

GEOSCIENCE

with Dr Denise Kulhanek, Dr Molly Patterson
and Dr Brian Romans

Talking points

KNOWLEDGE & COMPREHENSION

1. What are three mechanisms by which climate change can increase the melting of ice sheets?
2. What is micropalaeontology?
3. What is a sediment core? Why is a sediment core useful for climate scientists?
4. 'Tipping points' in climate change are when, after a certain threshold is reached, a system affected by climate change then begins to drive further climate change itself, accelerating the process and making reversal very difficult. Can you identify two tipping points described in the article?

APPLICATION

5. Besides those mentioned in the article, what other qualities of sediment cores do you think the researchers measure? What questions might you ask to find out how the researchers take these measurements and what they learn from them?
6. Besides sediment cores, climate scientists often take ice cores from ice sheets themselves, which have similarly formed over millennia. Tiny bubbles in the ice cores give evidence about past atmospheres. How do you think the researchers might include findings from ice cores to further build their evidence base?

ANALYSIS

7. Brian says there is evidence of a deep ocean current shutting down during a warm period of the Pliocene. What do you think were – and would be – the geological and biological implications of this?
8. The Greenland Ice Sheet, in the Arctic, is currently melting a lot more rapidly than the Antarctic Ice Sheet. Why do you think the researchers decided to research Antarctica, even though Greenland is arguably a more pressing contributor to climate-induced sea level rise?

EVALUATION

9. The term 'geoengineering' refers to a controversial set of possible measures to slow down or reverse climate change that involve artificially influencing geological or climatic processes on a massive scale. In Antarctica, proposals include pumping seawater onto the ice sheet's surface to refreeze it, or to dye the surrounding ocean yellow so it absorbs less heat. What do you think are the arguments for and against such approaches?
10. Opponents to action on climate change sometimes use the argument that there is insufficient evidence on how climate change will affect the world for us to take meaningful action. It is true that there are evidence gaps, as demonstrated in the article. To what extent do you think this should affect the magnitude of efforts taken to slow down or stop climate change?

Activity

Climate change is often said to be the greatest challenge in human history and will require concerted efforts from governments and society to overcome it. Scientific evidence is crucial to meeting this challenge, so we are able anticipate the effects of climate change under different future scenarios.

Imagine you are a scientific communicator, responsible for taking scientific findings and communicating them to governments around the world, to persuade them to take decisive action. You are charged with presenting to the government of a major nation about what the projected response of Antarctica to climate change means for the world.

1. Build your evidence base.

Governments are often sceptical of change, so there will need to be a strong case in favour of action.

- a. Pull out information from Denise, Molly and Brian's article that indicates how Antarctica is changing, or is likely to change, in the future.
- b. Use the internet to further research scientific evidence on Antarctica and climate change, noting down key relevant findings.

2. Organise your evidence.

How can you best present your evidence to an educated but non-scientific audience? What are the key points you need to communicate? You will need to emphasise:

- a. The quality/robustness of the evidence base
- b. Why projected impacts should be taken seriously
- c. Any uncertainties, and what they mean in a policy context.

3. Focus on solutions.

What should policy makers do with the information you have given them? Make recommendations for appropriate action. Steps to address climate change can be broadly categorised within the following:

- a. Mitigation. Actions to slow down, stop, or even reverse climate change, such as through reducing carbon emissions and increasing carbon storage capacity.
- b. Adaptation. Giving society the tools to change in response to climate change, such as building structures to defend against sea level rise.

4. Present to the 'government'

Classmates will play the role of government ministers. Individuals could have different 'portfolios' (responsibilities), such as agriculture, energy, transport, healthcare, environment and finance. Aim for your presentation to follow a clear structure (for example, introduction, evidence, implications, solutions, conclusion). Invite questions at the end.

5. Once finished, reflect on your presentation.

Do you think your 'government' was convinced? What felt like the most and least effective parts of your presentation? What would you change if you were to do it again? How has this activity made you feel about what it means to be a scientist with an important message to convey?

More resources

- The team's expedition to the Antarctic was documented for public engagement. You can gain a fascinating insight into the expedition and its findings at the expedition webpage: [unuco.com/antarctica](http://uninuco.com/antarctica)
- This video from Vox gives a quick insight into a particularly sensitive part of the Antarctic and why its response to climate change will have big implications for society: www.youtube.com/watch?v=XRUxTFWWdY
- These winning photos from The Micropalaeontological Society's microfossil image competition provide an entrancing look into the intricate structures of minute fossilised organisms: www.tmsoc.org/microfossil-image-competition-calendar-2021/