

# Antarctica's retreating ice may re-shape Earth

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In this Jan. 22, 2015 photo, a zodiac carrying a team of international scientists heads to Chile's station Bernardo O'Higgins, Antarctica. Water is eating away at the Antarctic ice, melting it where it hits the oceans. As the ice sheets slowly thaw, water pours into the sea, 130 billion tons of ice (118 billion metric tons) per year for the past decade, according to NASA satellite calculations. (AP Photo/Natacha Pisarenko)

(AP)—From the ground in this extreme northern part of Antarctica, spectacularly white and blinding ice seems to extend forever. What can't

be seen is the battle raging underfoot to re-shape Earth.

Water is eating away at the Antarctic [ice](#), melting it where it hits the oceans. As the ice sheets slowly thaw, water pours into the sea—130 billion tons of ice (118 billion metric tons) per year for the past decade, according to NASA satellite calculations. That's the weight of more than 356,000 Empire State Buildings, enough ice melt to fill more than 1.3 million Olympic swimming pools. And the melting is accelerating.

In the worst case scenario, Antarctica's melt could push sea levels up 10 feet (3 meters) worldwide in a century or two, recurving heavily populated coastlines.

Parts of Antarctica are melting so rapidly it has become "ground zero of global climate change without a doubt," said Harvard geophysicist Jerry Mitrovica.

Here on the Antarctic peninsula, where the continent is warming the fastest because the land sticks out in the warmer ocean, 49 billion tons of ice (nearly 45 billion metric tons) are lost each year, according to NASA. The water warms from below, causing the ice to retreat on to land, and then the warmer air takes over. Temperatures rose 5.4 degrees Fahrenheit (3 degrees Celsius) in the last half century, much faster than Earth's average, said Ricardo Jana, a glaciologist for the Chilean Antarctic Institute.

As chinstrap penguins waddled behind him, Peter Convey of the British Antarctic Survey reflected on changes he could see on Robert Island, a small-scale example and perhaps early warning signal of what's happening to the peninsula and rest of the continent as a whole.

"I was last here 10 years ago," Convey said during a rare sunny day on the island, with temperatures just above freezing. "And if you compare

what I saw back then to now, the basic difference due to warming is that the permanent patches of snow and ice are smaller. They're still there behind me, but they're smaller than they were."

Robert Island hits all the senses: the stomach-turning smell of penguin poop; soft moss that invites the rare visitor to lie down, as if on a water bed; brown mud, akin to stepping in gooey chocolate. Patches of the moss, which alternates from fluorescent green to rust red, have grown large enough to be football fields. Though 97 percent of the Antarctic Peninsula is still covered with ice, entire valleys are now free of it, ice is thinner elsewhere and glaciers have retreated, Convey said.



In this Jan. 22, 2015 photo, a Gentoo penguin regurgitates food to feed its chick. near Chile's station Bernardo O'Higgins, Antarctica. From the ground of this extreme northern part of Antarctica, a spectacular white and blinding ice seems to extend forever. What can't be seen is the battle raging underfoot to re-shape Earth. (AP Photo/Natacha Pisarenko)

Dressed in a big red parka and sky blue hat, plant biologist Angelica Casanova has to take her gloves off to collect samples, leaving her hands bluish purple from the cold. Casanova says she can't help but notice the changes since she began coming to the island in 1995. Increasingly, plants are taking root in the earth and stone deposited by retreating glaciers, she says.

"It's interesting because the vegetation in some way responds positively. It grows more," she said, a few steps from a sleeping Weddell seal. "What is regrettable is that all the scientific information that we're seeing says there's been a lot of glacier retreat and that worries us."

Just last month, scientists noticed in satellite images that a giant crack in an ice shelf on the peninsula called Larsen C had grown by about 12 miles (20 kilometers) in 2014. Ominously, the split broke through a type of ice band that usually stops such cracks. If it keeps going, it could cause the breaking off of a giant iceberg somewhere between the size of Rhode Island and Delaware, about 1,700 to 2,500 square miles (4,600 to 6,400 square kilometers), said British Antarctic Survey scientist Paul Holland. And there's a small chance it could cause the entire Scotland-sized Larsen C [ice shelf](#) to collapse like its sister shelf, Larsen B, did in a dramatic way in 2002.

A few years back, scientists figured Antarctica as a whole was in balance, neither gaining nor losing ice. Experts worried more about Greenland; it was easier to get to and more noticeable, but once they got a better look at the bottom of the world, the focus of their fears shifted. Now scientists in two different studies use the words "irreversible" and "unstoppable" to talk about the melting in West Antarctica. Ice is gaining in East Antarctica, where the air and water are cooler, but not nearly as much as it is melting to the west.

"Before Antarctica was much of a wild card," said University of

Washington ice scientist Ian Joughin. "Now I would say it's less of a wild card and more scary than we thought before."

Over at NASA, ice scientist Eric Rignot said the melting "is going way faster than anyone had thought. It's kind of a red flag."



In this Jan. 24, 2015 photo, an international scientist collects samples in Deception Island, in the South Shetland Islands archipelago Antarctica. Parts of Antarctica are melting so rapidly it has become "ground zero of global climate change without a doubt," said Harvard geophysicist Jerry Mitrovica. (AP Photo/Natacha Pisarenko)

What's happening is simple physics. Warm water eats away at the ice from underneath. Then more ice is exposed to the water, and it too melts. Finally, the ice above the water collapses into the water and melts.

Climate change has shifted the wind pattern around the continent, pushing warmer water farther north against and below the western ice sheet and the peninsula. The warm, more northerly water replaces the cooler water that had been there. It's only a couple degrees Fahrenheit warmer than the water that used to be there, but that makes a huge difference in melting, scientists said.

The world's fate hangs on the question of how fast the ice melts.



In this Jan. 24, 2015 photo, scientists walk near a Chilean shelter in Robert Island, in the South Shetland Islands archipelago, Antarctica. NASA satellite measurements calculate that since 2004, Antarctica has lost 130 billion tons of ice (118 billion metric tons) each year. (AP Photo/Natacha Pisarenko)

At its current rate, the rise of the world's oceans from Antarctica's [ice melt](#) would be barely noticeable, about one-third of a millimeter a year.



The oceans are that vast.

But if all the West Antarctic ice sheet that's connected to water melts unstopably, as several experts predict, there will not be time to prepare. Scientists estimate it will take anywhere from 200 to 1,000 years to melt enough ice to raise seas by 10 feet, maybe only 100 years in a worst case scenario. If that plays out, developed coastal cities such as New York and Guangzhou could face up to \$1 trillion a year in flood damage within a few decades and countless other population centers will be vulnerable.

"Changing the climate of the Earth or thinning glaciers is fine as long as you don't do it too fast. And right now we are doing it as fast as we can. It's not good," said Rignot, of NASA. "We have to stop it; or we have to slow it down as best as we can. "

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