

§6. Environmental Tritium Studies at Toki Site of NIFS (1994)

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(1) Environmental tritium at Toki area

Tritium(³H) concentrations in litter and underlying humus of pine forest in National Institute for Fusion Science, Toki, Gifu prefecture have been measured to examine ³H movement in forest ecosystem. The litter sample was mainly composed of dead pine needles being accumulated on the forest floor within a few years, while the humus was mostly degraded pine needles and already lost its original shape.

The tritium concentrations in litter and humus samples have showed similar levels at two sampling points (east and west samplings points), suggesting the same condition of these sampling points in relation to tritium environment. Although no remarkable difference was observed on the mean free-water-tritium (FWT) concentrations, we can see variation on the FWT concentrations from sample to sample. The variation of the FWT concentrations occurred coincidentally on the samples from the both points. It was concluded that the coincident variation on the FWT concentrations occurred on the surface soil layers over the pine forest, proposing a mechanism controlling FWT concentration over a limited area.

The ³H concentration in FWT showed a strong correlation with the weather condition before sampling as shown in Fig. 1; high concentration

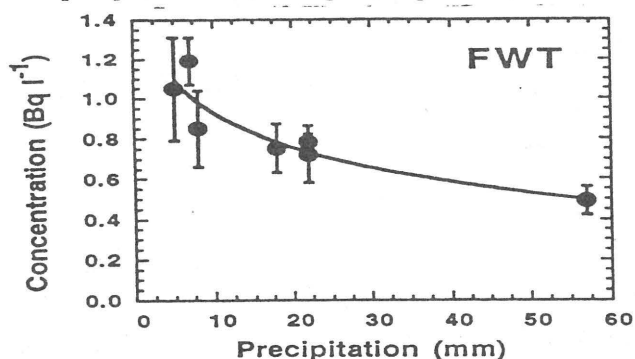


Fig 1. FWT concentrations vs. rain

was observed after the periods of less rain and low after much rain. The FWT tends to increase but rain events decrease. The tritium level after much rain, ca. 0.5 Bq l⁻¹ is comparable with the annual average concentration of precipitation, 0.73 Bq l⁻¹ that was measured in Fukuoka in 1990.

The elevation of ³H concentration is attributed to continuous oxidation of atmospheric ³H in hydrogen and methane of high specific activities (Table 1) due to biological activity of microorganisms on the forest floor. The decrease in ³H concentration occurs occasionally by rain that has low ³H concentration in the forest floor.

Table 1. Tritium concentrations of different chemical forms in the atmosphere collected Toki

	Specific Activity (TU)
HTO	16.4 ~ 22.8
HT	5.5 x 10 ⁵ ~ 7.6 x 10 ⁵
CH ₃ T	3.0 x 10 ⁴ ~ 5.0 x 10 ⁴

(2) Measurement of organically-bound tritium concentration in environmental samples around Toki site

Pine needle samples were analyzed for ³H in order to get background data around Toki site. The samples were collected at Toki site 4 times a year. The control samples were gotten at Higashiyama campus of Nagoya University and Heiwa-Koen in Nagoya City. Free water was separated from the sample with lyophilization. The dried samples were burned in a quartz tube to get organically-bound tritium (OBT) as water. Recovered water was purified by boiling with potassium permanganate, vacuum distillation, and two times distillation under atmospheric pressure. The ³H concentrations in the samples collected in 1993 were slightly higher than the recent data. The most samples collected in 1994 were already processed, and now ready to measure.

(3) Distribution of oxidation activity of tritium gas at Toki area of NIFS

No remarkable difference was observed on oxidation activity of tritium gas in soils.

Further study is necessary to establish reliable background data for environmental tritium, OBT concentrations and oxidation activity of tritium gas in environmental samples around Toki site.