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Underwater avalanches are trapping microplastics in the deep ocean

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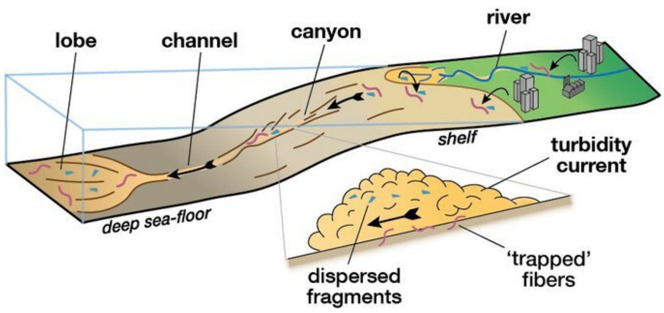

Credit: University of Manchester

A collaborative research project between the Universities of Manchester, Utrecht, and Durham, and the National Oceanography Centre has revealed for the first time how submarine sediment avalanches can transport microplastics from land into the deep ocean.

The study also revealed that these flows, the largest on earth, are responsible for sorting different types of microplastics—burying some, and moving others vast distances across the sea floor.

These findings may help predict the location of future seafloor microplastic hotspots, which in turn could help direct research into the impact of microplastics on marine life.

Over 10 million tons of plastic pollution is exported into the oceans each year. It is thought that around 99% of this is stored in the deep sea, often prefentially accumulating in submarine canyons.

However, it was previously not known how plastic pollution gets to the deep sea from land. The new research, published in *Environmental Science & Technology*, has shown that microplastics can be moved by gravity-driven sediment flows, which can travel thousands of kilometers over the seafloor.

Quartz sand was mixed with microplastic fragments and fibers and released in a flume tank that was designed to simulate real-world flows. University of Manchester researcher, Dr. Ian Kane, developed techniques to analyse the sediment carried within these flows and deposited on the seafloor, and the samples were analysed in The University of Manchester Geography Laboratories.

Concentrations of microplastic fragments were concentrated in the lower parts of the flow while microplastic fibres were distributed throughout the flow and settled more slowly. The larger surface to volume ratio of fibres is thought to be the reason they are more evenly distributed. The high concentration of microplastic fibres in sand layers at the base of the flow is thought to be because they get more easily trapped by sand particles.

Dr. Ian Kane said: "This is in contrast to what we have seen in rivers, where floods flush out microplastics; the high sediment load in these deep ocean currents causes fibers to be trapped on the seafloor, as sediment settles out of the flows."

Studying the distribution of different types of plastic on the seafloor is important because the size and type of plastic particle determines how toxins build up the surface, as well as how likely it is the plastic will enter the gut of any animal that eats it, and what animal may eat it.

These experiments show that sediment flows have the potential to transport large quantities of plastic pollution from nearshore environments into the deep sea, where they may impact local ecosystems. The next steps for research will involve sampling and monitoring deep-sea submarine canyon, to understand how robustly these experimental findings can be applied to natural systems and the effects on deep-sea ecosystems.

More information: Florian Pohl et al. Transport and Burial of Microplastics in Deep-Marine Sediments by Turbidity Currents, *Environmental Science & Technology* (2020). DOI: 10.1021/acs.est.9b07527

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