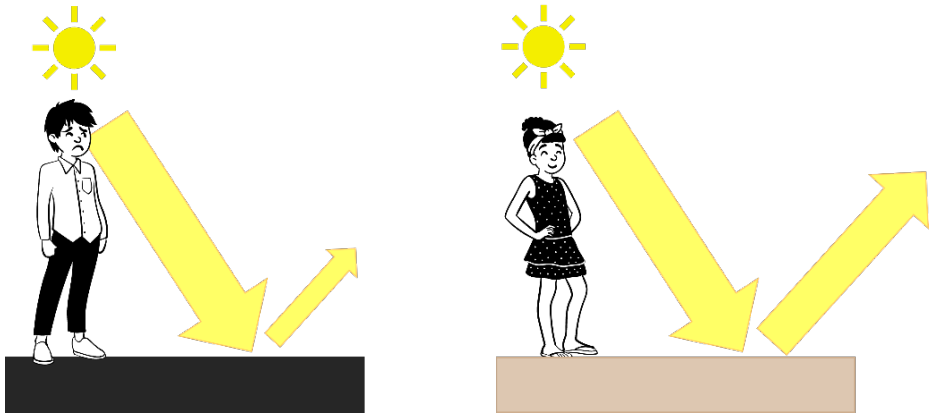
The effect of Albedo on glacier melting

Introduction

Have you ever wondered why some surfaces in the sun are much warmer than others? It has something to do with the so-called albedo radiation. Albedo describes the ability of an object to reflect light. It takes on values between 0 (no reflection) and 1 or 100 % (total reflection).

Imagine you are out for a walk on a sunny day. If the ground is covered with light-coloured sand, it reflects the sunlight well and remains cool so you can walk barefoot. This is because the sand has a high albedo. The situation is different with an asphalt road. Asphalt is dark and absorbs the sunlight instead of reflecting it. This makes the asphalt very hot. This is also the reason why you can hardly walk barefoot on it.

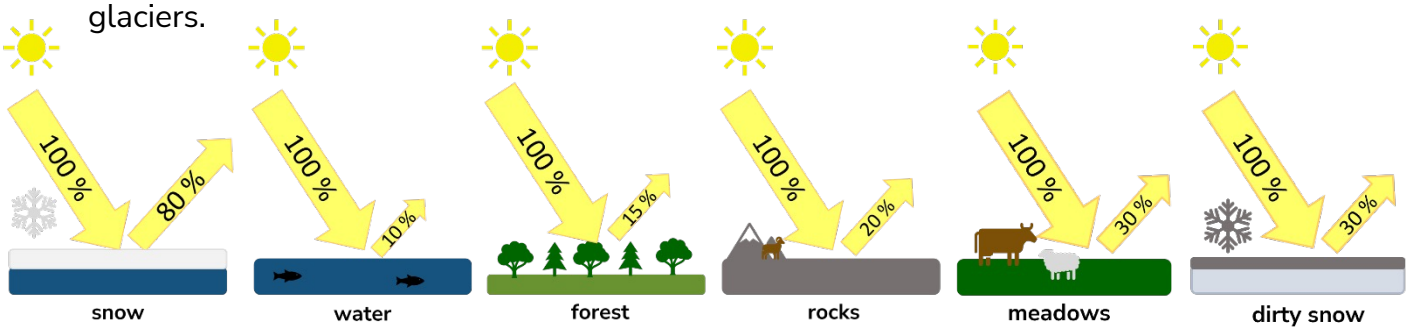


However, albedo radiation not only affects the temperature of surfaces, but also our climate. When large surfaces like ice or snow melt, less sunlight is reflected and instead absorbed by darker surfaces. This causes the affected regions to heat up further, which can lead to an acceleration of climate change.

Albedo radiation also plays a role in saving energy. If you want to cool your house in summer, it is helpful to choose light colours for the roof and exterior walls. This absorbs less sunlight and keeps the inside of the house pleasantly cool.

Albedo radiation is therefore not only a physical phenomenon, but also has an influence on our everyday life. By consciously choosing light-coloured surfaces, we can help to ensure that our surroundings absorb less heat and the climate is less polluted.

In the following experiment we want to observe the effects of albedo on polluted glaciers.



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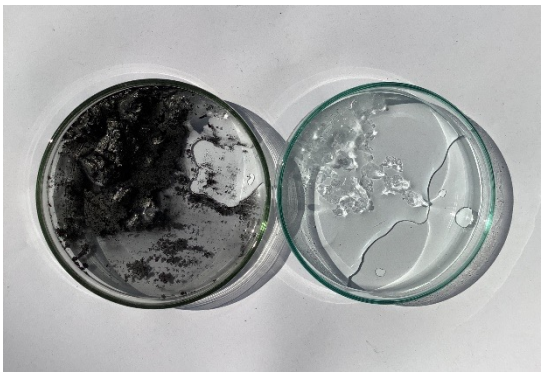
Instructions

Material

- 2 Petri dishes
- Coal dust (e.g. crushed barbecue charcoal)
- Ice cubes or crushed ice
- Isolating base (e.g. polystyrene)
- Scale
- Stopwatch



Instructions

1) Find a sunny spot and place your isolating pad on the ground - make sure it is straight and the sun can shine on it.
2) Put about 10 g of ice in each Petri dish.
3) Sprinkle the charcoal dust over the ice in one Petri dish so that the ice is covered.
4) Place the two Petri dishes on the surface in the sun.
5) Stop the time until the ice has melted.

To Dos

1) Make an assumption in which Petri dish the ice melts first.

2) Give a reason for your assumption.

3) Write down your observations.

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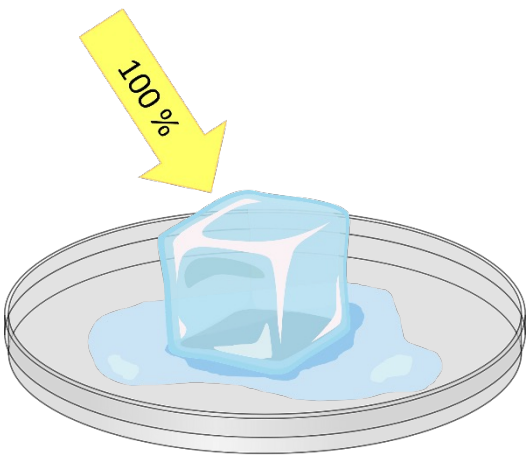
Evaluation sheet

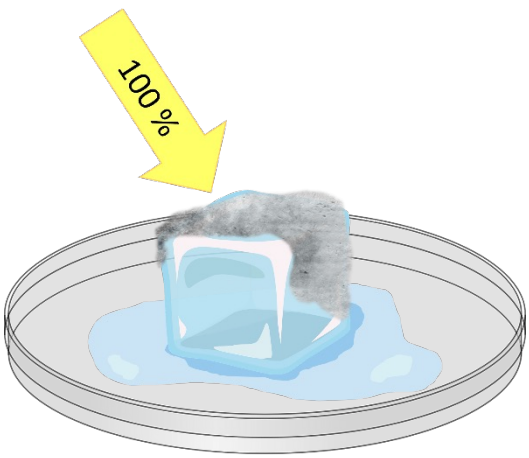
Results

Write in the table how long it took for the ice to melt.

Without coal dust	With coal dust

Draw an arrow representing the reflected radiation. Write down the percentage of the incoming radiation that is reflected (Tip: Read the info text on page 1).





To Dos

The so-called ice-albedo feedback describes the interaction between the cryosphere (snow- or ice-covered earth surface) and the global climate. As a result of global warming, ice melts and the underlying soil and rocks (in the case of glaciers) or the sea (in the case of the Arctic) emerges.

1) Compare the albedo values of ice with the values of soil and sea.

2) Discuss the consequences of the melting of the ice in terms of global warming.