Researchers track Chernobyl fallout

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When a reactor in the Chernobyl nuclear power plant exploded in 1986 in what was then the Soviet republic of Ukraine, radioactive elements were released in the air and dispersed over the Soviet Union, Europe and even eastern portions of North America.

More than 20 years later, researchers from Case Western Reserve University traveled to Sweden and Poland to gain insight into the downward migration of Chernobyl-derived radionuclides in the soil. Among the team's findings was the fact that much more plutonium was found in the Swedish soil at a depth that corresponded with the nuclear explosion than that of Poland.

Radionuclides occur in soil both from natural processes and as fallout from nuclear testing.

Gerald Matisoff, chair of the department of geological sciences at Case Western Reserve University, Lauren Vitko, field assistant from Case Western Reserve, and others took soil samples in various locations in the two countries, measuring the presence and location of cesium (137Cs), plutonium (239, 240Pu), and lead (210Pbxs).

Matisoff will present his findings on Monday, October 6, at the 2008 Joint Meeting of the Geological Society of America, Soil Science Society of America, American Society of Agronomy, Crop Science Society of America, and Gulf Coast Association of Geological Societies in Houston.

By looking at the magnitude of the radioactive fallout, how fast it moved down into the soil profile and how quickly it eroded and is transported by sediment, Matisoff's research helps shed light on two fronts.

The first is dealing with the public health ramifications, studying such issues as food chain transfer, exposure and cleanup as well as understanding the geologic aftereffects. These issues include measuring erosion rates, how long the radionuclides are retained in the watershed, the source of sediment found in rivers as well as compiling radioactive inventories.

The second is developing an understanding of the differentiation of radioactive elements from a one-time event like Chernobyl and those of fallout created by atmospheric nuclear weapons testing conducted in the 1960s.

Soil samples collected by Matisoff's team reveal insights based on several conditions, such as how the radionuclides were delivered to the soil, whether from a one-time event like the Chernobyl disaster or from atmospheric bomb testing; the half-life of the radionuclides and whether they were absorbed more heavily onto clay particles (such as 137Cs and 7Be) or organic materials (239, 240Pu and 210Pbxs); and the types of soil which may keep the particles at the surface or allow them to permeate to levels below the surface.

As the team examined a range of soil types from the two countries, they found a spike in 239, 240Pu in Sweden's soil at a depth that coincides with the Chernobyl disaster, yet no similar blip in Poland's soil. Meteorological research showed that it rained in Sweden while the radioactive cloud was over that country. Leeched of much of its radionuclides, much less plutonium fell on Poland when the cloud later crossed over its borders.

Matisoff says that his team's findings are preliminary, having raised as many questions as they have answered. His goal is to use this research for even bigger projects and greater, more definitive findings.

Source: Case Western Reserve University