

A look at melting ice sheets and the threat to sea levels

April 8 2016, by William Yardley, Los Angeles Times

The predictions only get worse. In 2007, a United Nations panel of scientists studying the rise of sea level related to climate change predicted that, if nothing was done to reduce greenhouse gas emissions, seas could rise by about 2 feet by 2100. By 2013, the panel had increased its forecast to more than 3 feet, which would put major cities at risk of flooding and storm surge.

Yet all along, the panel emphasized what it did not know. It expressed particular uncertainty about what could happen to the [ice sheet](#) in Antarctica. To help fill in the gaps, it invited outside scientists to contribute their own research.

Now the outside research is bearing fruit - and the news is not good.

A new study published in the journal *Nature* painted perhaps the most ominous picture yet. It showed that, by the end of this century, sea levels could rise 6 feet or more - again, if nothing is done to reduce emissions - potentially inundating many coastal areas, submerging nations and remaking maps of the world.

The study focused on one of the most elusive aspects of sea-level science: What will happen to the West Antarctic [ice](#) sheet?

Scientists have long believed the ice sheet would melt from [climate change](#) and contribute to higher sea levels. But they believed that the melting, and rising sea levels it would cause, could occur over many

hundreds or even thousands of years.

The new study, by Robert DeConto, a geoscientist at the University of Massachusetts at Amherst, and David Pollard, a geoscientist at Pennsylvania State University, based its finding on models it developed from studying ancient sea level and temperature changes. The scientists found that drastic [sea level rise](#) could happen within a lifetime.

As alarming as the study may have seemed to the public and to policymakers, Benjamin Horton, a coastal geologist at Rutgers University in New Jersey who studies sea level, said it did not surprise many people in his field.

In 2013, Horton led a survey of almost 100 sea level scientists that concluded that seas could rise almost 4 feet by 2100 - higher than the United Nations panel's worst scenario. But within that group, 13 scientists said there was a 17 percent chance that sea levels would rise by 6.6 feet, a figure in line with the study.

Why has it been so hard to predict [sea level change](#)?

Predicting changes involves measuring and modeling several different factors that then have to be blended together, Horton said. Those elements include an increase in volume from expansion caused by warming water, the melting of glaciers in places such as Alaska and the melting of ice sheets in places such as Greenland and Antarctica. Measuring sea changes from the first two, he said, is much easier than measuring what the vast ice sheets are doing.

What has helped improved our understanding of how ice sheets melt?

Satellite technology and imagery had made it easier to understand what is happening above and below the West Antarctic ice sheet, Horton said.

"These ice sheets have this double whammy," he said. "They're heated at the surface from air temperature and they're heated at the base from ocean temperatures.

"They retreat and then they become unstable and they retreat even further. They have all these feedback mechanisms that keep on making the situation worse."

The process involves what is known as cliff collapse.

"Ponds of meltwater that form on the ice surface often drain through cracks," the article said. "This can set off a chain reaction that breaks up ice shelves and causes newly exposed ice cliffs to collapse under their own weight."

How much water do the ice sheets hold?

Horton said that the Greenland ice sheet contains enough ice to raise sea levels 6 meters, or more than 20 feet, if they completely melted. Antarctica holds much more ice, enough to raise seas 65 meters, or more than 200 feet. But this extreme scenario could happen only over thousands of years.

What can be done?

Even as the study released this week predicted potential catastrophe, it also emphasized that the West Antarctic ice sheet probably would cause little change in sea level if temperature increases can be held under 2 degrees Celsius. That is a central goal of the climate agreement reached in Paris in December, though it is far from clear that countries will achieve it.

The obvious solution, Horton said, is to move quickly away from

burning fossil fuels that contribute to climate change and rapidly expand solar, wind and other renewable forms of energy.

"We have a choice right now," he said. "If we strongly mitigate against greenhouse gases, we can keep the [sea level](#) rise to a manageable level. These papers are not all doom and gloom. They are providing a warning and we as a scientific community are trying to stress the urgency on climate change.

"This is a dire warning, a dire prediction, but we can do something about it."

More information: Robert M. DeConto et al. Contribution of Antarctica to past and future sea-level rise, *Nature* (2016). [DOI: 10.1038/nature17145](#)

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