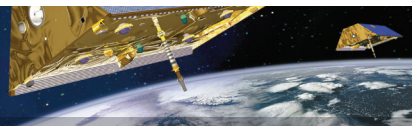




PASSAGE 1

# Where is Earth's Water?

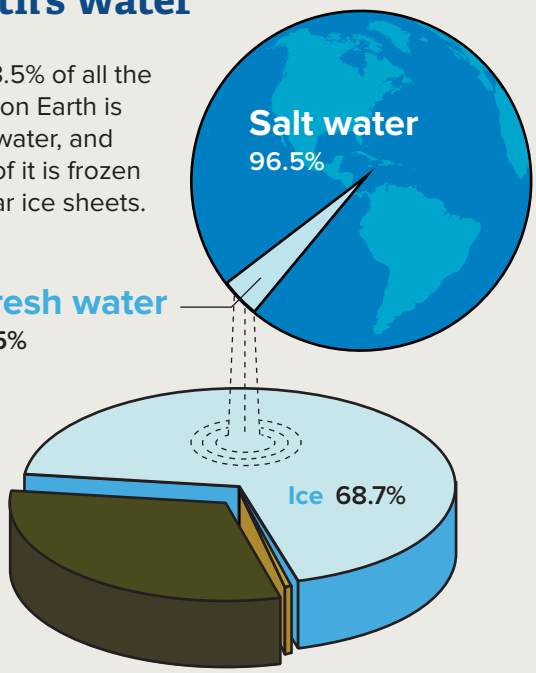
Our planet contains a finite amount of water that is in constant motion. The water that comes out of your faucet is likely to have moved though the atmosphere, flowed across Earth's surface, and circulated deep underground. This water cycle is fundamental to Earth's climate, and liquid water is essential to life.

## Most of Earth's fresh water is locked in ice

Over 96 percent of Earth's water is saline (salty) and found in the ocean. Only a little over three percent is fresh. Over two thirds (69%) of that three percent is locked up in glaciers and ice caps. Ninety percent of that is held in the Antarctica Ice Sheet, and about nine percent is contained in the ice sheet that covers Greenland. So, combined, these two ice sheets at the poles 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. It grows during the winter and melts during the summer months, but some sea ice remains all year in certain regions. Unlike sea ice, land ice 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, ice fields, and ice sheets. **Ice sheets** are masses of land ice that cover more than 50,000 sq kilometers/20,000 sq miles. They form in areas where some snow lasts through the warmer summer months. Over thousands of years the layers of snow pile up and compress into thick, dense masses of ice.

Ice sheets are constantly in motion. They flow slowly downhill, towards the ocean, under their own weight. Near the coast, most of the ice moves through relatively fast-moving outlets called ice streams, glaciers, and ice shelves. As long as an ice sheet accumulates the same mass of snow as it loses to the sea, it remains stable.

**Glaciers** are thick masses of ice that form on mountains or near the poles from fallen snow that compresses over the years. Some glaciers slide across solid earth all the way to the ocean. Others end in **ice shelves**: a part of the glacier that floats on the ocean like a dam at the end of an artificial lake. West Antarctica has some very big ice shelves. Large amounts of land ice would flow into the sea if they disintegrate. Greenland has fewer ice shelves, but its geography makes it vulnerable to climate change because its ice sheet receives a lot of sun during the summer, and melts substantially.

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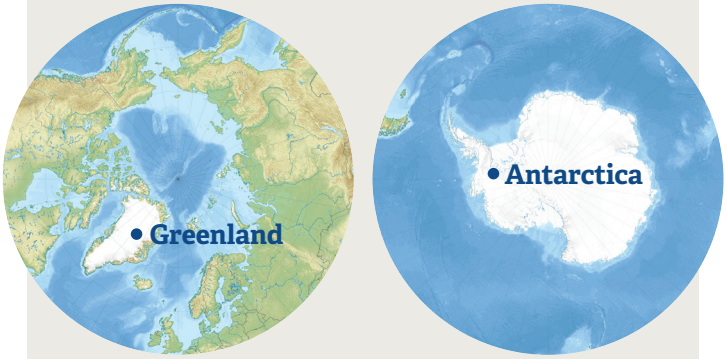


## The Greenland and Antarctica Ice Sheets

The two big ice masses on Earth today cover most of Greenland and Antarctica. Lying between the North Atlantic and Arctic oceans, **Greenland** is the world's largest island and its least populated country. The Greenland Ice Sheet extends about 1.7 million square kilometers (656,000 square miles) and covers three quarters of the island, an area roughly three times the size of Texas.

More than six times as large as Greenland, **Antarctica** is the southernmost continent—and the coldest, driest, and windiest place on Earth. The Antarctic Ice Sheet contains 30 million cubic kilometers (7.2 million cubic miles) of ice: 70% of Earth's freshwater and 90% of its ice. Antarctica is considered a desert because it gets very little rain or snow, and temperatures as low as −89 °C (−129 °F) have been recorded.

Map source: NASA

## Ice cover affects albedo

**Albedo** is a measure of the reflectivity of Earth's surface. Ice at the poles affects climate because it has a high albedo: most of the sunlight that hits it is reflected back into space. (In contrast, asphalt has a low albedo: most of the sunlight that hits it gets absorbed. That's why we avoid walking on it barefoot on a hot summer day.) Sea ice keeps surfaces cool by reflecting 50 to 70 percent of the incoming sunlight. Snow has an even higher albedo, and thick sea ice covered with snow reflects as much as 90 percent of incoming sunlight. This serves to maintain cold temperatures, and delays ice melt in the summer. The albedo of sea ice is much higher than other earth surfaces, such as the surrounding ocean. When sea ice melts, more dark open ocean is exposed. The water absorbs sunlight and heats up, leading to a feedback cycle of more melting, more warming, and rising global temperatures.

## Melting ice sheets affect sea level

Melting sea ice has no effect on sea level rise because it's already floating in the ocean, like an ice cube in your drink. When it melts, the amount of water in the glass stays the same. (The cube floats because fresh water, unlike most substances, becomes less dense as it nears the freezing point. That's also why icebergs float on the ocean surface.) Land ice is different. When giant blocks of ice move from land to ocean and melt, they turn from freshwater to seawater. It's like adding water to a glass that's already full. It overflows. That's why ice sheets are the biggest contributors to sea level rise.

**Stone Glacier, part of Greenland's ice sheet.**

**Image source:** Eric Rignot, NASA/JPL

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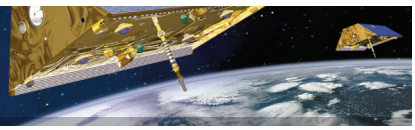



The polar ice sheets are more than the largest reservoir of fresh water on the planet. They are great indicators of what's happening with the climate today. If we can understand what's happening to the ice sheets, we'll be better equipped to make predictions about the future.

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PASSAGE 1

# Stop and Think Questions

## *Based on the Text*

1. What do scientists know about the amount and location of freshwater 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 answer.

## *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?

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