Radioactivity in Precipitation – Methods & Observations from Savannah River Site

Dennis G. Jackson and G. Timothy Jannik – Savannah River National Laboratory, Aiken, SC
Miranda LaBone – Clemson University, Clemson, SC
Rebecca Scheffler– University of South Carolina Aiken, SC

Background/Objectives: The Fukushima Daiichi disaster was a reminder of the global scale processes of atmospheric deposition. Monitoring of "fallout" from nuclear events has been a component of the nuclear age. The monitoring is central in determining exposure to the general population from anthropogenic events and nuclear operations. Numerous programs and ad-hoc networks have or currently monitor radioactivity as both dry and wet deposition. We present collection methods, analytical techniques, and observations from one network that is operated by the Savannah River Site (SRS).

Savannah River Site is one of several nuclear facilities in the U.S. Department of Energy complex. Nuclear facilities at SRS were constructed during the early 1950s to produce materials (primarily plutonium-239 and tritium) used in nuclear weapons. The site covers 800 square kilometers (310 square miles) in South Carolina and borders the Savannah River. Since the Spring of 1951 environmental radioactivity has been measured and reported as part of construction and nuclear operations. The objective of this monitoring is to characterize environmental radiation so that any increase due to operations could be readily determined. One aspect of the program is monitoring of radioactivity in precipitation.

Approach/Activities: Since 1954 SRS has reported radioactivity in precipitation. A network of rainwater sampling sites is maintained as part of the monitoring program. These stations are used to measure deposition of radioactive materials on-site, around the site-perimeter (approximately 15-miles in diameter), at off-site control locations, and at selected major population centers located at 40 and 161 kilometers (25 and 100 miles). In the early years collection and analytical methods were refined to current techniques. At each of the locations, two samples of precipitation are collected. Beginning in 1963 ion-exchange resin columns have been used for gamma-emitting radionuclides, gross alpha, gross beta and specific isotopes associated with facility operations. As precipitation passes through the column radioactive particles partition into the resin and are retained. Once in the laboratory the particles are extracted from the resin and assayed for specific isotopes. In 1971 the current tritium sampling methods were implemented. This involves direct capture of precipitation and analysis based upon scintillation counting. Generally the ion-exchange column sampling is performed monthly, while sampling of rainwater for tritium is performed biweekly. Results are compiled and reported annually in the *SRS Annual Environmental Report* as activity and deposition.

Results/Observations: Continuous observations from 1954 have allowed scientists to assess impacts of SRS nuclear operations on the surroundings. In addition SRS has observed fallout from weapons testing from around the world and the 1986 Chernobyl and 2011 Fukushima disasters. The observations record long-term trends of radioactivity and nuclides in precipitation from the southeastern United States.

Accepted for presentation at the 2012 RETS/REMP Workshop Orlando, Florida. June 25-27, 2012

Radioactivity in Precipitation – Methods & Observations from Savannah River Site

Preferred Format: Platform (Oral) Presentation

Lead Author/Presenter: Dennis G. Jackson
Savannah River National Laboratory
Building 773-42A, Room 210
Aiken, SC, USA

Voice: 803.725.1468
Fax: 803.725.7673
dennis.jackson@srnl.doe.gov

Co-Author: G. Timothy Jannik
Savannah River National Laboratory
Building 773-42A, Room 226
Aiken, SC, USA

Voice: 803-725-3042
Fax: 803.725.7673
tim.jannik@srnl.doe.gov

Others: Miranda LaBone – Clemson University, Clemson, SC
Rebecca Scheffler– University of South Carolina Aiken, SC

Accepted for presentation at the 2012 RETS/REMP Workshop Orlando, Florida. June 25-27, 2012