

Environment News Service

Silver From Asian Coal Burning Pollutes North Pacific

SANTA CRUZ, California, March 14, 2005 (ENS) - The highest levels of silver contamination ever observed in the open ocean were found in samples collected during a survey of the North Pacific conducted in 2002 and made public today. Researchers from the University of California-Santa Cruz, measured silver concentrations 50 times greater than the natural background level. This pollution of what had been considered clean ocean waters demonstrates the global impact of industrial emissions from Asia, the researchers said.

"The most likely source of the silver contamination is atmospheric emissions from coal burning in Asia," said Russell Flegal, professor of environmental toxicology at University of California, Santa Cruz (UCSC). "Silver concentrations in the North Pacific trace the atmospheric depositions of industrial aerosols from Asia, with the highest concentrations in those waters closest to the Asian mainland," said Flegal. Flegal Dr. Russell Flegal chairs the UCSC Environmental Toxicology Department, which he founded in 2000. (Photo courtesy UCSC).

Previous studies by Flegal's group have documented high mercury levels in rainfall on the west coast of the United States, which they linked to contamination from coal burning in Asia. "Unlike mercury, silver is not a human health concern. But silver is second only to mercury in its toxicity to marine invertebrates," Flegal said. The North Pacific survey completes a preliminary survey of silver throughout the world's oceans. The goal was to establish current levels of contamination as a baseline for future studies, Flegal said.

"We found by far the highest levels of silver in the North Pacific. Even though the Atlantic Ocean is subject to industrial emissions from North America and Europe, the amounts are small compared to what goes into the Pacific from Asia," he said.

Mara Ranville, Ph.D., a researcher in Flegal's lab, collected the samples on a 35 day cruise in the summer of 2002 as part of the Global Investigation of Pollution in the Marine Environment, a program of the UNESCO Intergovernmental Oceanographic Commission.

Ranville found silver concentrations as high as 1.2 parts per trillion in samples of North Pacific surface waters taken during the cruise. This is about 50 times higher than baseline levels of silver in uncontaminated waters sampled by UCSC researchers on a previous cruise in the Atlantic Ocean.

Because the natural background level is so low, scientists may be able to use silver as a tracer element for tracking the fate of industrial emissions from Asia, Ranville said.

"Atmospheric pollution from Asia is becoming a serious problem for the western United States, and this may be a valuable tool for tracing those emissions, both in the atmosphere and in the water," she said.

Prevailing westerly winds carry atmospheric pollution across the North Pacific ocean from China, where coal is the primary fuel and the use of emissions controls is limited.

Sam Luoma, a U.S. Geological Survey scientist who has worked with Flegal to study heavy metal contamination in San Francisco Bay, said the elevated silver concentrations in the open ocean suggest there may be "hotspots" in Asian coastal waters where the concentrations reach toxic levels.

"The open ocean is vastly diluted, so there may be some massive hotspots of silver contamination around the Asian continent. That's where effects on marine organisms would occur," Luoma said.

In San Francisco Bay, silver and copper from industrial discharges reached such high levels in the 1970s and early 1980s that clams stopped reproducing and some species of invertebrates disappeared from mudflats, he said.

At that time, silver concentrations in the bay were 100 times higher than the levels Ranville and Flegal found in the open ocean.

With stricter pollution controls, silver has now declined to around six parts per trillion in San Francisco Bay waters, and the affected invertebrates have recovered, Luoma said.

Ranville and Flegal reported their findings in the March 9 issue of "Geochemistry, Geophysics, Geosystems," an electronic journal published by the American Geophysical Union and the Geochemical Society.