

## RADIOACTIVITY VARIATION AND TRANSPORT BEHAVIOR OF RADIOCESIUM IN THE NATSUI RIVER AFTER THE FUKUSHIMA DAI-ICHI NUCLEAR POWER PLANT ACCIDENT

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*Total radioactivity of <sup>134</sup>Cs and <sup>137</sup>Cs in the Natsui River located south of FDNPP was 0.37 to 284 mBq/kg-bulk and 1.5 to 894 mBq/kg-bulk, respectively during July 2011 to October 2016. Almost of data that <sup>137</sup>Cs radioactivity higher than 30 mBq/kg-bulk had particulate/total Cs radioactivity ratio over 90 %. This result suggests that higher radioactivity concentration of the Natsui River is controlled by suspended particle.*

### I. INTRODUCTION

A large quantity of radioactive materials was released into atmosphere by Fukushima Dai-ichi Nuclear Power Plant (FDNPP) accident caused by the East Japan Great Earthquake disaster of March 11, 2011. <sup>137</sup>Cs released in the atmosphere by early April is estimated to be 12PBq (Chino et al., 2011). Some part of <sup>137</sup>Cs was deposited on the land area of Fukushima Prefecture, Japan. The radioactive contamination has been increase of the space dose rate, and radioactivity of agricultural and marine products. In addition, the radionuclide deposited on the land area transports to the ocean through river systems. Therefore it is important to study medium-and-long term habits impact statement to river basin and the coast ocean to grasp the shift behavior of the radionuclide in river systems. This study reported behavior of radiocesium in the Natsui River located in the south of FDNPP from July 2011 to October 2016.

### II. MATERIALS AND METHOD

The Natsui River was watershed area of 748.6 km<sup>2</sup> and river length of 67.1 km. River research was conducted at Iwaki, Fukushima Prefecture (37° 03' 40.9" N 140° 56' 26.2" E) from July 2011 to October 2016. Dissolved Cs in the river waters was collected with ammonium molybdophosphate (AMP)/Cs compound. The AMP/Cs compound was dried at 60°C and weighed to determine the weight yield of AMP/Cs compound. The dried sample was packed into a polyethylene bag (3.5 cm × 7.0 cm). Suspended solids collected by filtration and centrifugation, and packed into a polyethylene bag, and or well type tube (inner diameter 1.0 of cm). The radioactivity was measured by using gamma-ray spectrometry with low background Ge detectors equipped with a multichannel analyzer at the Low Level Radioactivity Laboratory of Kanazawa University during 1–3 days. Gamma emission peaks were used for calculating activity at 605 keV for <sup>134</sup>Cs and 661 keV for <sup>137</sup>Cs. The cascade summing effect was corrected for <sup>134</sup>Cs using a contaminated soil sample from Fukushima Prefecture. Decay correction of radioactivity for <sup>134</sup>Cs and <sup>137</sup>Cs was done at each sampling date.

### III. RESULTS AND DISCUSSION

Fig.1 shows total radioactivity of  $^{134}\text{Cs}$  and  $^{137}\text{Cs}$  and turbidity during the sampling period after the accident. Total radiocesium concentration decreases with time after the accident, though monitoring research was observed for higher radioactivity after the rain event. Total radioactivity of  $^{134}\text{Cs}$  and  $^{137}\text{Cs}$  was 0.37 to 284 mBq/kg and 1.5 to 894 mBq/kg, respectively. The variety of radioactivity of  $^{134}\text{Cs}$  and  $^{137}\text{Cs}$  appears to be similar with turbidity. Fig.2 shows particulate  $^{137}\text{Cs}$  radioactivity as a function of turbidity. There is a good positive correlation between particulate of  $^{137}\text{Cs}$  and turbidity.  $^{137}\text{Cs}$  radioactivity was 0.98 to 27.2 mBq/kg for dissolved phase and the percentage of particulate  $^{137}\text{Cs}$  to total ranged from 11 % to 98 %, 0.47 to 891 mBq/kg for particulate phase. This result suggest that particulate phase of  $^{137}\text{Cs}$  is major existent forms and is related to the variation of total radioactivity fluctuation in the Natsui River.

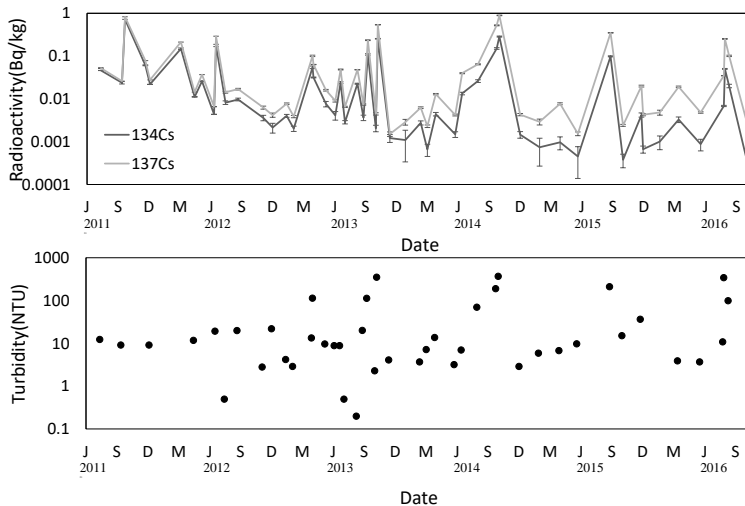


Fig.1 Fluctuation of total Cs radioactivity and turbidity of river water samples for the Natsui River

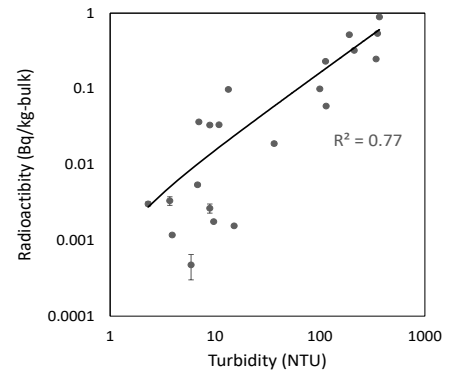


Fig.2 Radioactivity of particulate  $^{137}\text{Cs}$  and turbidity in the Natsui River water

#### IV.CONCLUSION

This study was investigated for radioactivity of  $^{134}\text{Cs}$  and  $^{137}\text{Cs}$  in the Natsui River during July 2011 to October 2016. The large variation of  $^{134}\text{Cs}$  and  $^{137}\text{Cs}$  radioactivity was observed for the research period. The percentage of particulate phase of  $^{137}\text{Cs}$  ranged from 11 % to 98 %. The results suggest that quantity and quality of riverine suspended particles greatly influence to the variation of  $^{134}\text{Cs}$  and  $^{137}\text{Cs}$  radioactivity.

#### REFERENCES

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