The humankind contribution to CO2 emissions

- **Graph Objective**

  In recent years, the greenhouse effect is a hot topic, and carbon dioxide is one of the cores of greenhouse gases. We can study the changes in the carbon dioxide concentration of the earth from the ice cores to speculate the impact of human activities on carbon dioxide emissions. As shown in the figure below, since the first industrial revolution, humankind has caused a sharp increase in carbon dioxide emissions.

  In fact, the carbon dioxide emissions on the earth are mainly divided into humankind emissions and natural emissions. Human carbon dioxide emissions are mainly caused by burning fossil fuels for electricity, heat, and transportation ("Sources of Greenhouse Gas Emissions | US EPA", 2020). The greatest source of carbon dioxide in nature are the oceans, breathing, disaster and etc ("Natural CO2 Emissions vs. Human CO2 Emissions", 2020).

- **Data management**

  The raw data is sourced from NOAA's National Climatic Data Center (NCDC) https://www1.ncdc.noaa.gov/pub/data/paleo/icecore/antarctica/antarctica2015co2composite.txt. The original data is about the carbon dioxide concentration measured in the ice core from 800,000 to 2002.

  There are three features in the data, age, carbon dioxide concentration and carbon dioxide sigma mean. The age data refers to 1950 as the origin, positive values indicate how many years before 1950, and negative values indicate how many years after 1950.

  The data management step is to convert the raw txt file into a table file readable by Tableau. Then use the split function in Tableau to use spaces as separators to separate different features. There are no missing values and duplicate data in this set of data. Data at different times in the same year can be used as more reference.

- Visual implantations and retinal variables

  I use a horizontal grid line to set off small changes in carbon dioxide concentration and remove the default vertical grid line to prevent interference with reading in the reference area and reference line.

  The main part of the information is the change in carbon dioxide concentration, so I use a slightly thick dark blue solid line to encode it. This is because during the second industrial revolution, the carbon dioxide concentration increased faster, so I used a darker color.

  For the reference area, I use light gray and dark gray to indicate the first industrial revolution and the second industrial revolution, respectively, and mark them with text. For the reference line, I chose to use a light gray dashed line to represent the origin of time 1950, because this time does not have an important impact on the change of carbon dioxide concentration, just to mark the present year.

- Graph identification

  The graph objective is to show the contribution of humankind to carbon dioxide emissions, so we limit the axis range to 1000 years before 1950 AD to 2002 AD. This is mainly because in the past ten of thousands of years the carbon cycle has been a periodic process due to changes in the Earth ’s orbit ("The Carbon Cycle", 2020), and our goal is to focus on the impact of humankind.

  The focus of humankind's activities changed in CO2 concentration was during the first and second industrial revolutions. These two pieces of time period are encoded using graph enhancement tools: reference areas. And the present year are encoded using reference line. I use the label to mark the reference area of different periods to facilitate readers

Because the span of the vertical axis is too large and there is no data between 0 and 200, I removed 0 and set the axis range from 200 to 400 to more clearly show the line changes.

I mark the data source and eliminate 0 in caption to prevent misleading.

- Visual decoding
  Here is my proposed solution:

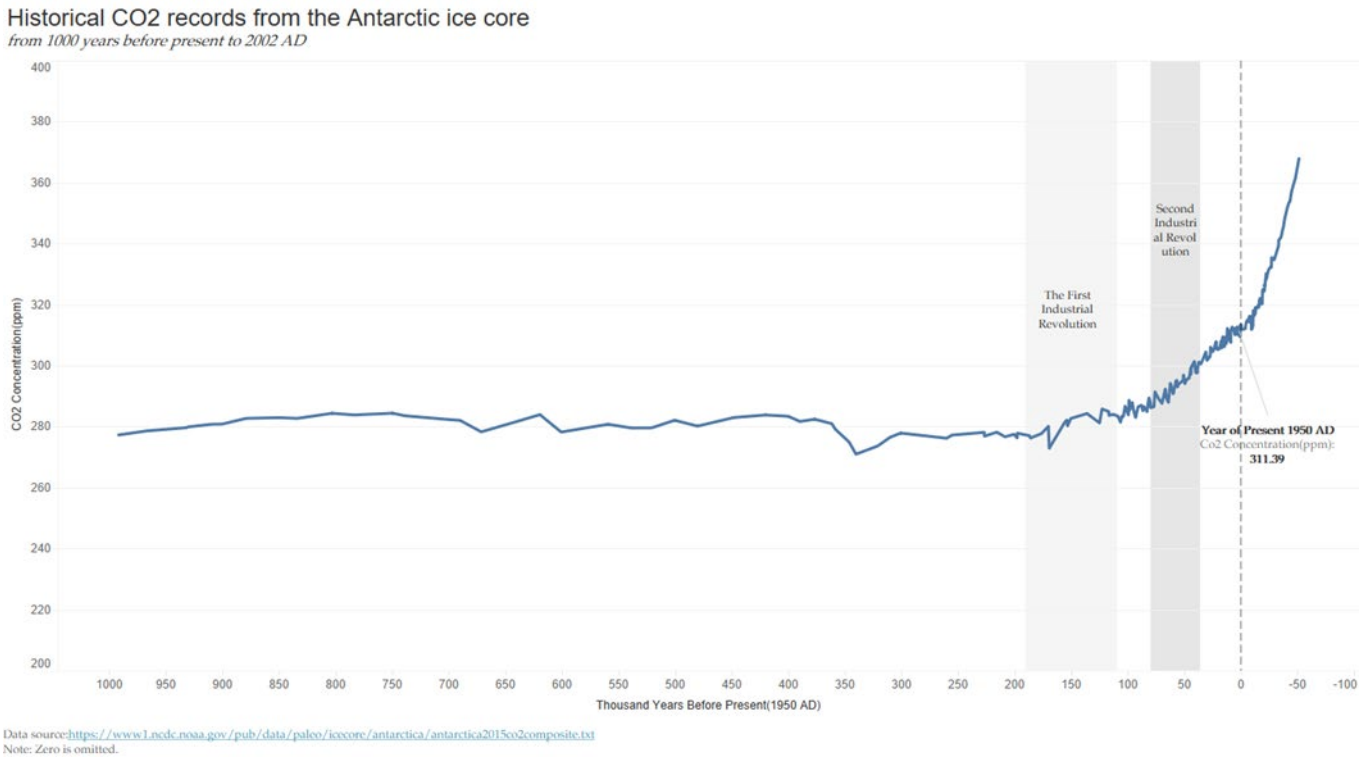

Figure 1. Historical CO2 records from the Antarctic ice core

The figure above plots the changes in the Earth 's carbon dioxide concentration from 1000 before 1950 to 2002. I have shaded the period of the first industrial revolution and the second industrial revolution, because we can see that the concentration of carbon dioxide has continued to increase significantly. Before the Industrial Revolution, the carbon dioxide concentration of the earth changed periodically. But after the Industrial Revolution, the concentration of carbon dioxide will no longer fall.

On the other hand, we can see that the concentration of carbon dioxide has increased faster after the present. The reason for this matter, I think we need to use the updated data for more research.

References:

Natural CO2 Emissions vs. Human CO2 Emissions. (2020). Retrieved 7 April 2020, from https://www.arcadia.com/energy-101/environmental-impact/greenhouse-gas-emissions-natural-vs-man-made/

Sources of Greenhouse Gas Emissions | US EPA. (2020). Retrieved 7 April 2020, from https://www.epa.gov/ghgemissions/sources-greenhouse-gas-emissions

The Carbon Cycle. (2020). Retrieved 7 April 2020, from https://earthobservatory.nasa.gov/features/CarbonCycle/page4.php