Topics Fukushima

October 16, 2020 No.101

Students learned methods for studying environmental dynamics in forest.

In two-week internship during summer vacation, students experienced field inspection and sample analysis to investigate distribution and migration of radioactive materials in forests.

The Fukushima Environmental Evaluation Research Division, Collaborative Laboratories for Advanced Decommissioning Science, Japan Atomic Energy Agency (JAEA) in Miharu Town, holds internships during summer vacation (hereafter referred to "summer internship") for college and university students who are interested in environmental radiation and environmental restoration of Fukushima.

Seven students participated in the summer internship this year. Among them, one student of Kyoto University and one student of National Institute of Technology, Fukushima College participated in the field inspection training to evaluate distribution of radioactive cesium and its migration into trees in a forest from August 17, 2020.

To prevent coronavirus infection, the training this year was conducted under a "new lifestyle", which was different from the normal internships. The students had measured the body temperature and recorded the action history from two weeks before the training, and they wore masks or face shields during the training.

◈ From preparation to field inspection in forest

For real field inspection in forest, it is important to acquire knowledge in advance. Therefore, on the first day of the training, the students learned the background of the past research and inspection, meaning of the training from examples, and the purpose/procedure of the field inspection. In addition, the students deeply understood the contents of the training by the general orientation as to the information sharing about dangerous places on sites and the confirmation of equipment, which are generally conducted by JAEA staff every time.

Going to the training site through the forest

From the next day, the students conducted a field inspection training in the forest of Tamura City in the hot weather of over 30°C for four days. Before entering the forest, they wore work clothes such as long sleeves and long pants to prevent insect bites and injuries. Also, they put on a helmet as a safety measure for the head. Then, they walked on the slope for about 15 minutes to the site, while carrying the inspection equipment on their backs.

The first thing to do when arriving at the training site was to determine the inspection area. The students specified the species of the trees by comparing with a botanical picture book, and inspected the thickness and number of trees (hereafter, these processes are called “tree survey”). Based on the tree survey results, they judged whether or not the place was appropriate as a test site, and selected the sampling spots.

Tree survev

After that, they collected fallen leaves and branches, while taking a note of the slope and position of the sampling point. Also, they collected soil samples using a “liner soil sampler”[*1] that can collect soil up to 25 cm underground at once. In addition, they collected bark, xylem[*2] using an “increment borer” (a tool to hollow out inside a tree), and leaf branches using high branch cutting scissors.

Collecting xylem using an increment borer

In this way, the students experienced all processes from the selection of the sampling spots to the real sampling.

◈ From pretreatment to analysis

The samples collected in the field inspection were brought to the Laboratory Building in the Fukushima Prefectural Centre for Environmental Creation (Miharu Town) where the Fukushima Environmental Evaluation Research Division is working. There, after checking the contamination of radioactive materials, they analyzed the samples. In the analysis, a "germanium semiconductor detector"[*3] was used to measure the concentration of radioactive cesium. In order to efficiently analyze the radioactivity, various pretreatments are needed before measuring the radioactivity by a germanium semiconductor detector. Firstly, water containing in the samples should be eliminated because water has a property to shield radiation. Secondly, a sample must be fully mixed by pulverizing and stirring so that the distribution of radioactive materials in the sample becomes homogeneous. By these pretreatments, the state of the samples become unified, so it becomes possible to compare the analysis results of the samples collected at different sites. The students concentrated on the analysis, while considering the meaning of each pretreatment process.

Pretreatment work

After the pretreatments, the students measured the radioactivity by themselves using the germanium semiconductor detector. In addition to the measurements by the germanium semiconductor detector, they also observed leaves, branches and barks using an "autoradiograph"[*4)], which can visualize the radiation map in a sample. After receiving the explanation about how to treat and analyze the obtained data, the students calculated and summarized the data by PC.

◈ After the internship

On the final day of the internship, each student presented the results for the field survey and the sample analysis (species and diameter of trees, concentration of radioactive cesium in the trees, autoradiograph data, analysis results, etc.). They also presented the interpretation that was considered by themselves. The JAEA staff in charge commented that the students deeply understood the objective of the training and the presentation was well organized.

Two students who participated in the internship talked about their impression, "Through the internship this time, we were able to experience a series of the works, from the selection of the inspection site and sampling up to the data analysis. In particular, we could deeply learn a method for the data analysis of the obtained results and how to treat

the experimental errors in the measurement results." Further, the students continued, "Due to the spread of coronavirus infection, lectures in the university are now conducted online. So, it became hard to contact people or to have various experiences. Under such severe circumstances, it was a valuable experience for us to participate in this internship. Through the training, we were able to actually experience the research activities in "environmental dynamics", such as the field works and sample treatments that cannot be done in the physics and chemistry departments at the university. From these experiences, we realized how the knowledge obtained in the university lectures is related to real research activities. This was really exciting and valuable for our future studies."

【Terminology】

＊1）liner soil sampler

A tool for collecting soil, which was developed for the investigation of soil. Since it is small and lightweight with a cylindrical shape of about 30 cm in length, it has an advantage of being easy to carry.

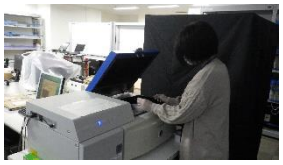
＊2）Xylem

A part of a tree where the dark part (heartwood) in the center of the tree and the white part (sapwood) around it are combined.
For details, please see the following website;
https://fukushima.jaea.go.jp/QA/en/tree.html

＊3）Germanium semiconductor detector

Radiation detector using semiconductor for analyzing concentration of radioactive materials.

＊4）Autoradiograph



An analytical method that creates an image based on the radiation emitted from radioactive materials distributed in a sample.

(References)

Summer schools held in FY2020 at the Sector of Fukushima Research and Development are listed below.

○Collaborative Laboratories for Advanced Decommissioning Science (CLADS)

·August 17~August 28, 2020:　2 students for "Environmental Dynamic Study"

·August 24~August 28, 2020:　2 students for "Environmental Dynamic Study"

·September 1~September 11, 2020:　3 students(note) for “Environmental Dynamic Study”

(note) One student participated from September 3 to September 10.

·August 17~August 28, 2020 :　2 students for “Radiolysis of water”

○Naraha Center for Remote Control Technology Development (NARREC)

·August 30~September 4, 2020:　3 students for “Remote-control technology”

Topics Fukushima　No. 101

Fukushima Administrative Department Sector of Fukushima Research and Development

Japan Atomic Energy Agency (JAEA)

Address: 8F Taira Central Building, 7-1 Aza-Omachi, Taira, Iwaki-shi, Fukushima 970-8026, Japan

Phone: +81-246-35-7650　Fax: +81-246-24-4031

Website: https://fukushima.jaea.go.jp/en/