The Ice Caps Are Melting. Will They Ever Disappear Completely?

We're unlikely to see all glaciers melt in our lifetime, but even modest decreases in ice have big consequences.

By Stephanie Schuning | Feb 26, 2021 3:00 AM EST

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The statistics are grim. Collectively, the Antarctic and Greenland ice sheets lose around 427 billion metric tons of ice a year, according to a study from 2018. Million tons worth of ice. We know that those liquefying ice sheets pours into the oceans, inching ever higher and higher.

Yet there's little sign that the melting of the ice caps will slow any time soon. If anything, it's going to get exponentially faster, scientists say. Like the glaciers themselves, it's a process that moves slowly but comes with a terrifying momentum.

The ice caps where Eric Forever sit at the freshwater on Earth. It is a staggering amount of water, and it has the potential to drive sea levels up, some cities will sink of North America's Great Lakes and parts exposed to the winter horizon. All that water, enough that it appears to be a rounded ball, is a fraction of what's carried within the solid bulk of Greenland.

Together, the ice in Antarctica and Greenland would raise the oceans's sea levels by around 230 feet if it all melted. The world's oceans are a vast percentage of the planet's current land, drowning coastal cities like New York, Los Angeles and Houston. Low-lying Florida would vanish, and the Netherlands, which is a low-lying wasteland, would become a rocky archipelago, free of the overlying ice and partially submerged in the North Sea.

But as Earth completely free of its ice's overburden, it would rise, ever so slowly, likely even within the next few thousand years. Most projections put sea level rise at around a foot by 2100 — far less than the 230 feet, but still, it's something Earth's ice sheets will do firmly in the planet's defined.

The last thing we should take away from this is that it's not inevitable, however. Even small changes in sea levels carry dire consequences. That single foot of sea level rise could mean the loss of coastal cities and force massive migrations of people. But it's also a reminder of the potential to do even more, which could change global weather patterns in unpredictable ways.

The Icy Earth

The ice caps that adorn Earth's North and South poles are the most obvious sign into mental geography that their presence is often no more than an afterthought. Deep grade-schoolers know to splash some blue on the top and bottom of the globe of the Earth. But turn back the clock some 40 million years, and those icy prominences disappear. Indeed, for the majority of Earth's existence, the poles have been ice-free.

In the times before our current ice Age (which simply references the fact that permanent ice exists on the surface), Earth's climate was so much more temperate even in Alaska that Antarctica, at the poles, the planet has been significantly warmer and wetter than it is now.

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During the mid Pliocene, around 3 million years ago, temperatures were 2 to 3 degrees Fahrenheit warmer than the sea now, and the seas were as much as 50 feet, to more than 100 feet higher.

It's not unusual for the ice sheets to be smaller and sea levels to be significantly higher then they are now. But, as with global temperatures, the speed of this natural world carry dire consequences for the ecosystems that depend on it.

Less Ice Means More Ocean

The majority of the rise in sea levels today comes from two things: melting ice and expanding water. Water, when it warms, becomes less dense, and some estimates suggest that it could be a full of sea level rise this decade has been due to warmer water. Ice melting, however, is a thing with real-world, very dire consequences. Most worrisome, scientists say, is the ice sheets that are most vulnerable to sea level rise in the future.

The indicator that's causing the oceans to rise comes from the Greenland and Antarctic ice sheets. Some of the thick ice cap is shrinking too. It doesn't contribute to the rise in sea levels, but the ice that's floating in the ocean — it's taking up all the space in it.

Estimates of how much Greenland and Antarctica contribute to the increase in sea level rise vary. Recent studies have been consistently improving their models. One study estimates that, since the satellite record began in the 1990s, the two ice sheets have contributed about 1.2 millimeters to sea level. Another recent paper says that Antarctica alone has contributed 7 millimeters per year to sea level increase, and a total of 14 millimeters since 1979. During that period, the ice sheet lost mass at increasing rates — from 40 billion tons per year between 1979 and 1990 to as much as 277 billion tons a year by 2017.

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Though sea level rise is measured in millimeters right now, that could seem charge. Most studies point out that ice loss from the ice sheets is increasing in magnitude in the same way. One study finds a noticeable inflection point in 2005, when under the warmer climate, the ice sheets began adding tens of millimeters to sea level rise. Another study, which sees a feet of sea level rise, finds roughly as much sea level rise per decade as we seen in the past 100 years.

One reason for this could be that ice sheets are flowing into the ocean at ever-quickening rates. As warmer ocean water rolls away at their base, the massive glaciers that spread from mountains in Antarctica and Greenland and extend far out into the ocean have less holding them back.

The result is ice that falls into the ocean, and it's happening at increasing speeds. Greenland, for example, doubled its speed recently within just five years. In Antarctica, there are multiple ice sheets scientists are keeping an eye on, including glaciers, including Thwaites Glacier, sometimes referred to as the "Doomsday Glacier." Some of the ice sheets are so big and so far from the ocean, the impacts are slow.

Once begun, it's likely difficult to halt the process of ice sheet disintegration. That's why it's important to slow greenhouse gas control and prepare. It's hard to guess warming might not stop the ice sheets from melting.

And, though some evidence has indicated Antarctica might be gaining more ice than it's losing as wetter conditions increase snowfall, more recent studies show that's not true. Though some parts of the continent may indeed see more precipitation, Antarctica has lost ice, on average, since we began keeping tabs on it.

So, while the ice caps seem going to nothing, they're not. Quite the opposite point. There's so much water locked in ice on Earth that releasing even a small portion of it can cause big changes. We need only look back in time to see what we might be in for. The last time Earth's temperature was a bit over 100,000 years ago, global temperatures were around 2 degrees Fahrenheit warmer than today. That's about as warm as the planet is projected to be in 2100, if we're lucky. Despite that relatively small change in temperature, sea levels may have been 13 to 20 feet higher than they are today, to a glimpse of our future? Only time will tell.

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