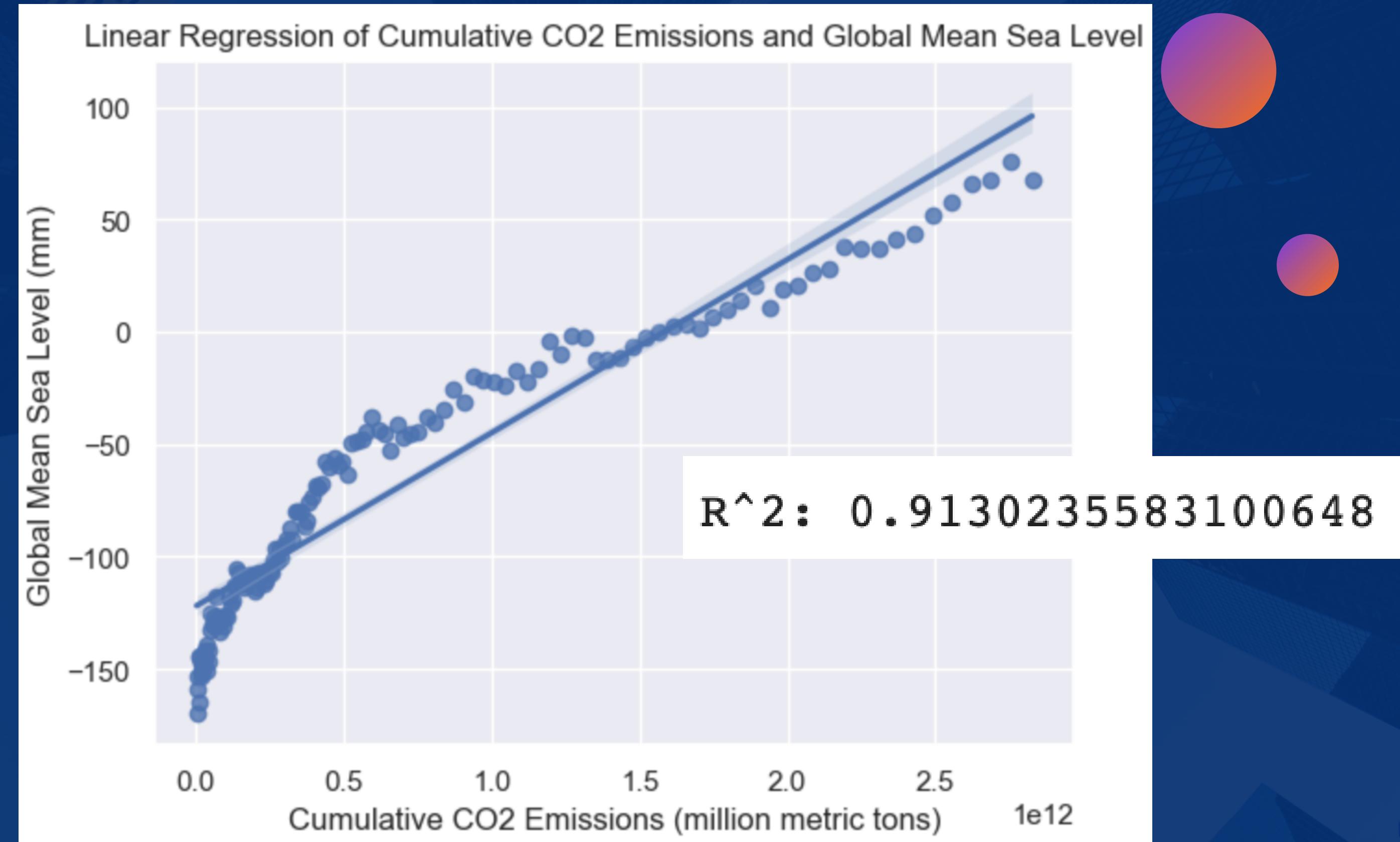


Relationship between Cumulative CO2 Emissions and Global Mean Sea Level



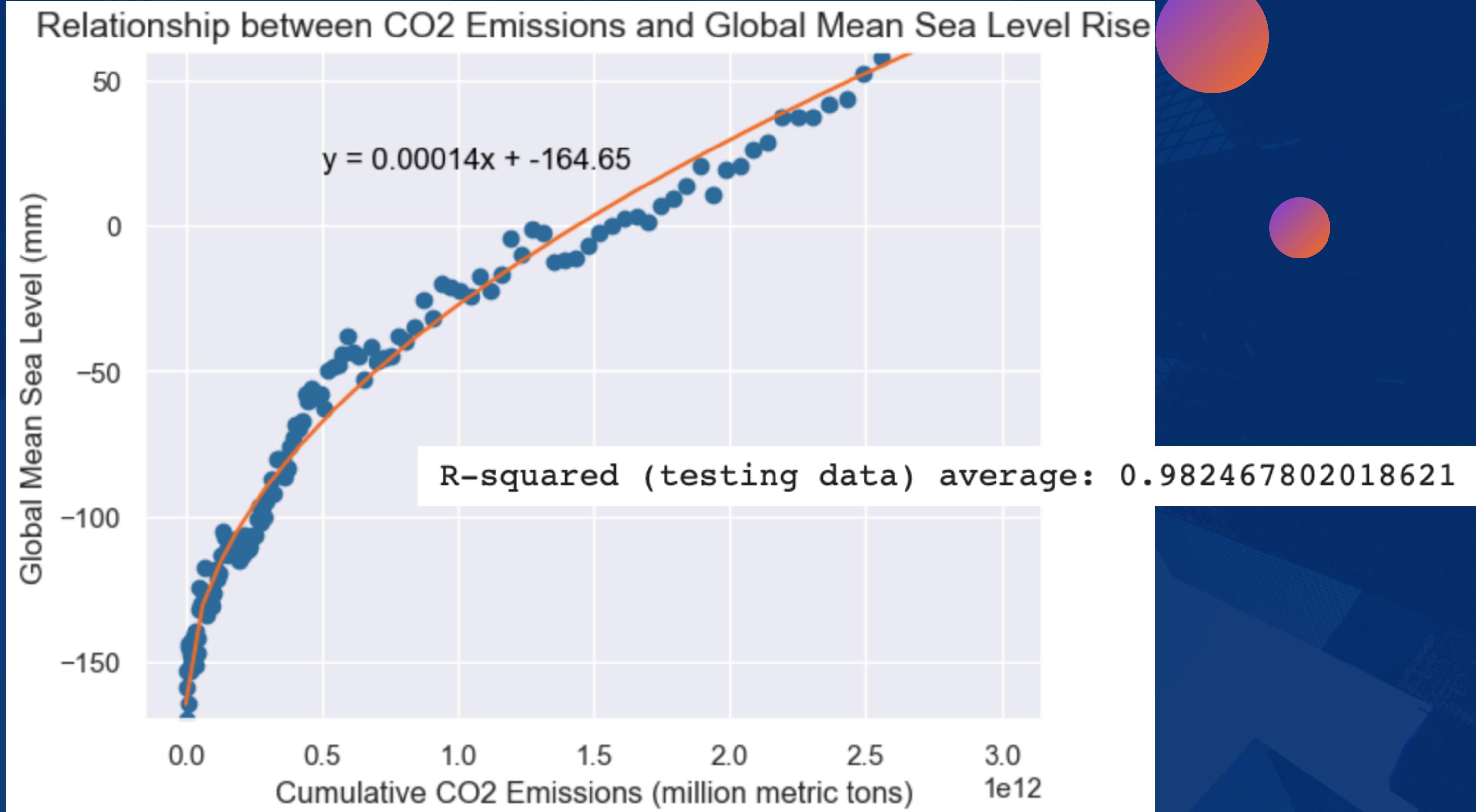
# Statistics Method

## Linear Regression Analysis



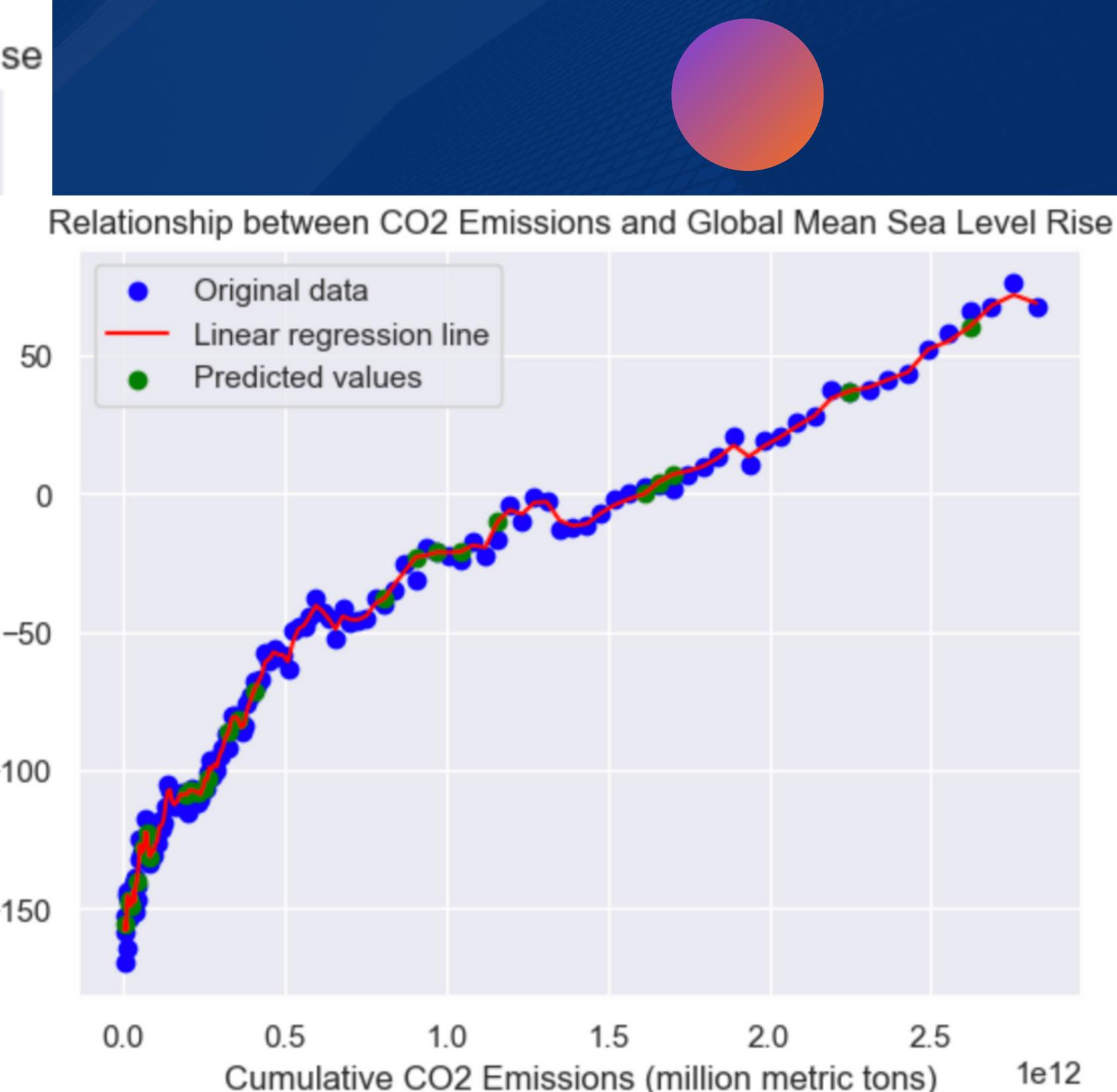
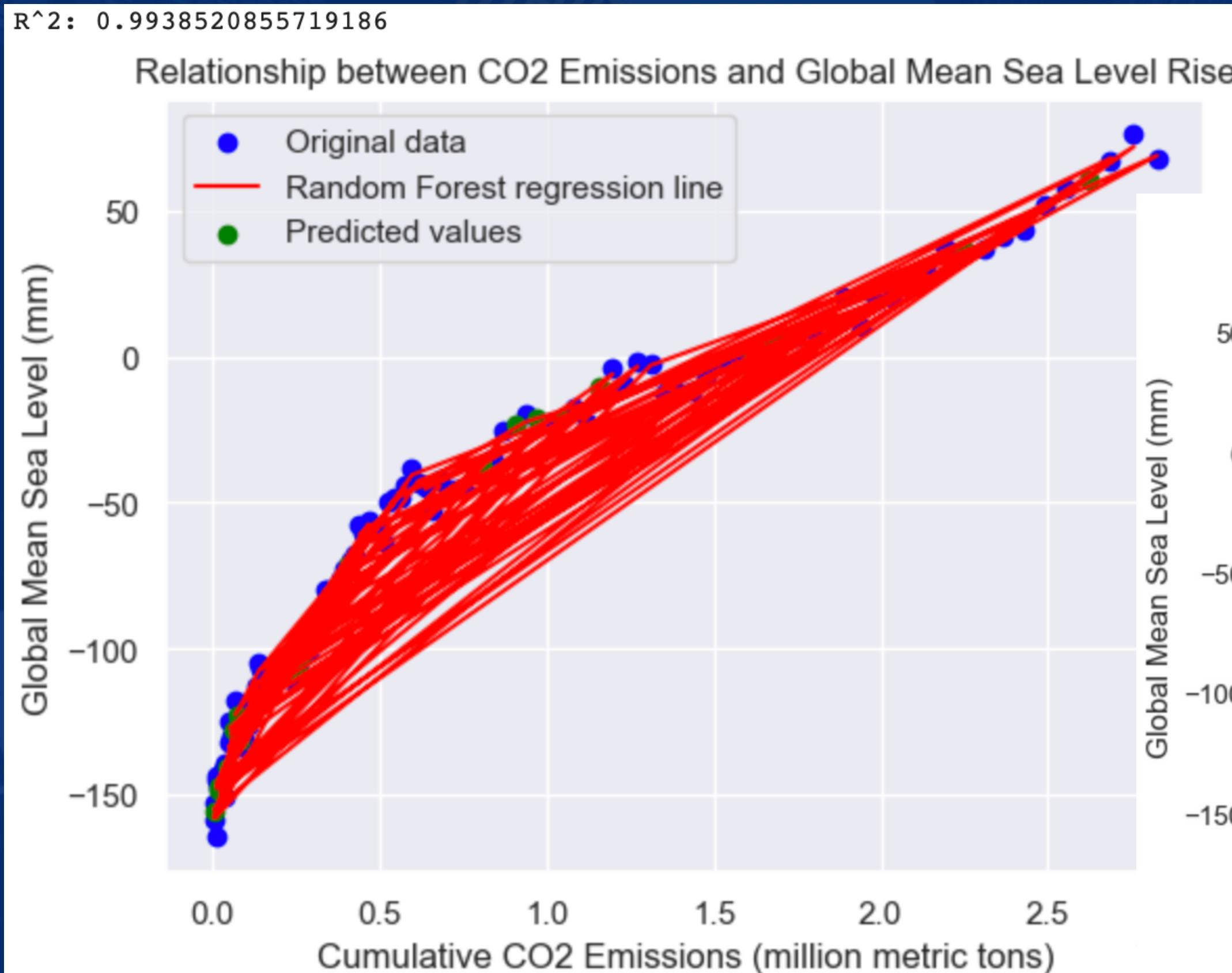
# Statistics Method

## Polynomial Regression Analysis of the Square Root of Cumulative



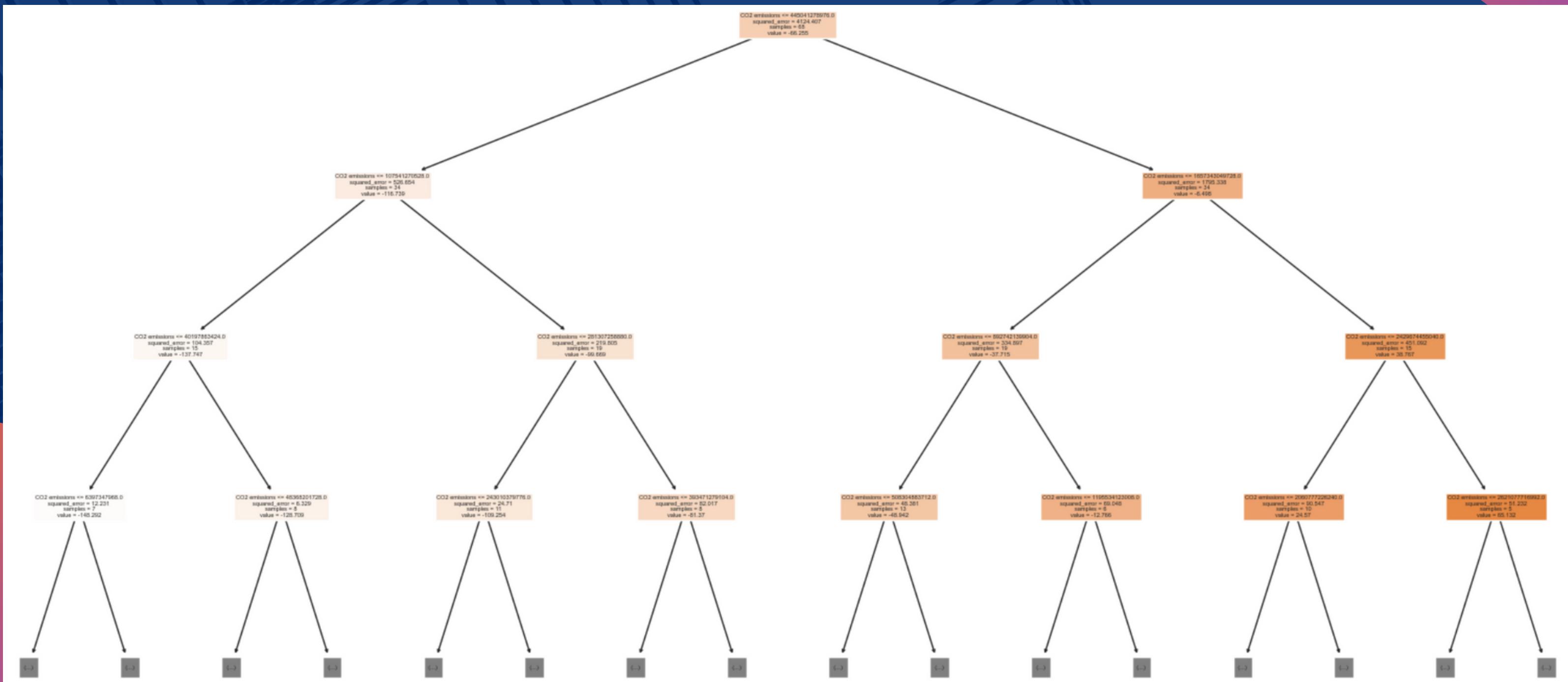
# Predicting Future using a Random Forest Regression Model

$R^2: 0.9938520855719186$



# Random Forest Not useful in this case

1. Nonlinear relationship
2. Overfitting



# Results

Our findings showed that carbon emissions have been rapidly increasing over time, with an exponential upward trend that poses significant threats to the environment and human society.

We also found a strong correlation between cumulative carbon emissions and global mean sea level rise, with both linear and polynomial regression models providing a good fit to the data. This highlights the urgent need to reduce carbon emissions and mitigate the impacts of climate change on sea level rise.

# Results

Based on these findings, we recommend several policy interventions to address climate change.

Governments should implement policies to reduce carbon emissions, such as carbon taxes or cap-and-trade systems, to incentivize industries and individuals to reduce their carbon footprint.



# Thank You