How your car sheds microplastics into the ocean thousands of miles away

July 15 2020, by Claire Gwinnett

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The impact of car travel on the environment is well known. Exhaust emissions pollute the atmosphere with gases that raise global temperatures and make the air less safe to breathe. Sadly, the problems don't end there. Scientists have been studying another problem—and one that connects your daily commute to the most remote stretches of the world's oceans.

A new study has revealed that microplastics released from car tires and brake systems are a major source of marine plastic pollution—much more than previously thought. Every year, 100,000 metric tonnes of microplastics are shed from tires, transported through the air and dumped in the ocean. Another 40,000 tonnes comes from brakes. To put that in perspective, if the average scrapped car tire is around nine kilograms, then the total weight of microplastics reaching the sea each year equates to just under 11 million tires.

Microplastics are polymers smaller than 5mm, and they are hazardous to the health of animals that are exposed to them. The different shapes and densities of microplastics cause them to disperse throughout habitats, making them available for different species to eat. In the ocean, microplastics can accumulate in an animal's gills or digestive tract. Laboratory studies on fish and molluscs have shown that this can affect respiration, feeding and growth.

Microplastics don't just harm sea creatures though. We now know that their proliferation in the world's soils has reduced how successfully worms reproduce and even affected the growth of crops.

The widespread impact of microplastics on Earth's ecosystems makes it important to understand where they come from and how they travel between different environments. Their transportation via waterways has been well studied, but the new research highlights an overlooked route for microplastics entering the world's ocean—the atmosphere.

Road microplastics ride the wind

Car tires are made of rubber, which contains about 50% natural and synthetic polymers. We're used to thinking of polystyrene as a more typical synthetic polymer, while rubber is more natural. But tire rubber includes man-made elastomers which, when broken down into smaller

fragments, falls within the definition of a microplastic.

And tires aren't indestructible—they wear down through abrasion and friction into tiny fragments called tire wear particles. Car braking systems, which include braking pads and linings, also create particles when friction is applied. These brake wear particles are made of a mix of materials that includes plastic. Together, tire and brake wear particles make up a class of pollutants called road microplastics.

Credit: Nubia Navarro (nubikini) from Pexels

Asia produces more of both types of road microplastics than any other

continent. North America and Europe, with their large numbers of road vehicles, also produce significant amounts of brake wear particles.

Not only are huge quantities of road microplastics being produced every year, but they're exceptionally good at travelling for a long time in the air. As a result, they can end up being deposited thousands of miles from where they originated.

To understand how long these particulates can travel in the atmosphere, the researchers calculated their typical lifetimes based on their sizes. They found that smaller particles from tires can spread further, with the smallest staying airborne for an average of 18 to 37 days. Larger particles don't travel as far, and instead create hotspots of microplastics near the roads they are released from. Smaller particles travel far and are deposited worldwide, with about 43% of their total mass ending up on land, and 57% in the ocean.

A difficult road ahead

Road microplastics that started life contained in tires and brakes can end up in remote places where there are no roads or cars, like the Arctic Circle.

Here, these pollutants pose a greater threat, as tire and brake particles are dark and absorb light, potentially increasing the rate of warming and ice melting in the region.

The amount of particles released from vehicles may be even more than the recent study reported. Emissions of microplastics from non-road vehicles, such as tractors and construction machinery, weren't considered by the research team. Although they are fewer than cars, they carry heavier loads which can speed up the abrasion of tires and brake systems into microplastics.

Given how reliant societies are on cars and road travel, and how useful synthetic rubber is for making tires, this one source of microplastics that could be very difficult to eliminate.

Provided by The Conversation