Study warns of potentially catastrophic impacts from Antarctic ice melt

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The ongoing rise in greenhouse gas emissions may trigger a rapid, irreversible collapse in an Antarctic ice sheet the size of Mexico, with potentially catastrophic consequences, a study published last week in the journal *Nature* found.

Rob DeConto, a geoscientist at University of Massachusetts Amherst, and paleoclimatologist David Pollard, of Pennsylvania State University, suggest the West Antarctic ice sheet is far more unstable than previously appreciated by scientists. Its collapse may add more than a meter to the level of the world's oceans as quickly as 2100, and more than 15 meters long-term. With ice melt from other regions, sea level could rise nearly 2 meters before the end of the century.

Such a rapid increase in the world's oceans could permanently flood entire cities, necessitating mass migration and unleashing destruction on a scale not experienced outside of world war. Research compiled last year offered a conservative estimate of well over a hundred million people directly imperiled by sea level rise corresponding to 2 degrees Celsius warming, without accounting for West Antarctic collapse. If rising temperatures do trigger such a collapse, many of the world's mega-cities, from New York to Shanghai to Rio, may be in jeopardy within the lifespans of children alive today.

DeConto and Pollard's research examined how climate change affects the West Antarctic ice sheet, a vast region where much of the land mass is below sea level. Floating ice sheets, which extend for hundreds of kilometers, are subject to the dual forces of warming ocean currents and rising air temperatures. Meltwater flowing through cracks in the floating ice can trigger a domino effect of disintegration as instability mounts with each collapsing ice cliff. This is precisely what scientists have observed at the rapidly retreating Helheim Glacier in Greenland, and what may be in store for West Antarctica.

The researchers accounted for ice cliff collapse and other melting mechanisms in climate models for the first time, enabling them to more accurately reconstruct historic sea levels that have long puzzled scientists. While temperatures in polar regions over the past several million years have only slightly exceeded today's, global sea level averages have been as much as 9 meters higher. The culprit, as DeConto and Pollard explain in their paper, is the sensitivity of melting Antarctic ice sheets to relatively small changes in temperature.

Having more accurately replicated the past, they ran their model to explore future scenarios of climate change. The study found that for a given amount of warming, the expected rate of ice loss in Antarctica, which holds approximately 90 percent of the earth's fresh water, far exceeds the previously accepted estimate.

The relationship between warming global temperatures and sea level rise has long been one of the more controversial topics among climate scientists. While one of the primary mechanisms, thermal expansion due to rising water temperatures, is well understood, the potential impact of melting glaciers and ice sheets has been a source of substantial uncertainty. The Intergovernmental Panel on Climate Change in 2013 revised their assessment of projected sea level rise upward by about 60 percent from six years previous. The new study suggests a rise nearly double that of the 2013 estimate.

DeConto and Pollard's study adds to a body of research that over the past few years has raised alarms over the potential for runaway sea level rise. Using satellite data, studies by Bert Wouters and colleagues,

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and separately Christopher Harig and Frederick Simons , for example, observed rapid melting in areas of Antarctica previously thought to be stable.

This emerging research is a grim warning about the severity of rising sea levels. Far from being written off as a problem hundreds of years distant, or one that may impact only a limited number of geographies such as low-lying islands and flood-prone settlements, a meters-large increase in global ocean levels within the next several decades would be catastrophic for wide stretches of humanity.

“This could spell disaster for many low-lying cities,” DeConto remarked to his university’s press office. He added that his study showed that aggressive action to reduce global carbon emissions can reduce the risk greatly.

However, this growing urgency to mitigate and adapt to climate change before disastrous and unstoppable consequences has been matched with little more than pretense by the ruling class. The Paris Agreement, signed last December, binds the world’s governments to little more than accounting paperwork. Their voluntary pledges, even if carried out, fall well short of limiting temperature increase to avoid catastrophe.

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