

The Oceans Are Warming Fast, and Our Lives Are About to Change

Vanishing coral reefs, intensifying hurricanes, rising seas — new studies confirm the toll of climate change

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Sea ice melts on the Franklin Strait along the Northwest Passage in the Canadian Arctic Archipelago. AP/REX/Shutterstock

The basic physics of climate science is as certain as the basic physics of gravity—despite climate deniers trying to convince you to believe otherwise. Even so, there are plenty of uncertainties in the Earth’s climate system. For instance, we do not know exactly how

much each ton of carbon dioxide we emit warms the atmosphere or how different clouds cool (by reflecting away sunlight) and warm (by trapping in heat) the Earth. On the other hand, scientists understand how burning fossil fuels cooks the planet. The risks we face from climate change could be lower than scientists expect—or higher.

Last week, scientists resolved an important uncertainty—and it's not a happy story. A paper published in the journal *Science* shows that the Earth's oceans are warming at a rate that's about 40% faster than indicated in the 2013 U.N. Intergovernmental Panel on Climate Change report. Because the oceans capture heat and release it over time, warmer oceans have huge consequences for everything from the rate of sea-level rise to hurricane intensity for decades to come.

During the last century, as humankind has been pumping fossil fuels into the atmosphere, about 90 percent of the extra heat going into the climate system has been soaked up by the ocean. As the water warms, the surface of the land is spared from rapid heating. Scientists knew this. However, the ocean seemed to be warming more slowly than it should have been given the results from the climate models they made to predict rising temperatures. This is important, because if the climate models can't accurately capture temperature changes the past, then it won't be accurate in predicting these changes in the future.

Measuring the heat content of the oceans is a challenging task. While the surface temperature is relatively simple to determine, scientists must also be able to measure the temperature as deep as 2,000 meters to get the full picture.

Since the data suggested that the oceans were warming more slowly than predicted, did that mean the models were wrong, or the measurements were off?

Scientists resolved the dilemma by using new data from a network of thousands of robots called Argo floats. The Argo floats dive down to the depths of 2,000 meters or so and measure temperature, salinity, pH and other ocean characteristics as they slowly come back to the surface. Once the Argo floats emerge, the data they collected is sent to scientists by satellite. The payoff of this new data was that the climate models were right after all, and the oceans are warming much faster than anyone realized.

These results point to significant consequences for our climate.

Fast-warming oceans are incredibly damaging to coral reefs. Coral reefs are vanishing five times more frequently than they were 40 years ago and will be completely gone within your lifetime.

Fast-warming oceans strengthen hurricanes. When Hurricane Harvey hit Houston in 2017, scientists were able to link Harvey's severe rains with the amount of heat stored in the ocean. Harvey dumped the most water ever recorded from a single storm in U.S. history on Southeast Texas at 60 inches of water.

Scientists argued that the heat absorbing into the oceans turns a storm into an even bigger rain-producer by amplifying its size and strength. Two different studies found climate warming boosted Harvey's rainfall by about 20 to 35 percent.

Hotter oceans also mean faster sea-level rise, partly because as water warms, it expands. Fast-warming oceans are also melting the great ice sheets of Greenland and Antarctica from below. As warm currents flow to the bases of glaciers, the ice sheets become weak and break apart. This is particularly disturbing because it could destabilize West Antarctica and lead to the collapse of ice sheets that could raise sea levels by 10 feet.

Fast-warming oceans also have big consequences for marine life. Sea-dwellers are finding their habitats disrupted and are being forced to move, leading to unbalanced and damaged ecosystems.

Fast-warming oceans mean that the last resort Big Fix technologies will be less effective. This means we cannot rely on such Big Fix technologies as geoengineering and carbon removal to reverse the damage. It's one thing to throw up a sunshade beside a pool; it's another thing entirely to try to cool down the water in the pool itself.

The upside is that we know that this is further proof that climate science is getting better, more accurate and more sophisticated. We can't say we weren't warned.