

Arctic Ice and Sea Level Rise



Age 7-14



45 minutes

XL Catlin Arctic Live 2018

Running for a fifth year, XL Catlin Arctic Live is the northernmost live education event that connects classrooms globally to members of the UK science expedition team based at the UK Arctic Research Station in Ny-Ålesund, Svalbard.

Curriculum Links

Science

- Recognise that environments can change and that this can sometimes pose dangers to living things
- Observe that some materials change state when they are heated or cooled, and measure or research the temperature at which this happens in degrees Celsius (°C)
- Describe the differences in arrangements, in motion and in closeness of particles explaining changes of state, shape and density, the anomaly of ice-water transition

Working Scientifically

- Ask relevant questions and use different types of scientific enquiries to answer them
- Set up simple practical enquiries, comparative and fair tests
- Make systematic and careful observations and take accurate measurements using standard units, using equipment such as thermometers
- Gather, record, classify and present data in a variety of ways to help in answering questions

Lesson overview

A common misconception is that melting sea ice in the Arctic will cause sea levels to rise. This investigation will provide students an opportunity to **observe over time** and **compare** how the melting of different types of ice in the Arctic and Antarctic will affect sea level rise.

Resources

- 2 plastic containers (ideally the height of the containers should be higher than the cans)
- 2 full cans of food
- Some ice
- Some water
- A marker pen

Safety and Guidance




- Carry containers with two hands, carefully observing the surroundings.
- Participants should work in the centre of the table.



Running the activity


 To help make the live investigation run smoothly, it will be helpful to have all resources prepared for your students to use.


10 mins  Jamie Buchanan-Dunlop and a member of the expedition team will say a brief welcome, including shout-outs to registered classes. Then they'll proceed to speak about how the Arctic is changing and the importance of working scientifically to better understand changes in the environment. Then the team will do a resources check with your students before guiding them in the steps to set up the investigation.

5 mins  Student groups should follow-along as the investigation team sets up the investigation.


Steps to set-up the investigation


1. Place the two cans of food in the plastic containers.
2. Into one container put a mixture of ice and water until it comes up to about 1cm below the top of the can. Try to measure how much ice you use. This is the Arctic Ocean model. The ice in the water represents the sea ice.
3. In the other container pour water (again until it comes up to about 1cm below the top of the can). Then place the same amount of ice that you used for the Arctic sea ice model on top of this can. This is the Greenland or Antarctica model, where there is an ice sheet on top of the land.
4. Label each container and mark a line at the water level, which should be the same for both containers.
5. Leave the cans for a time (up to 2 hours). The melt rate will of course vary with the warmth of the room and the amount of ice used.


5 mins  Jamie will ask your students to predict what will happen to the water (sea) level as the ice melts. Students should then share with a partner.

 Student representatives will be invited to share what they predict will happen.

Key

 **Information**
background or further information to guide an activity or explanation

 **Group**
activity for students to complete in pairs or small groups

 **Watch**
students watch a demonstration or video

LIVE INVESTIGATION

Running the activity

10
mins



Jamie and his investigation partner will then discuss more about how the Arctic is changing, what causes sea level rise and why it is an issue. In this exposition, they will discuss the physical states of water and its transition points and talk about what makes water an anomaly. The investigation team will also describe the water cycle and highlight various forms of water you might see in nature.

5
mins



Students should observe and describe what happened in their two models.

Steps to observe the results

6. Mark the level of the water after all the ice has melted.
7. Students will be asked to discuss in groups:
 - a. What difference can you see between the two containers?
 - b. From this investigation, what has greater impact on sea level rise: melting sea ice or melting glaciers and ice sheets?
 - c. How could this affect people who live near an ocean?

5
mins



Student representatives will be invited to report what they observed in their investigations.

5
mins



Jamie and his investigation partner will discuss why there was a difference in the water level rise and make the connection to sea level rise. There will be a discussion about why melting glaciers and ice sheets have greater impact on sea level rise than melting sea ice. Additionally, there will be discussion of thermal expansion and how particle spacing changes with temperature which also contributes to sea level rise.

LIVE INVESTIGATION

Find out more

Expected results and answers

The 'Arctic Ocean' container should see little rise in the level of the water. Melting sea ice causes little impact on sea level, as this just represents the sea freezing and thawing without the addition of other water sources.

The 'Greenland' or 'Antarctica' container should see a greater rise in the level of the water, potentially 'flooding' over the top of the can. Melting ice on land can have a significant impact on sea level rise, with 99% of the freshwater on the planet stored in the Greenland and Antarctic ice sheets.

People living in coastal areas around the world, including the UK and USA, would be more susceptible to flooding if the ice on land (e.g. the Greenland and Antarctic ice sheets) melted but melting sea ice would have little impact. It is estimated that global sea levels would rise by an average of 66 metres if all the ice sheets were to melt.

A study published in the journal Science in 2012 estimates that 4 trillion tonnes of ice from the Greenland and Antarctic ice sheets has melted between 1992 and 2011. This has resulted in an 11mm rise in sea level, contributing about 40% of the total sea level rise during this period.

For more on ice see the Subject Update All about ice <bit.ly/FO_AboutIce>.

