PASSAGE 1

Where is Earth's Water?

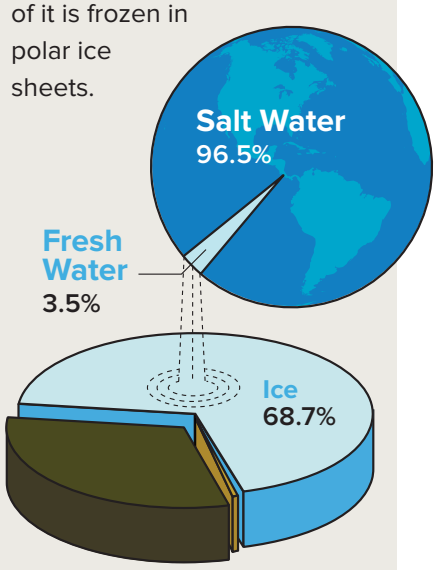
Our planet contains a limited amount of water that is always in motion. The water that comes out of your faucet moved through the atmosphere, flowed across Earth's surface, and circulated deep underground. This water cycle is very important for Earth's climate, and liquid water is necessary for life.

Most of Earth's fresh water is locked in ice

Over 96% of Earth's water is saline (salty) and found in the ocean. Only a little over 3% of Earth's water is fresh. Most of that fresh water (68.7%) is frozen in glaciers and ice caps. Two ice sheets, the Antarctica Ice Sheet and the Greenland Ice Sheet, contain more than 99% of the ice on Earth's surface.

Total Distribution of Earth's Water

Only 3.5% of all the water on Earth is fresh water, and most of it is frozen in polar ice sheets.



Info source: www.usgs.gov

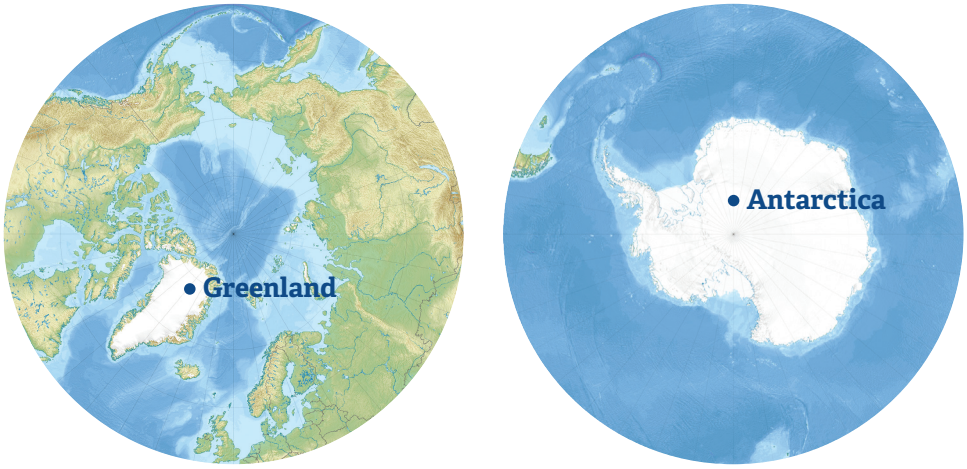
There are two kinds of ice on Earth's surface, sea ice and land ice. **Sea ice** is frozen ocean water. **Land ice**, on the other hand, forms from fresh water: snow or rain. Land ice is any form of ice that lasts longer than a year on land, such as glaciers, ice caps, and ice sheets. **Ice sheets** are masses of land ice that cover very large areas. They form in places where some snow lasts through the warmer summer months. Over thousands of years, layers of snow pile up and form these thick, dense ice sheets.

Antarctica and Greenland are the only places on Earth that have ice sheets. Ice sheets are always moving. They flow downhill slowly, towards the ocean, under their own weight. As long as an ice sheet accumulates the same mass of snow as it loses to the sea, it stays stable.

Glaciers are thick masses of ice that form on mountains or near the poles. They form as a result of snow fallings over many years. Some glaciers slide all the way to the ocean. Others end in ice shelves. **Ice shelves** are floating sheets of ice that connect to a land mass. West Antarctica has some very big ice shelves. Ice shelves are very important. Large amounts of land ice would flow into the sea if they disintegrated. Greenland has fewer ice shelves, and its location puts them at risk of melting. Its ice sheet receives a lot of sun during the summer and melts substantially.

The Greenland and Antarctica Ice Sheets

Ice sheets cover most of Greenland and Antarctica. Greenland lies between the North Atlantic and Arctic oceans. It is the world's largest island and its least populated country. The Greenland Ice Sheet covers three quarters of the island, an area roughly three times the size of Texas. Antarctica is the southernmost continent and the



Maps Source: Uwe Dedering via Wikimedia Commons

coldest, driest, and windiest place on Earth. The Antarctic Ice Sheet contains 70% of Earth's freshwater and 90% of its ice.

Ice cover affects albedo

When light hits a surface, some of it is reflected and some of it is absorbed. **Albedo** (al-bee-doh) refers to the amount of light that is reflected (and not absorbed) when it hits a surface. A light surface reflects most of the light that hits it and has a high albedo. A dark surface absorbs most of the light that hits it and has a low albedo.

Ice at the poles affects climate because it has a high albedo. Most of the sunlight that hits the white ice is reflected back into space. In contrast, asphalt, the blackish-grey material used to pave streets, has a low albedo. It absorbs most of the sunlight that hits it. That is why we avoid walking on it barefoot on a hot summer day.

Sea ice keeps surfaces cool by reflecting 50 to 70% of the incoming sunlight. Snow has an even higher albedo. Thick sea ice covered with snow reflects as much as 90% of incoming sunlight. This helps maintain cold temperatures, and prevents ice from melting too quickly in the summer. The albedo of sea ice is much higher than other surfaces on Earth, including the surrounding sea that is not covered by ice. When sea ice melts, more open ocean is exposed. The dark water absorbs the sunlight and heats up. This leads to more ice melting, more warming of the ocean, and rising global temperatures.

Melting ice sheets affect sea level

When sea ice melts, it does not affect sea level rise. Sea ice is already floating in the ocean, like an ice cube in your drink. When the ice cube melts, the amount of water in the glass stays the same. But land ice is different. When giant blocks of ice move from land to ocean and melt, they turn from fresh water into seawater. It's like adding water to a glass that's already full. It overflows. That is why the melting of ice sheets is the biggest cause of sea level rise.

By observing the polar ice sheets, scientists can get information about how climate is changing. If we can understand what is happening to the ice sheets, we'll be better equipped to make predictions about the future.

Stone Glacier, part of Greenland's ice sheet

Image Source: Eric Rignot, NASA JPL

PASSAGE 1

Stop and Think Questions

Based on the Text

1. Where is most of the fresh water on Earth?

2. What is albedo? How does albedo influence temperature?

3. How would the melting of sea ice affect sea level? What about land ice? Explain your reasoning.

Looking Ahead

4. What data should scientists collect in order to investigate the Greenland and Antarctic Ice Sheets?

5. What methods do you think they should use to collect data?