Tons of PCBs Reaching the Deep Oceans

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Toxic chemicals that have been released into the environment have turned up in some rather unexpected places. And while it has long been known that polychlorinated biphenyls (PCBs) and other persistent organic pollutants have been found in the surface waters of the oceans, especially the North Atlantic and Arctic, little was known about the quantity of PCBs that have reached the deep ocean.

In a paper published in *Geophysical Research Letters*, University of Rhode Island chemical oceanographer Rainer Lohmann and colleagues found that approximately 870 kilograms of PCBs per year make their way to the deep ocean at four subduction zones in the North Atlantic and the Southern Ocean.

According to Lohmann, 600,000 tons of PCBs were produced in Europe and North America in the 1950s and 1960s, and about 10 percent of that total has escaped to the atmosphere, soils, sediments and water column.

“In the oceans, the surface water has the highest concentrations of PCBs, and there is a slow exchange with the deeper waters as the chemicals attach themselves to phytoplankton and sink,” Lohmann said. “At these subduction zones, though, even more PCBs are removed from the surface through deep water formation.”

Subduction zones are where cold or highly saline water sinks below warm or less salty water, moving at a rate of 10 million cubic meters per second and carrying with it whatever chemicals are in the water column. By translating the known atmospheric concentrations of PCBs into

dissolved levels in the surface water, the researchers determined that about 420 kilograms of PCBs per year are circulated to deep water in the Norwegian Sea subduction zone, while an additional combined total of 450 kilograms per year are removed from the surface waters annually in the Labrador, Ross and Weddell seas.

“There is tremendous interest in removing these toxic chemicals from the active environment where they could impact human health, so it is helpful to know how much has been removed from the surface,” Lohmann said. “While the total amounts being removed from the surface waters is small when compared to the total PCBs produced, it’s still important to know just where those chemicals have gone. But it’s also useful to know that natural processes in the ocean will take a long, long time to remove all the PCBs from the surface water.”

Because these chemicals are persistent in the environment over long periods of time, Lohmann said that they could be used to trace human activity back to the time they were made. “If we could switch off the release of PCBs today, we would still be able to see how a plume of PCBs from 50 years ago moved into deeper water. In 1,000 years, someone will still be able to trace those chemicals back to us,” he said.

Source: University of Rhode Island