§5. Geochemical Characteristics of Precipitation and Inland Water at Okinawa Island

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Introduction

Environmental radiation monitoring and radiation safety study are essentials to pursue the development of Large Helical Device for the nuclear fusion. Particularly, for the environmental tritium data around NIFS, it is required to draw a comparison with data of the past and/or the other region. From this viewpoint, the measurement of tritium concentration has been carried out on precipitation and inland water samples obtained from Okinawa Island in this study. Many researches on the environmental tritium were performed in Japan, but there is very little data in Okinawa prefecture. It is well known that the variation of environmental tritium concentration with latitude and some geographical conditions, therefore the comparison between tritium data obtained in NIFS and Okinawa Island, the middle and the southwest of Japan, respectively, is very important to safety operation of the nuclear fusion plant.

Materials and Methods

In order to estimate the recent environmental tritium concentration, water samples were taken at five sites in the middle and southern part of Okinawa Island (Fig. 1), main island of Okinawa prefecture, every month from June 2014. Precipitation was collected at the rooftop of a building of University of the Ryukyus, and the amount of monthly precipitation was approximated. Also the inland water samples were taken from two springs, a well and a limestone cave, Gyokusen-dou. The inland samples in the cave are dripping water seeped through a stalactite straw. These water samples were distilled to remove impurities. Then the distilled water samples were electrolysis enriched, because the concentration of tritium in the environmental water is extremely low in recent years. Analysis for the tritium concentration was performed by a liquid scintillation counter.

Results and Discussions

So far, the analyses have been performed for the samples obtained from June 2014 to August 2014. The arithmetic mean of tritium concentration for the precipitation samples was calculated to be 0.11 Bq/L (range: 0.06～0.16 Bq/L). Also the mean for inland water samples was estimated to be 0.16 Bq/L (range: 0.12～0.19 Bq/L). The maximum value, 0.19 Bq/L, was observed on a dripping water sample obtained from the cave. The means for each site are shown in Figure 2.

At the present time, there is no difference for the tritium concentrations between precipitation and inland water samples. Also the correlation between the tritium concentration and the amount of precipitation was not recognized.

The results indicate that the tritium concentration of environmental water in Okinawa Island is lower than that of the past data obtained in Japan. This suggests that the latitude effect brings the low tritium concentration in Okinawa Island. In addition, it is considered that the decrease with physical half-life of tritium originated from the past atmospheric nuclear tests contributes the low tritium concentration in Okinawa Island. To view the recent seasonal and geophysical variations of the environmental tritium concentrations, continuous study in the East Asia is minimum requirements.

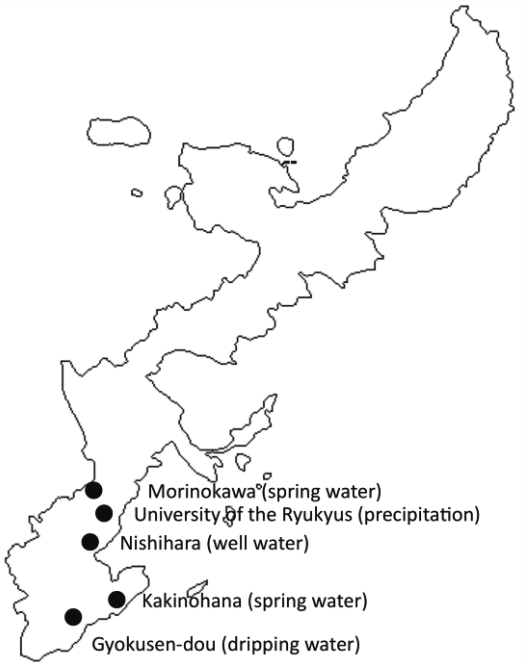

Fig. 1 Locations of sampling sites in Okinawa Island.

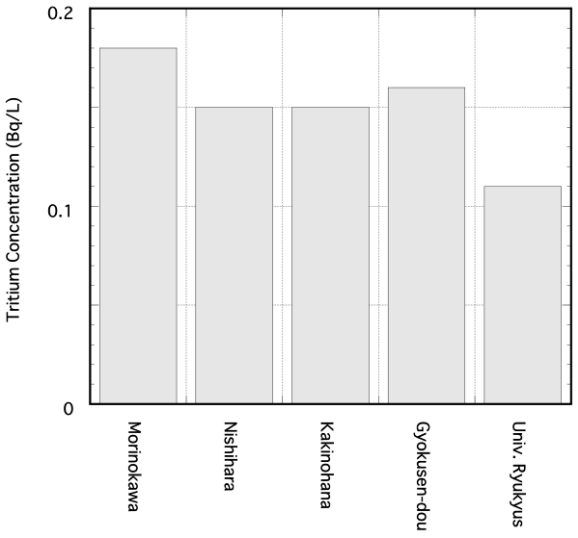

Fig. 2 Arithmetic means of tritium concentration at the sampling sites from June 2014 to August 2014.