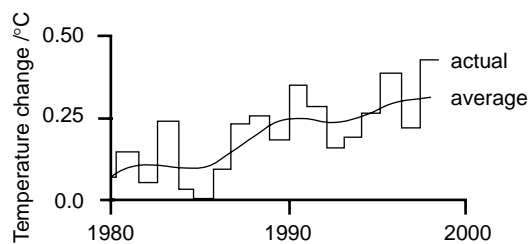


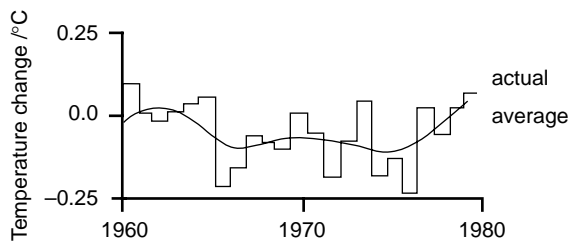
Looking at the data – temperature changes over the last century

Study the graphs, published by the International Panel of Climate Change (IPCC) and then answer the questions. These are temperatures above and below the average for the period 1961–1990.



1980–2000 data

1. Describe how the temperature of the earth has changed over the last twenty years.
2. By how much has the temperature changed?
3. Draw a sketch graph to show what you expect the average temperature to change by over the twenty years from 2000–2020.

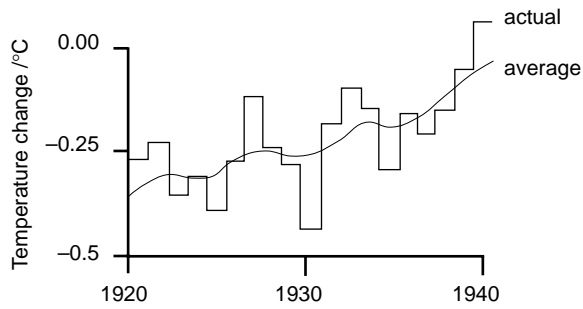


1960–1980 data



1940–1960 data

4. Compare how the temperature of the earth changed between 1960 and 1980 and between 1940 and 1960.
5. Based on the new information from question 4, draw a second sketch graph to show what you expect the temperature to change by over the twenty years, 2000–2020.



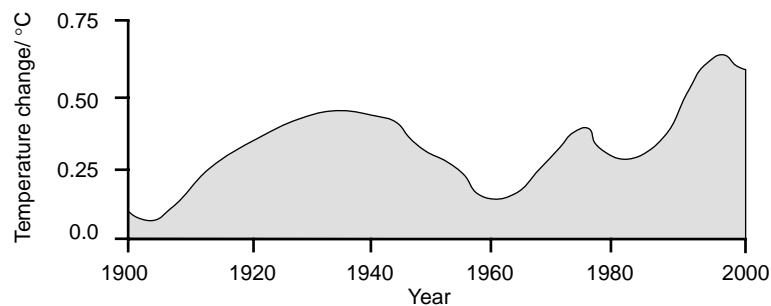
1920–1940 data



1900–1920 data

6. Compare how the temperature of the earth changed between 1920 and 1940 and between 1900 and 1920.
7. Based on the new information from question 6, draw a third sketch graph to show what you expect the temperature to change by over the twenty years 2000–2020.
8. Has the overall temperature of the earth increased over the last century? (Use the data above to support your answer.)
9. Based on the temperature changes over the whole of the 20th century, which of your sketch graphs is most likely to be correct?
10. Do you think that you have enough evidence to support a firm conclusion to your answer to question 9?

When looking for answers scientist usually analyse data from more than one source if they can. The following graph comes from the Central England Temperature (CET) record. This record goes back to 1660 when instruments were first used to record temperatures. Annual temperatures are recorded here.

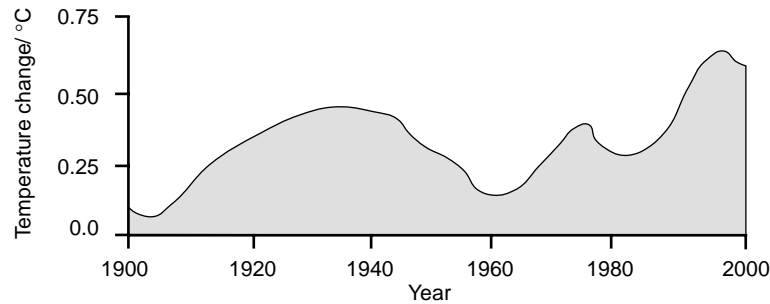


CET 1900–2000 data

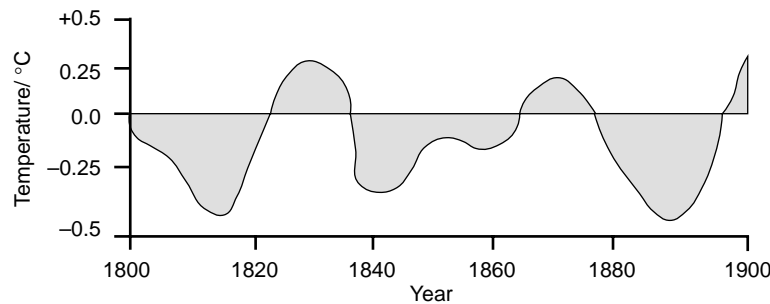
11. Does the Central England Temperature Record show the same temperature pattern as the IPCC data above?
12. How does the overall temperature change compare to the answer you gave in question 8?
13. Suggest a reason why different data collected during different experiments might vary, leading to uncertain conclusions.

Looking at the data – temperature changes over several centuries

Study the graphs, from the Central England Temperature record (CET) and then answer the questions.



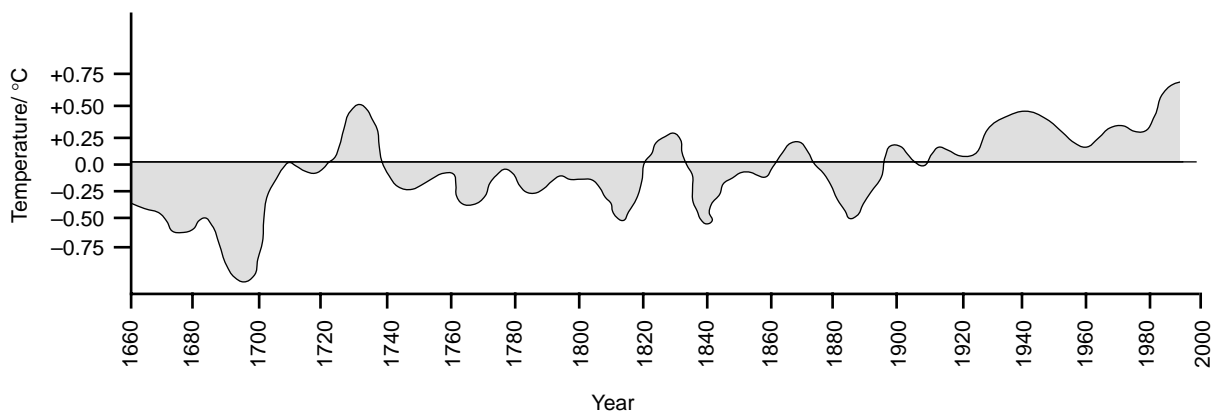
CET 1900–2000 data



CET 1800–1900 data

1. Do you think that the temperature changes seen in the 19th century were any different to those seen in the 20th century?
2. Which century was the coldest?

You may have seen pictures of people ice skating on the river Thames. At the same time, other places in Europe were also suffering from long bitterly cold winters and cold wet summers. This cooler period is often known as the 'Little Ice Age'.



CET 1660–2000 data

3. When do you think the end of the Little Ice Age was?
4. After the Little Ice Age, how long did it take to warm up?
5. Compare the temperatures of the 1730s and 1740s with the present temperature.

6. How do these values compare to the temperature in the 1930s?
7. How do you think the temperature will vary over the next twenty years?

In groups of 3 or 4

8. Look back at the conclusions you came to about how you think the average temperature will change based on:
 - the 1980–2000 data
 - the 1940–1980 data
 - the 1900–1940 data
 - the 1660–2000 data

Try and decide if any are correct.

9. What is your overall conclusion about global warming?
10. Has the data changed your views about global warming?

If you have time, go on to the extension sheet.

Looking at the data – extension sheet

Question 1. **Looking at the data, does the evidence so far support a firm conclusion? Explain your answer.**

So far you have investigated data from two different sources. The Central England Temperature record goes back for 340 years, which is a very long experiment, but when we stop and think about the age of the earth, 340 years is a very short length of time because the Earth is millions of years old. To help support our conclusion we need to take our temperature investigation back further. To do this a new method of determining temperature (and time) must be found.

Question 2. **Can you think of anything that scientists could use to help discover what the temperature was hundreds, thousands and even millions of years ago?**

Background information

Recently leading scientists have also tried to answer the above question. Their search for complete temperature records has taken them to some places on Earth where many people do not go, such as the middle of the Atlantic and Pacific oceans, and the ice and snow of Greenland and Antarctica. The scientists have applied an idea that the ‘father of geology’, James Hutton had in the 1700s.

In the 1700s James Hutton from Edinburgh realised that the key to understanding the future of the planet was by investigating the past. James Hutton was the first man to study the rocks and realise that the Earth was millions of years old. He introduced the idea of geological time, and used fossils to learn about previous ages. Hutton’s ideas were very controversial at the time because in 1650 Archbishop James Ussher of Ireland completed his dating of the Earth using biblical evidence.

Ussher declared that the world was created on the evening of October 22, 4004 BC, and was less than 6000 years old.

