

The annual output of radiocaesium in stream water from a forested watershed

Yoshiki Shinomiya^{1*}, TAMAI Koji¹, KOBAYASHI Masahiro¹, OHNUKI Yasuhiro¹, SHIMIZU Takanori¹, IIDA Shinichi¹, NOBUHIRO Tatsuhiko¹, SAWANO Shinji¹, TSUBOYAMA Yoshio¹, HIRUTA Toshihide²

¹For. and For. Prod. Res. Inst., ²Fukushima Pref. For. Res. Ctr.

Radiocaesium (Cs) was released by the accident in Fukushima Daiichi nuclear power plant. Although the woodland is thought to have strong tendency to maintain radiocaesium within a forest ecosystem, there is an anxiety that radiocaesium flows downwards through stream water at the freshet because the terrain of mountain area in Japan is steep and a lot of rainfalls exist. Then, the behavior of radiocaesium in stream water in a forested catchment in Fukushima Prefecture was investigated. In this time, we report on the runoff of radiocaesium in 2012 and its feature.

The investigation was carried out in a small catchment in the Tadano experimental forest of the Fukushima Prefecture forestry research center in Koriyama city, Fukushima Prefecture (Annual rainfall 1163 mm ; drainage area 1.2 ha, the elevation 358 to 409 m, and the relief 0.42). The geology is a sedimentary rock (sandstone and tuff). As for the vegetation, the deciduous broad-leaved species such as *Quercus serratas* exists together with the Japanese red pine woods in the *Cryptomeria japonica* and the *Chamaecypari obtusa* plantation (about the 48 years old). The discharge was observed by setting up the v-notched weir and the water level gauge in the catchment end. The automatic water sampler was set up near the weir and collected stream water (volume; about 2L) every one hour when the freshet. The turbidity was measured by a turbidity sensor that was able to be installed in the automatic water sampler, and it was recorded every ten minutes automatically.

Based on 28 data of five freshets (March 23, 31, May 3, 28 and June 19 in 2012) of which the analysis had been completed, the relation between the turbidity and ¹³⁷Cs concentration in stream water were examined. Its relationship had high correlation ($r = 0.828$, $p < 0.001$). From this relation, turbidity and discharge, ¹³⁷Cs runoff for the observation period (267 days of March 20th - December 11th) was estimated as 183 Bq m⁻². We divided daily radiocaesium runoff data into two categories by daily rainfall (5 mm day⁻¹) and found that 84 % of ¹³⁷Cs discharged during the flood flow (> 5 mm day⁻¹). When converting ¹³⁷Cs runoff in the observation period into the yearly value (365 days), the estimated annual ¹³⁷Cs runoff became 250 Bq m⁻² yr⁻¹. This is about 0.3% of ¹³⁷Cs fallout around our site (80 kBq m⁻² by Ministry of Education, Culture, Sports, Science, and Technology; airplane monitoring 2011/10/13).

Keywords: forest, stream water, radiocaesium