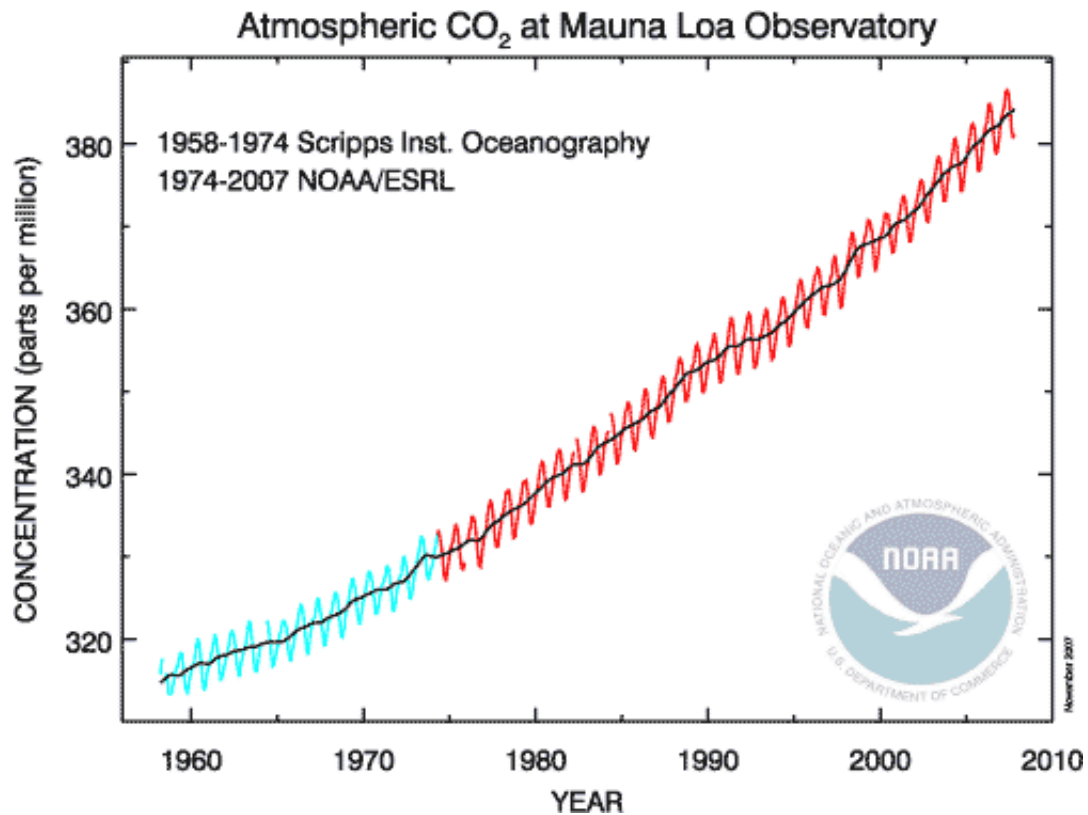


1. Carbon Dioxide Change



As humans continue to burn fossil fuels, the amount of carbon dioxide in the atmosphere increases. Scientists measure atmospheric carbon dioxide in parts per million, which means the number of carbon dioxide molecules for every 1 million other molecules of atmospheric gases such as oxygen and nitrogen.

A simple mathematical model that models the carbon dioxide changes is given by

$$P(X) = 1.8X + 352$$

where X is the number of years since 1990.

Problem 1 - What does this model predict as the carbon dioxide concentration in the year 2012?

Answer 1: $P(2012) = \dots$

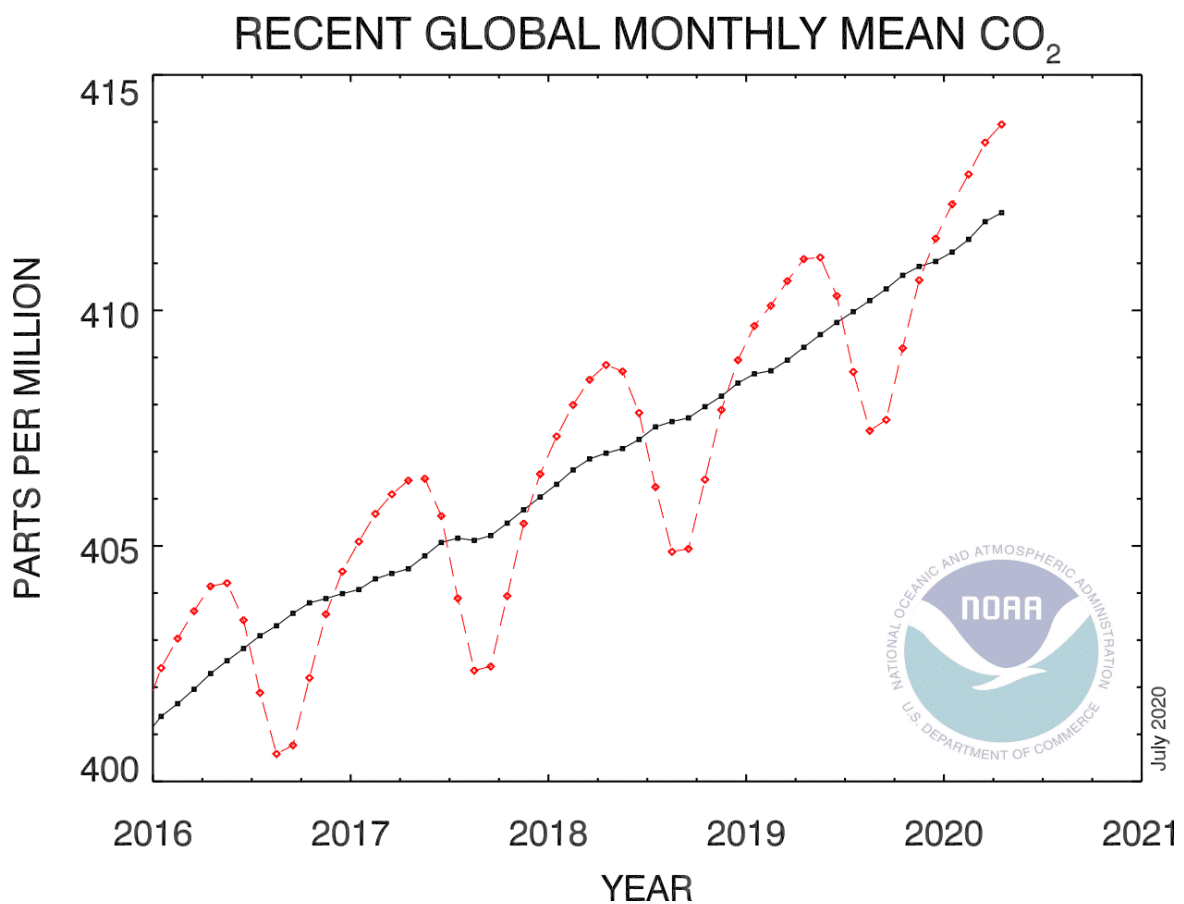
In words: The CO₂-concentration in 2012 was predicted as ppm.

Problem 2 - What does this model predict as the carbon dioxide abundance in the year 2020. Compare your predicted outcome with the concentrations measured in 2020 (year average, black line). What can you conclude about the model's predictions?

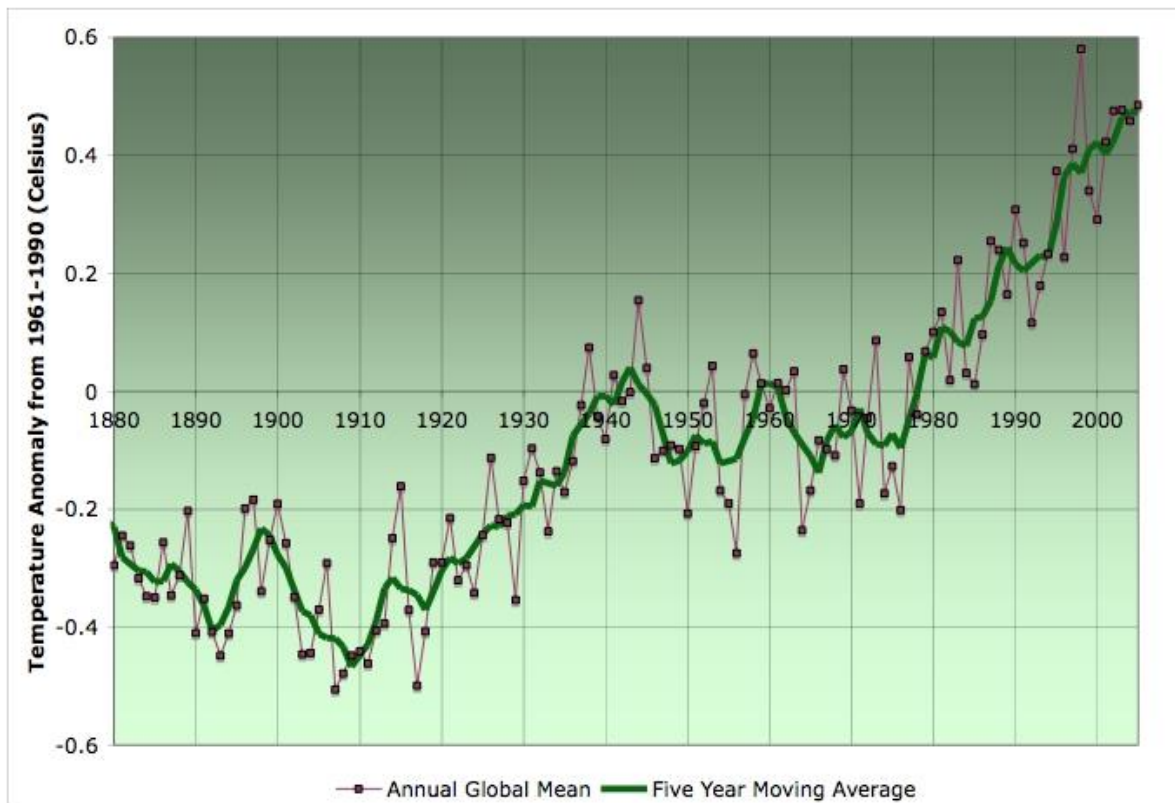
Answer 2: Predicted outcome $P(2020) = \dots$

Measured concentration in 2020 = ppm

Conclusion: ...



2. Global Warming Trends



A combination of hundreds of climate studies have traced changes in the average temperature of Earth since before the Industrial Revolution in the 1800's. The temperature data after 1960 can be approximated by the function

$$T(X) = +0.10X + 0.05$$

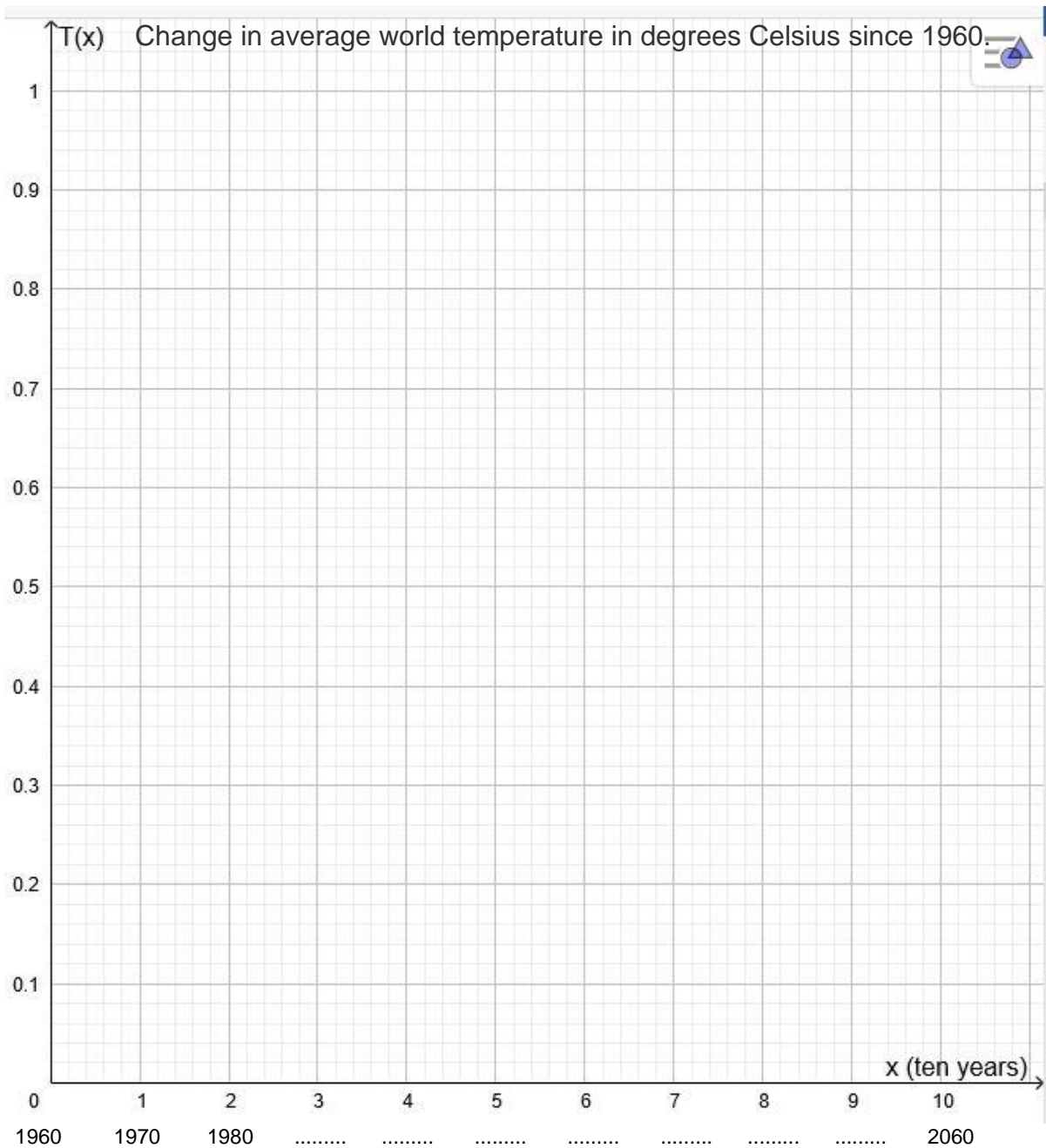
The function $T(X)$ gives the change in world temperature in degrees Celsius, and X is the number of decades since 1960.

For example, 1960-1969 is the decade $X=0$, and at this time, $T(0) = +0.05$, which means that the world was $+0.05$ C warmer than its average temperature before 1960.

Problem 1 - Graph this function over the period from 1960 to 2050. Use a table and use the coordinate system below. Start writing down the corresponding years on the horizontal axis:

| | | | |
|------|---|---|---|
| x | 0 | 4 | 9 |
| T(x) | | | |

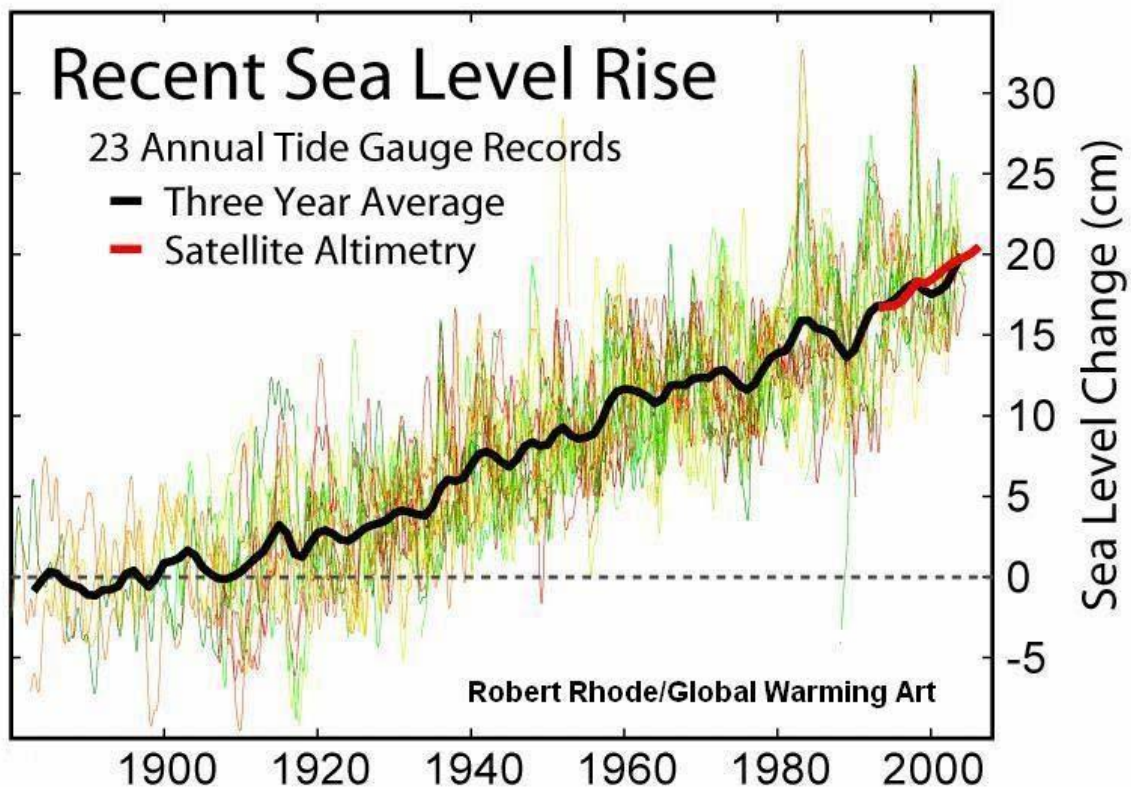




Problem 2 - What does it predict for the temperature change in 2020 and in 2050?

Answer 2: ...

3. Sea Level Changes



As global temperatures increase, water expands. This means that the volume of the world's oceans will steadily increase in time. This causes the sea level to increase.

Also, some areas of the world are still changing after the enormous weight of the ice sheets from the last Ice Age have gone away. This causes land areas to rise, and so in those coastal areas, such as the East Coast of North America, sea levels are falling. A simple function that models the average sea level around the world is given by

$$H(X) = 0.21X - 401.1$$

where X is the year (currently X=2020), and H is the sea level change since 1910 in centimeters.

Problem 1 - What was the change in sea level by 2020 compared to 1910?

Answer 1: $H(2020) = \dots$

In words: ...

Problem 2 - Graph this function over the period from 1910 to 2100. Use a table and use the following coordinate system. Choose the right scales for the horizontal and vertical axis.

| | | | |
|------|------|-----|-----|
| x | 1910 | ... | ... |
| H(x) | | | |



Problem 3 - In what year the sea level rise of 30 cm will be reached, according to this model? Calculate the year and read this answer from your graph.

Answer 3:

