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DAILY SCIENCE

Plastic trash is the latest source of greenhouse gas

Common plastics emit greenhouse gases such as methane and ethylene as they degrade, a finding that brings home just how interconnected environmental problems tend to be.

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August 7, 2018

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Common plastics emit greenhouse gases such as methane and ethylene as they degrade in the environment, researchers from the University of Hawai'i at Mānoa reported last week in the journal *PLoS ONE*.

The researchers sealed samples of various plastics – polycarbonate, acrylic, polypropylene, polyethylene terephthalate, polystyrene, high-density polyethylene, and low-density polyethylene – in airtight jars and measured the amount of gases produced under different environmental conditions.

Sunlight triggers the breakdown of plastic, but once the process starts, greenhouse gas emissions continue in the dark.

All of the polymers tested give off methane, one of the most potent greenhouse gases, and ethylene, which contributes to carbon monoxide formation in the atmosphere. Low-density polyethylene, the most commonly used form of plastic worldwide (it's used in plastic grocery bags), is the highest emitter of both gases.

Sunlight triggers the breakdown of plastic, but once the process starts, greenhouse gas emissions continue in the dark, the researchers found. They also documented higher emissions from plastic exposed to air than from plastic in water.

An estimated 275 million megatonnes of plastic waste were produced in 2010. And plastic production is expected to double worldwide over the next two decades. Even though much of that plastic may be recycled or disposed of properly, the sheer scale of production makes for a mind-boggling amount of plastic out there breaking down and giving off greenhouse gases.

“Our results show that plastics represent a heretofore unrecognized source of climate-relevant trace gases that are expected to increase as more plastic is produced and accumulated in the environment,” the researchers write.

The researchers also collected plastic – mostly polyethylene – from the Pacific Ocean. They found that this “aged” plastic still produces greenhouse gases, suggesting that emissions may continue for the entire lifetime of a piece of plastic debris. Emissions likely continue because as the plastic weathers, it develops tiny pits and cracks that increase the surface area available to release greenhouse gases.

In fact, the problem may get worse as plastic breaks down in the environment. The researchers measured emissions from low-density polyethylene pellets, flakes, and powder, and found that powder emits the highest levels of greenhouse gases by weight, likely because of its greater surface area.

This suggests that the tiny particles known as microplastics in the ocean may be, ounce for ounce, the worst form of plastic where greenhouse gas emissions are concerned.

The researchers are now trying to calculate the amount of plastic exposed to the environment on land and at sea in order to estimate global greenhouse gas emissions from plastics. Given the large amounts of methane produced by other sources, plastic trash may represent a tiny proportion. But for rarer greenhouse gases, production from plastics could be a significant source.

Moreover, the findings bring home just how interconnected environmental problems tend to be. At first, that seems like cause for despair – oh great, plastic trash not only entangles sea turtles but now it warms the climate too? But it's also an opportunity: turn off the spigot of cheap fossil fuels and you'll likely diminish the environmental ills from plastics too.

Source: Royer S.-J. *et al.* "Production of methane and ethylene from plastic in the environment." *PLoS ONE*. 2018.

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