Impacts of COVID-19 emissions reductions remain murky in the oceans

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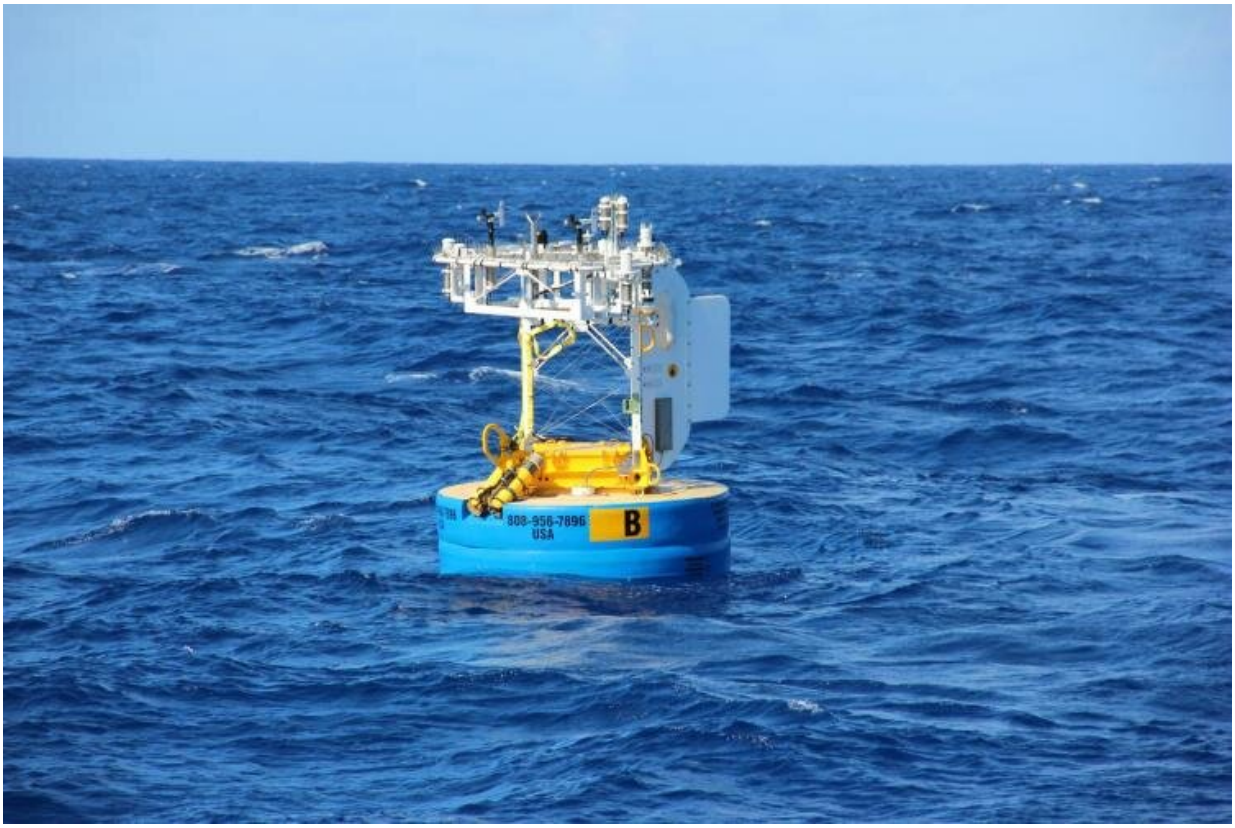

Off the coast of Hawaii, a Woods Hole Oceanographic Institution (WHOI) Hawaii Ocean Time-series Station buoy makes measurements of surface ocean pressure. Credit: Al Plueddemann, WHOI

As the COVID-19 pandemic took hold in the first half of 2020, humans

around the world stopped moving and making, resulting in a 9% drop in the greenhouse gas emissions at the root of climate change.

Almost overnight, the Himalayas became visible from a distance for the first time in years. Rivers flowed free of toxic pollutants and the air sparkled with blue skies in major cities like New Delhi and Los Angeles. While internet rumors of swans and dolphins returning to Venetian canals were debunked, the idea that "nature is healing" in 2020 quickly took root.

Unfortunately, any silver lining from the pandemic remains murky in the oceans.

Nicole Lovenduski, associate professor of atmospheric and oceanic sciences and director of the Ocean Biogeochemistry Research Group at the Institute of Arctic and Alpine Research, delved into the data and found no detectable slowing of ocean acidification due to COVID-19 emissions reductions. Even at emissions reductions four times the rate of those in the first half of 2020, the change would be barely noticeable.

"It's almost impossible to see it in pH," said Lovenduski. "So has this solved ocean acidification? No, it has not."

Lovenduski shared the results Friday, Dec. 11 at the American Geophysical Union 2020 Fall Meeting. The findings will also be submitted to the journal *Geophysical Research Letters*.

On the bright side, this study yields important insights on how to track changes in ocean carbon going forward. Lovenduski and fellow oceanographers now have a better idea of where to look for the signs if emissions reductions are having an impact on the Earth system, what they will look like and the resources they will need to gather that data.

The study results also put COVID-19 emissions reductions in sharp perspective as short-term, one-time gains in comparison with the committed, long-term cuts needed to reduce the impacts of human-caused climate change.

"It's a little bit wild to think that that complete economic shutdown of the world didn't do anything immediately that we could detect in terms of ocean acidification or atmospheric carbon. But it's also a little bit wild to think that this reduction in emissions is what it will take every single year to get us back to something that's a healthy version of our climate," said Lovenduski.

Lovenduski analyzed data shared by a group of Canadian modelers, who ran a suite of experiments to see how the climate has been impacted by the reduction in emissions in 2020. She used a fingerprinting technique on the data, often used to differentiate humans' impacts on the climate from non-human impacts like volcanic eruptions and sunspots. Using this method allowed her to separate COVID-19 emissions reductions from non-human influences on the oceans.

While she found no perceptible change in ocean acidity, her analysis showed that by 2021, the oceans were already absorbing slightly less carbon from the atmosphere due to COVID-19 emissions reductions.

"What this suggests is that pretty much immediately, the exchange of carbon between the ocean and atmosphere responds to the change in the loading of carbon in the atmosphere because we've decreased our emissions," said Lovenduski.

The ocean is a major climate change buffer, absorbing a large fraction of the carbon dioxide that human activity emits into the atmosphere every year. This mitigates the immediate impacts of climate change, such as rising global temperatures, but heats up the ocean instead,

causing the water to expand and contribute to rising sea levels.

Increased carbon in the ocean is also the cause of ocean acidification, which is detrimental to coral reefs and a significant swath of ocean life. However, if we mitigate our emissions year after year to avoid the worst global warming scenarios, we have a chance to slow the rate of ocean acidification in the long term, according to Lovenduski.

While she doesn't have the dramatic good news that friends and neighbors were hoping to hear, this work offers clues as to what it will take to stop the worsening impacts of global climate change in the world's oceans.

"This sudden precipitous drop in emissions is a big deal," she said. "It can offer insight into what might happen if we actually follow a plan like the Paris Climate Agreement."

Provided by University of Colorado at Boulder

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