Geophysical Research Abstracts
Vol. 19, EGU2017-5382, 2017
EGU General Assembly 2017


# Decoding Environmental Processes Using Radioactive Isotopes for the Post-Radioactive Contamination Recovery Assessment

Misa Yasumiishi (1), Taku Nishimura (2), Kazutoshi Osawa (3), and Chris Renschler (4)

(1) Department of Geography, University at Buffalo - The State University of New York, New York, U.S.A. (misayasu@buffalo.edu), (2) Laboratory of Soil Physics and Soil Hydrology, Department of Agriculture, The University of Tokyo, Tokyo, Japan (takun@soil.en.a.u-tokyo.ac.jp), (3) Laboratory of Agricultural and Environmental Engineering, Department of Agriculture, Ustunomiya University, Tochigi, Japan (osawa@cc.utsunomiya-u.ac.jp), (4) Department of Geography, University at Buffalo - The State University of New York, New York, U.S.A. (rensch@buffalo.edu)

The continual monitoring of environmental radioactive levels in Fukushima, Japan following the nuclear plant accident in March 2011 provides our society with valuable information in two ways. First, the collected data can be used as an indicator to assess the progress of decontamination efforts. Secondly, the collected data also can be used to understand the behavior of radioactive isotopes in the environment which leads to further understanding of the landform processes. These two aspects are inseparable for us to understand the effects of radioactive contamination in a dynamic environmental system. During the summer of 2016, 27 soil core samples were collected on a farmer’s land (rice paddies and forest) in Fukushima, about 20 km northwest of the nuclear plant. Each core was divided into 2.0 – 3.0 cm slices for the Cs-134, Cs-137, and I-131 level measurement. The collected data is being analyzed from multiple perspectives: temporal, spatial, and geophysical.

In the forest area, even on the same hillslope, multiple soil types and horizon depths were observed which indicates the challenges in assessing the subsurface radioactive isotope movements. It appears that although highly humic soils show higher or about the same level of radioactivity in the surface layers, as the depth increased, the radioactivity decreased more in those samples compared with more sandy soils. With regard to the direction a slope faces and the sampling altitudes, the correlation between those attributes and radioactivity levels is inconclusive at this moment. The altitude might have affected the fallout level on a single hillslope-basis. However, to determine the correlation, further sampling and the detailed analysis of vegetation and topography might be necessary. Where the surface soil was scraped and new soil was brought in, former rice paddy surface layers did show three-magnitude levels lower of radioactivity in the top layer when compared with forest soils. At the foot of forest slopes where the surface soil was scraped and litter was cleared, the scraping showed mixed results in radioactivity reduction.

It is estimated that by the completion of soil decontamination in 2020, up to 22 million cubic meters of so-called ‘contaminated soils’ will have been scraped off in the affected areas and transferred to an underground storage. Understanding the radioactive isotope behaviors is crucial to assessing the financial and environmental consequences of such measures. As an example, a 30-year simulation of a 5-13 % hillslope under thick vegetation with GeoWEPP (the Geospatial interface for the Water Erosion Prediction Project) resulted in a very small soil loss on the hillslope. However, the results showed about five tons of soil loss through channels and as sediment discharge annually. On the hillslope, the radioactivity level in about the top 4.0 cm of the soil exceeded the 8,000 Bq/kg threshold which the Japanese government has set for surface soil removal.

Referring to the case study data in Fukushima, this presentation will discuss how environmental decontamination measures (e.g. forest clearing) and monitoring methods should be considered and planned against dynamic environmental processes.