Assignment 1

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A look into greenhouse gas emissions concentrations

Humans have engaged in large-scale transformation of natural systems for millennia, but since the industrial era, every home lit by coal or natural gas-fired power plant and every petroleum-powered train, plane, and motor vehicle has contributed to the net accumulation of carbon dioxide (CO2) in the atmosphere (Hsiang and Kopp 2018).

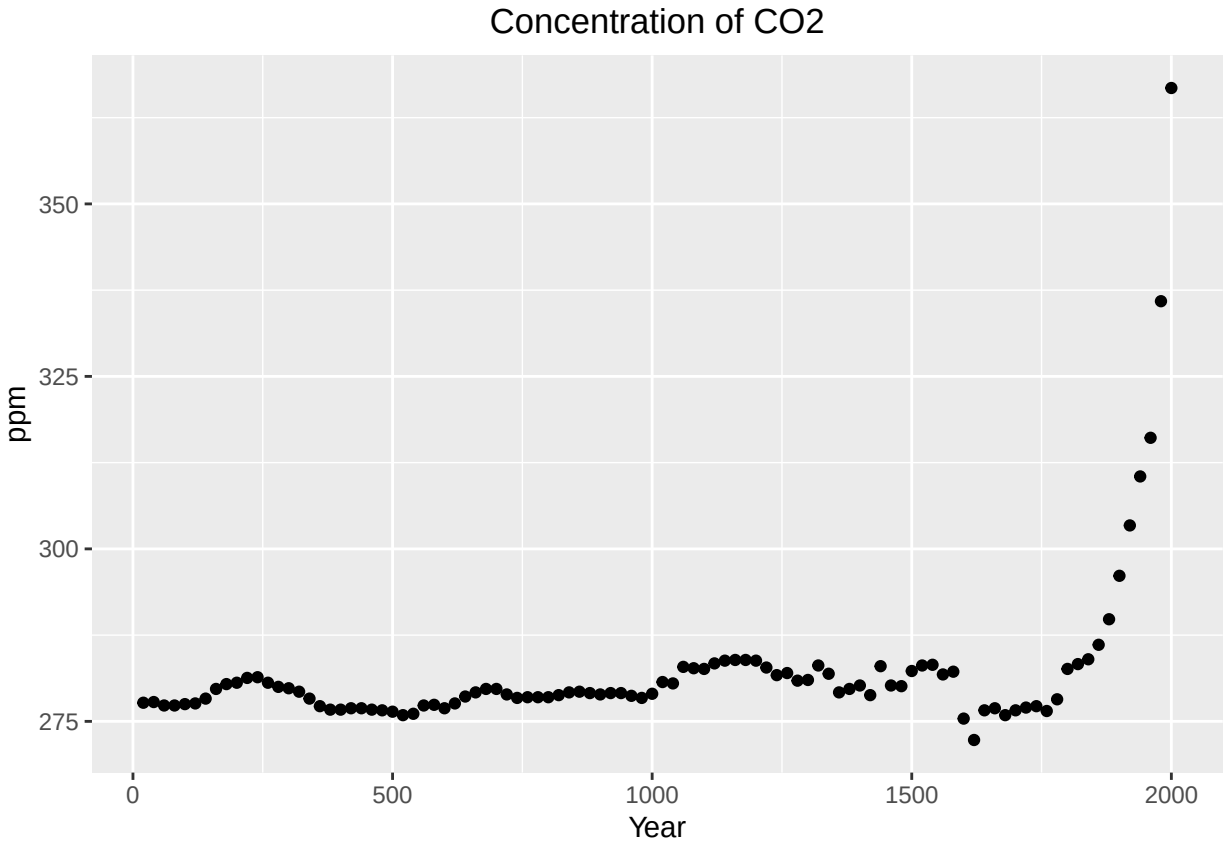
In this document, I explore the concentrations of greenhouse gas emissions using data from the Data Science Lab (dslab). The data measures the concentrations of the three main greenhouse gases carbon dioxide, methane, and nitrous oxide. The data was collected from the Law Dome Ice Core in Antarctica. Selected measurements are provided every 20 years from 1 to 2000 CE (MacFarling Meure et al. 2006).

In the table below, we can see a very rudimentary description of the data. We can see the variable years from year 20 to 2000 (in jumps of 20) and the variable concentration of CO2 with a variation from 272.3 to 366.8 in the time series.

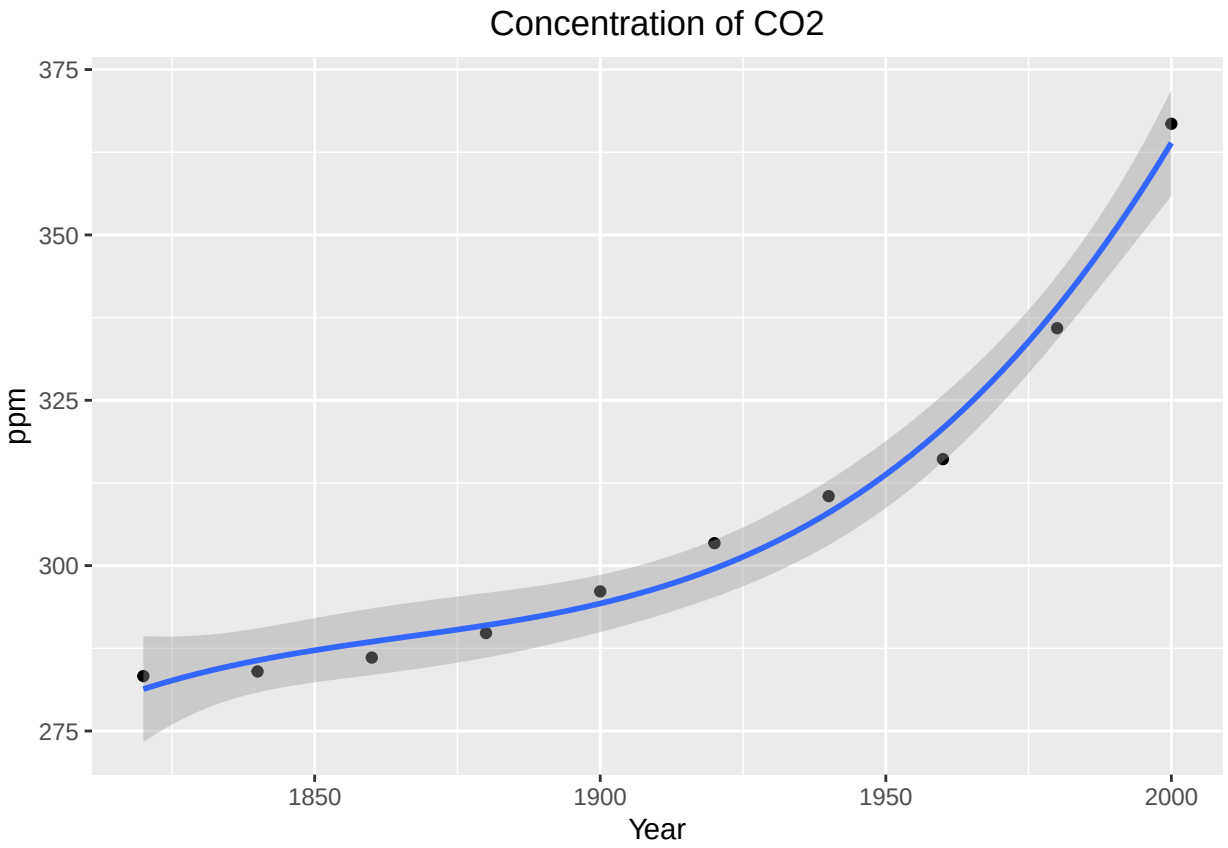
```
##       year          gas            concentration
##  Min.   :  20   Length:100         Min.   :272.3
##  1st Qu.: 515   Class :character   1st Qu.:277.6
##  Median :1010   Mode  :character   Median :279.2
##  Mean   :1010                      Mean   :282.1
##  3rd Qu.:1505                      3rd Qu.:282.2
##  Max.   :2000                      Max.   :366.8
```

Concentration of CO2 emissions in time

In the figure below, we can observe the increase in the concentrations of CO2 emissions in the last 2000 years. We can observe how, since records exist, concentrations of CO2 remained steady until the last 200 year, this beyond simple correlations, have been show to be a direct cause of human activity.



If we look closer into the last 200 years, since the industrial revolution in 1800, we can observe how human activity has a cumulative impact that growths exponentially. In the figure below a polynomial of degree 3 adjustment shows a trend that follows the accumulation of CO2 emissions very precisely.



References:

Hsiang, Solomon, and Robert E Kopp. 2018. "An Economist's Guide to Climate Change Science." Working Paper 25189. Working Paper Series. National Bureau of Economic Research. https://doi.org/10.3386/w25189.

MacFarling Meure, C., D. Etheridge, C. Trudinger, P. Steele, R. Langenfelds, T. van Ommen, A. Smith, and J. Elkins. 2006. "Law Dome Co2, Ch4 and N2o Ice Core Records Extended to 2000 Years Bp." *Geophysical Research Letters* 33 (14). https://doi.org/10.1029/2006GL026152.