

Glaciology Resources

Thank you for taking interest in our series of glaciology resources titled “The Power of Ice”.

This resource pack was developed in partnership with Prof. Doug Benn of the School of Geography and Sustainable Development, University of St Andrews.

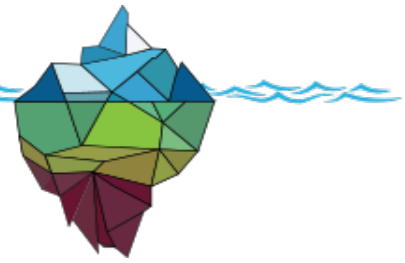
These resources were made as part of the NERC-NSF research projects: Calving Laws for Ice Sheet Models (CALISMO) and Disintegration of Marine Ice Sheets: Novel Optimized Simulations (DOMINOS) – International Thwaites Glacier Collaboration.

Special thanks is also due to Robert Jones and Bethany Hudd who wrote all materials. The development of this resource would not have been possible without the generous support of the GeoBus sponsors, which we gratefully acknowledge.



Melt Factors – Ice Cubes

Teacher Notes

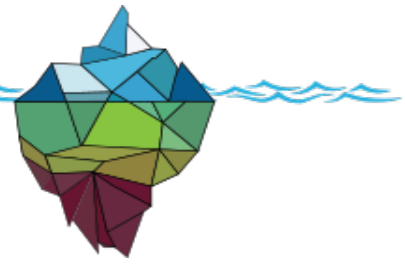


<i>Activity Title:</i>	Factors Influencing Melt; Ice Cube Experiment
<i>Target Age Group:</i>	Scottish S1 – S4 (approximately 12 – 16 years)
<i>Preparation:</i>	Collect materials (including freezing ice cubes, some with dirt added), download associated PowerPoint and visit the GeoBus You Tube Channel to view 'Glacier Mass Balance' & 'Glaciers and Climate Change' Glaciology in a Minute videos.
<i>Activity Description:</i>	The focus of this activity is to identify the different factors that can influence glacial melting and to observe the impact these have on glacier melt rates
<i>Time:</i>	10-15mins introduction/preparation, ~30mins activity (with teaching within this time), 10mins reflection Total: 50mins – 1 hour
<i>Learning Outcomes:</i>	<ul style="list-style-type: none">- Understand and appreciate that glaciers exist in different climates and environments and as a result of this they melt differently- Think critically about the different glacial environments and predict which glaciers may melt the fastest- Observe evidence of the differences in melt rates for each condition through the ice cube experiment
<i>Group Size:</i>	This activity may be done as a whole class, in groups, or as individuals but typically groups of around 4 work well

BACKGROUND

With an increasingly warming world due to Climate Change, glaciers are melting fast. However, glaciers aren't all melting at the same rate, with some melting far faster than others. Why is this? This activity examines different glacier conditions that effect melt rates – clean, dirty, marine terminating, lake terminating and land terminating – and tests which of these conditions has the greatest effect on how a glacier melts.





INGREDIENTS

You Will Need:

- 5x Tupperware Containers (or similar boxes that don't leak)
- 5x ice blocks/cubes
- Water
- Salt
- Some dirt/mud
- Stopwatch

PRIOR PREPERATION

1. Make five ice cubes (per group), they can be as large or as small as you want
2. Add dirt to one of the cubes (simulating a dirty glacier) before freezing

ACTIVITY

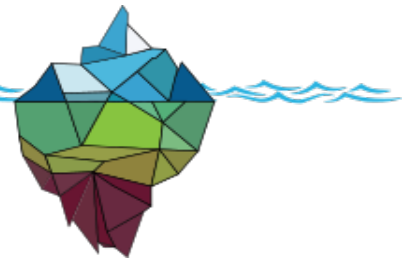
Before setting up the experiment, the students should briefly discuss (in their groups) and write down the order they think that the ice cubes will melt in.

Then, the activity can be run:

1. To simulate the clean vs. dirty glaciers, one clean and one dirty ice cube should be placed in separate Tupperware and placed in the sun (either by a window or in direct sunlight).
2. To simulate a marine terminating glacier, one clean ice cube should be placed in a Tupperware along with some water. There should be enough water to float the ice cube. A heaped teaspoon of salt should be added to this and the tub sat away from the window.
3. For a lake terminating glacier, the same procedure as 2. should be followed, but this time, no salt should be added.
4. For a land terminating glacier, one clean ice cube should be placed in a tub on its own.
5. Once all the stations have been set up, start the stopwatches
6. Observe and report the melt behaviour of each of the 'glaciers' until the ice has melted
7. The time it takes for each ice cube to melt completely should be recorded

Please note: it may take a while for the ice to melt completely and so it is advised that the PowerPoint is continued (*from the 'why is this important' slide*) during the experiment time.





Once all the ice cubes have melted, compare the results of melt times with the hypotheses stated before the experiment and discuss what this means in terms of real world glaciers.



ALTERATIONS

For a more advanced version of this experiment you could assess the impact of a hair dryer and/or a fan (tropical storm / wind) on glacier melting. Additionally, a range of water (ocean / lake) temperatures could be tested. You could also try a combination of factors e.g. a 'clean', ocean terminating glacier in the sun with a hair dryer to assess the difference in melt rate.