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Greenland ice melt shocks scientists

Rising sea level - Climate models failed to foresee the acceleration, and the far-reaching effects are likely to bring more Northwest rain

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KANGERLUSSUAQ, Greenland -- The vast ice sheet that coats Greenland up to 2 miles thick is reacting to global warming far faster than scientists thought it would.

It makes some of them wonder whether they've underestimated the speed of changes a warmer climate brings.

A few decades ago, Greenland's glaciers had little bearing on Oregon. Now they're melting and sliding into the ocean quickly enough to measurably -- though slightly -- raise the sea level on the coast of Oregon and around the world.

It is the acceleration that stuns scientists. Greenland's glaciers are adding up to 58 trillion gallons of water a year to the oceans, more than twice as much as a decade ago and enough to supply more than 250 cities the size of Los Angeles, NASA research shows.

That's particularly unsettling because elaborate climate models that scientists use to estimate the effects of global warming did not foresee it. Scientists themselves never imagined Greenland's ice, which holds enough water to raise sea levels 23 feet and sits in position to influence Northwest weather, would move so quickly.

"The overriding mind-set was that it would take many centuries to change in any significant way," said Robert Bindshadler, a leading ice researcher and chief scientist at NASA's Hydrospheric and Biospheric Sciences Laboratory. "The whole community was astonished at how rapidly these really large glaciers are accelerating."

So much ice is disappearing so rapidly that the earth beneath Greenland is rising -- bouncing back like a bathroom scale when you step off it. Researchers helicoptering around Greenland are now dotting its coast with global positioning units to track that rise.

Higher temperatures are melting more of the ice sheet, at higher elevations than ever known before.

Offshore, the sea level is rising faster than ever in modern times, approaching speeds scientists did not expect until later this century. Greenland is a question mark that, if its ice continues the rush seaward, could push the seas even higher, even faster.

Scientists know that seas rose as fast as a foot a decade -- some 10 times faster than today -- when the climate warmed in the past at the rate it is now. Greenland probably contributed much of that.

"You don't need to melt much of Greenland to have a pretty big effect," said Christina Hulbe, a professor at Portland State University who specializes in the behavior of glaciers. "The fact that it's already happening faster than people thought possible -- that's reason to be concerned."

Though predictions of higher temperatures, melting ice and rising seas as the world warms may strike some as overstated, scientists now wonder whether they might actually be understated.

"Feedback" mechanisms

In particular, climate models that did not foresee Greenland's rapid changes might not fully recognize "feedback" mechanisms where warming drives changes that, in turn, drive even more rapid warming.

"I think they're too conservative," Bindshadler said. "I have no doubt that sea level will rise, and it will probably rise at an increasing rate."

Though climate models project melting of ice, they have a tougher time foreseeing changes in the way the ice moves -- something scientists still do not clearly understand, but which is turning out to be a dominant means of delivering ice to the sea.

Those forces within ice operate on such small scales, they remain out of focus of the global climate models that provide most forecasts of climate change.

"There's no way they can get it right," Hulbe said.

Greenland's ice is vulnerable to warming for some of the same reasons that glaciers on Mount Hood and throughout the Cascades are vulnerable. Both lie in climates mild enough that only slight warming can rapidly speed their disintegration.

The difference is that Greenland contains thousands of times more ice, and though melting of Cascade glaciers affects the Northwest, the melting of Greenland affects the world.

It's clear that the climate has changed radically and rapidly in the past, with Greenland at the center of that change. Climate records suggest that modern humans have lived in a period of climatic calm and that wild swings in climate -- even without human-driven climate change -- are much more the rule than the exception.

"Everyone around the world could experience abrupt climate change in the future," said Ed Brook, a professor at Oregon State University who examines ice cores from Greenland that reveal how the climate has behaved in the past. "We don't really know why they happen, but we know that Greenland is where they happen."

Irreversible slide?

A central question is whether warming has already pushed Greenland into an irreversible slide that will change the world, as it has before.

Greenland, about three times the size of Texas, strongly affects the world's climate. The Nazis, recognizing that influence, installed secret weather stations along its coast during World War II that U.S. troops worked feverishly to destroy.

Researchers now believe the influence reaches as far as the Pacific Northwest, and will probably alter Northwest weather as ice covering the ocean around Greenland melts away. That ice is also shrinking faster than models predicted, setting off a rush by nearby nations to claim rights to possible oil reserves below.

More Arctic sea ice melted this summer than ever before recorded, and many suspect it will disappear entirely by midcentury.

The melting removes an insulating blanket from the ocean surface, releasing warmth from the water into the cold air above as towering columns of warmer air.

Those columns appear to reorient global air flows the way a boulder falling into a stream reorients the current, said Jacob Sewall, a professor of geosciences at Virginia Tech, who has used atmospheric models to study the effect. The result is that the stream that carries storms over the West Coast of North America shifts north, turning much of California drier, and the Northwest wetter.

"Instead of hitting near San Francisco, they'll be pushed to the north and come in over Oregon," Sewall

said. "The ice changes we're seeing now appear to be following this pattern. We're already seeing some of these precipitation shifts in western North America."

It signals how what might seem like a subtle change as far away as Greenland makes a difference in Oregon.

"It's not just that the polar bears no longer have ice," Sewall said. "This can have a far-field effect as well."

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