

Reactor Fission Product Fallout in North American Wet-Deposition Samples, from the March 11, 2011 Fukushima Dai-ichi Incident

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The U.S. Geological Survey (USGS) and National Atmospheric Deposition Program (NADP) networks successfully responded to monitor radioactive fallout from the Fukushima Dai-ichi nuclear power facility release incident, March 11, 2011. In coordination with other federal agencies, USGS/NADP provided scientifically reasonable and cost effective observations of fission-product isotopes in wet deposition over North America from 170 NADP sites. These results are comparable to measurements from other networks in North America and Europe.

For the period March 8 - April 5, 2011, wet-only precipitation samples were collected by NADP and analyzed for radionuclides in whole-water and filterable solid samples (0.45 μm polysulfone filter) by the USGS using gamma spectrometry. Samples from two sites in Environment Canada's Canadian Air and Precipitation Monitoring (CAPMoN) network were analyzed, but no fission-products were found in these samples.

Initially, filterable solids from National Trends Network (NTN) samples were analyzed. However, no fission products were detected on the filters. The USGS then analyzed whole-water precipitation samples provided by the NADP. NTN samples were acidified with 0.5% Ultrex nitric acid and placed in a warm bath to limit adsorption to the NADP bottles. Weekly Mercury Deposition Network (MDN) samples were also analyzed, and were acidified with 1% hydrochloric acid preservative at time of collection. Two-week precipitation-weighted composite samples were made from weekly NTN and daily CAPMoN samples, but MDN samples were not composited.

Detectable quantities of ^{131}I , ^{134}Cs , or ^{137}Cs were observed at approximately 25% of sampled NADP locations. One-week and two-week deposition fluxes calculated from NADP/USGS data range from 39 - 3,300 Becquerels per square meter (Bq/m^2) for ^{131}I , 0.5 - 108 Bq/m^2 for ^{134}Cs , and 0.7 - 240 Bq/m^2 for ^{137}Cs . The spatial extent of measured deposition were consistent with the modeled position of the jet stream and air mass back trajectory (NOAA HYSPLIT) modeling results. Fission products were also detected in Alaska. Activities measured in wet deposition samples are comparable to bulk measurements by the USEPA RadNet network, University of California at Berkeley, and European entities. The highest ^{131}I , ^{134}Cs , and ^{137}Cs activities (9.2, 1.2, and 1.5 Bq per liter, respectively) were observed at the CO90 site, located at 3,015 meters altitude in the Rocky Mountains near Nederland, CO.

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