

Case study: Climate change

We are all familiar with the idea that our climate is changing. Every year there are debates in the news about whether a particular weather event is the result of global warming. Governments regularly gather to debate what can or should be done to limit the impact of human activity. Meanwhile various scientific bodies have claimed that we are now living in the ‘anthropocene’, an geological era dominated by the effects of humanity.

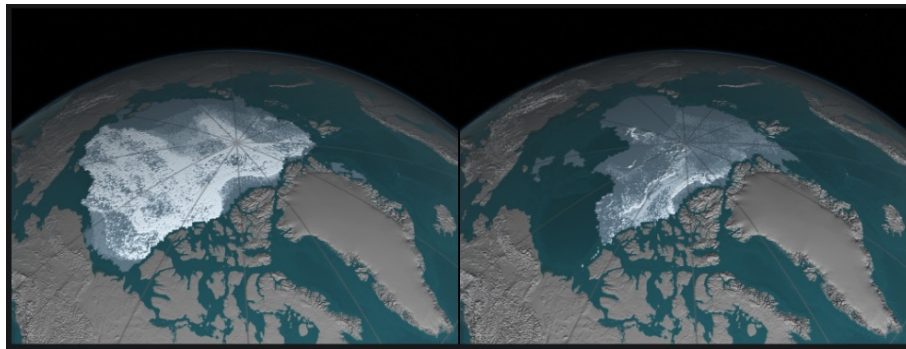


Figure 1: Arctic ice coverage September 1984 (left) and 2016 (right). Reductions in ice coverage at the North Pole are a commonly-cited consequence of change (source: NASA)

But how do we know that the climate is changing? What do we know about the causes? This is where data analytics comes in. Scientists have collected a huge amount of data on global temperatures (e.g. in Figure 2), carbon dioxide and other gas concentrations, tree and cloud coverage etc. This data often goes back decades, hundreds or even millions of years (for example in gases stored in antarctic ice). Data analytics is required to turn this data into knowledge – to identify how the world has really changed, and what the causes are.

Your goal in this case study is to investigate how climate data can be used to demonstrate whether or not the climate is changing, and what the possible causes of any changes are. This is an open-ended investigation, but areas you may look at are:

- How much did the climate vary before the industrial revolution?
- What can we say statistically about the apparent increase in temperature over the last century?
- What other measurable factors are connected to the increase in temperature? How can we establish a link?
- What is likely to happen in the future?

GLOBAL LAND-OCEAN TEMPERATURE INDEX

Data source: NASA's Goddard Institute for Space Studies (GISS). Credit: NASA/GISS

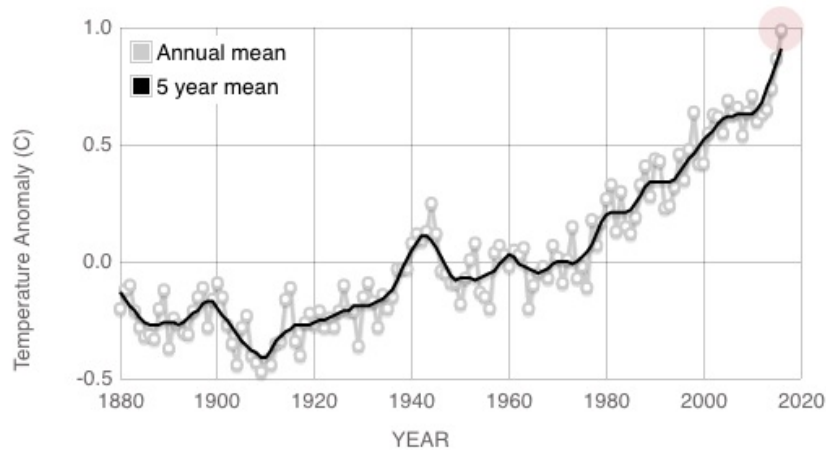


Figure 2: Global temperature data from 1880 to 2016 from NASA

You should identify appropriate statistical models to analyse the data. Furthermore, you should present clear visualisations to aid understanding of both the data set and your findings.

To begin your investigation I have downloaded the global temperature data in Figure 2. You can retrieve this on the VLE. You should also find additional data to look at other changes and try to link these with statistical analysis. You can collect additional data from many sources, but a good place to start is the NASA climate change website investigate, which also includes some basic visualisation tools <https://climate.nasa.gov>.