

Berkeley RadWatch

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Rainwater Sampling Experimental Setup

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UCB Rainwater Sampling Experimental Setup

As part of our radiation monitoring program, we are sampling rainwater collected on the roof of Etchevery Hall. Rainwater is an especially effective way of monitoring particulates in the air because raindrops condense on particles and then fall to the ground, where we can collect them on our tarp (*right*). Most of these particles in the air will be from natural sources or man-made pollution, while a small fraction may have originated at the reactors in Japan, transported by air currents across the Pacific.



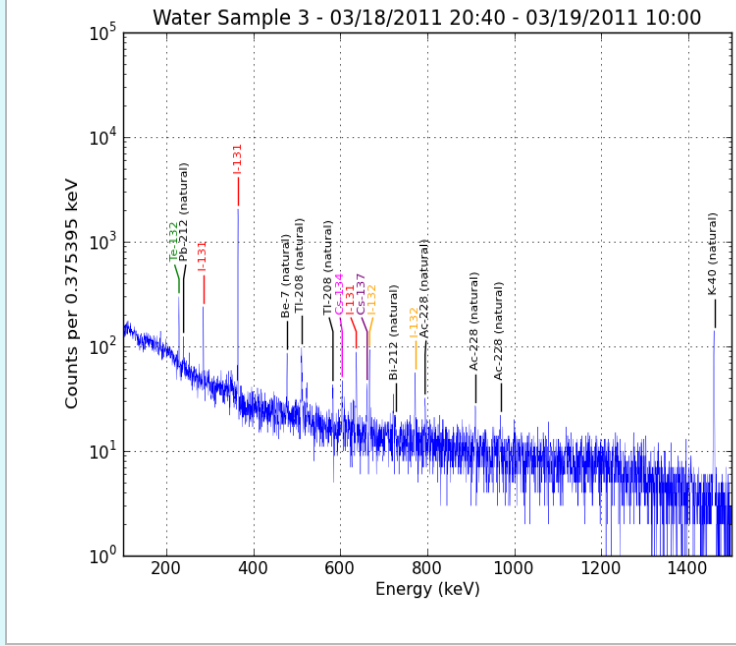
We distill the rainwater in an oven for several hours, often reducing the volume from about 5 liters to 1 liter. Teflon beakers are used in this process so that the particulates will not stick to the sides of the beaker as the water level decreases. We then place the liter of distilled rainwater in a special container called a Marinelli beaker that fits around our cylindrical high-purity germanium gamma-ray detector.

By evaporating the rainwater in this fashion, we reduce the amount of water in the sample while keeping the amount of particulates constant. We therefore have a more concentrated sample, which increases our sensitivity to detect trace amounts of gamma radiation from particles in the rainwater. The Marinelli beaker also increases our sensitivity since it is more likely for a gamma-ray emitted in the water to strike somewhere in our detector, as compared with a container that does not wrap around our detector.



The high-purity germanium detector and Marinelli beaker are housed in a 2"-thick lead cave (*left*), shielding the detector from natural background radiation. As gamma-rays are emitted from radioactive isotopes in the rainwater sample, some will interact inside the germanium detector and deposit their energy. The properties of the germanium crystal allow us to measure an electric current proportional to that energy. After several hours of measuring individual gamma-ray energies, we produce an accumulated energy spectrum. The

measured spectrum is compared to a background sample taken with deionized water. The presence of certain radioactive isotopes such as Cs-137, I-131, and Te-132 can be ascertained by whether their signature lines are present or absent. If present, the height of the lines give us information about how much of that isotope is present in the rainwater. An example of a gamma-ray spectrum that we have measured showing both natural gamma-ray lines and lines due to radioisotopes from the Japanese reactors is shown below.



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