P-04

THE DISTRIBUTION AND ACCUMULATION MECHANISM OF RADIOCESIUM ON SEDIMENT IN MIDDLE ABUKUMA RIVER SYSTEM

Chie WATAI, Hirokazu OZAKI, Kota SATO, Takashi GOMI, Makoto YOSHIDA, Tadashi YOKOYAMA, & Izumi WATANABE
(The Graduate School of Agriculture, Tokyo University of Agriculture and Technology)

Key words : radiocesium, middle Abukuma river system, sediment, distribution, temporal variation, accumulation mechanism

Tokyo University of Agriculture and Technology

Introduction

"The 2011 off the Pacific coast of Tohoku Earthquake" and the subsequent "Tsunami" occurred on March 11, 2011.
They caused the Fukushima Daiichi nuclear power plant accident.
A lot of radionuclides (e.g. ^{131}I, ^{137}Cs, ^{90}Sr) were released from the nuclear power plant.

Through the analysis of the radiocesiums on sediments of the Abukuma River, this study aims to investigate…

- the comprehension of the distribution
- the clarification of the temporal trend
- the identification of the mechanism of accumulation

Conclusion

- The ^{137}Cs concentration in the sediments significantly varied with locations.
- The ^{137}Cs concentration did not correspond with the reduction tendency by the half-life.
  →Possibility of redistribution, accumulation or new inflow of pollutants ?
- Antagonistic actions between ^{137}Cs and congeners and between ^{137}Cs an isobar were shown.

Results and Discussion

The distribution of ^{137}Cs concentration on sediments in middle Abukuma river system

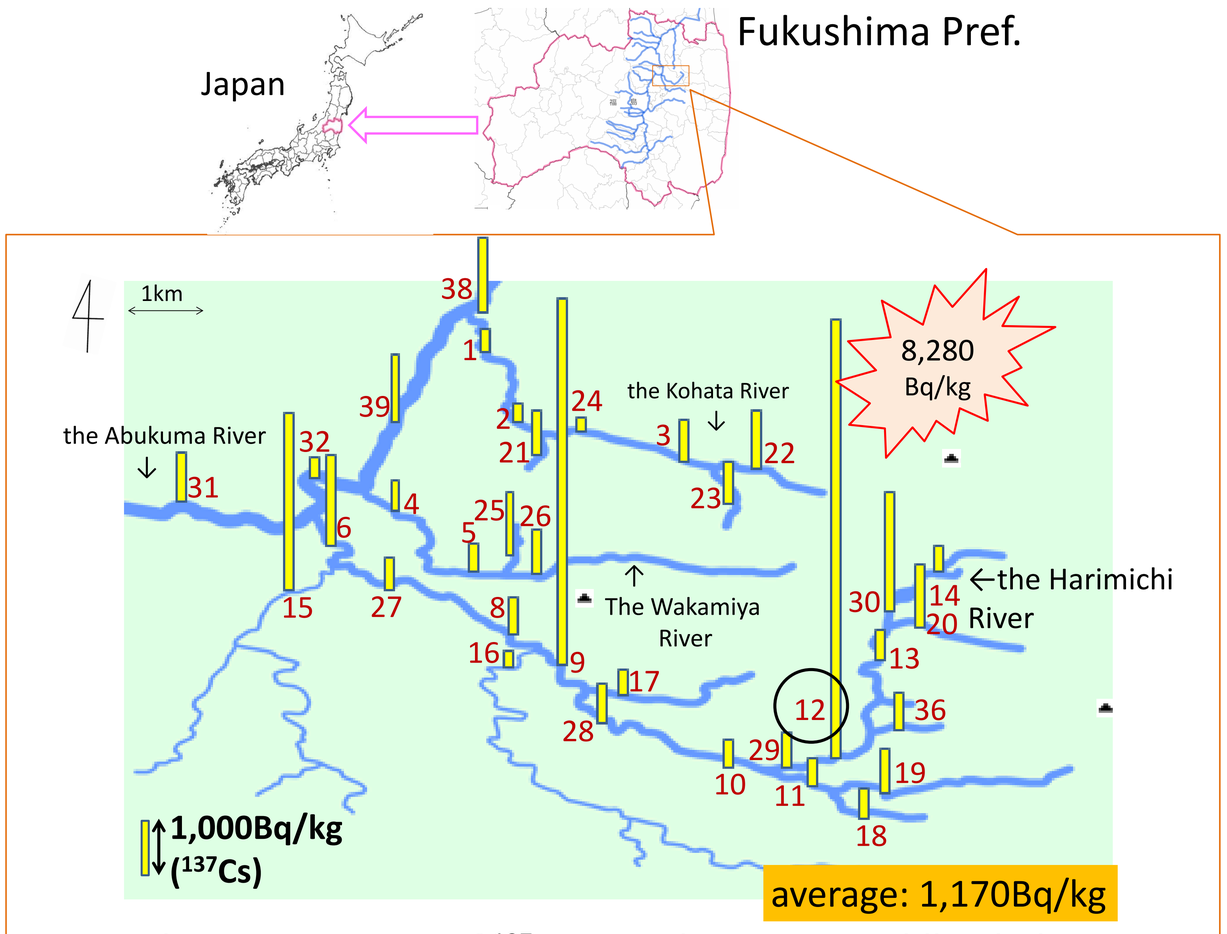

Fig. 1 The concentration of ^{137}Cs on sediments in middle Abukuma river system in term Ⅱ (October 2012)

- ^{137}Cs concentration in sesdiments significantly varied among every location.
- The highest concentration was detected in the sediment from location 12.

Why was the ^{137}Cs concentration high in the sediment in location 12 ?

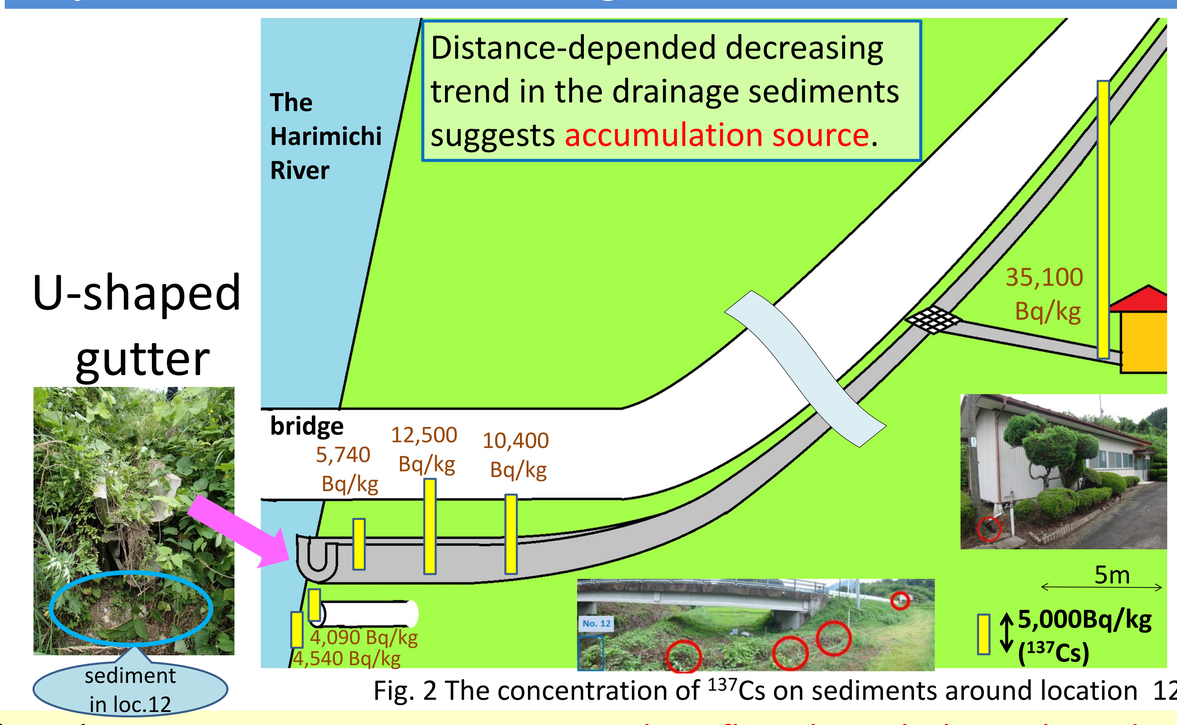

Fig. 2 The concentration of ^{137}Cs on sediments around location 12

- In location 12, NOT the river current BUT the inflow through the U-shaped gutter may have affected the ^{137}Cs activity concentration.

Seasonal variation of the ^{137}Cs concentration in sediments collected from middle Abukuma river system

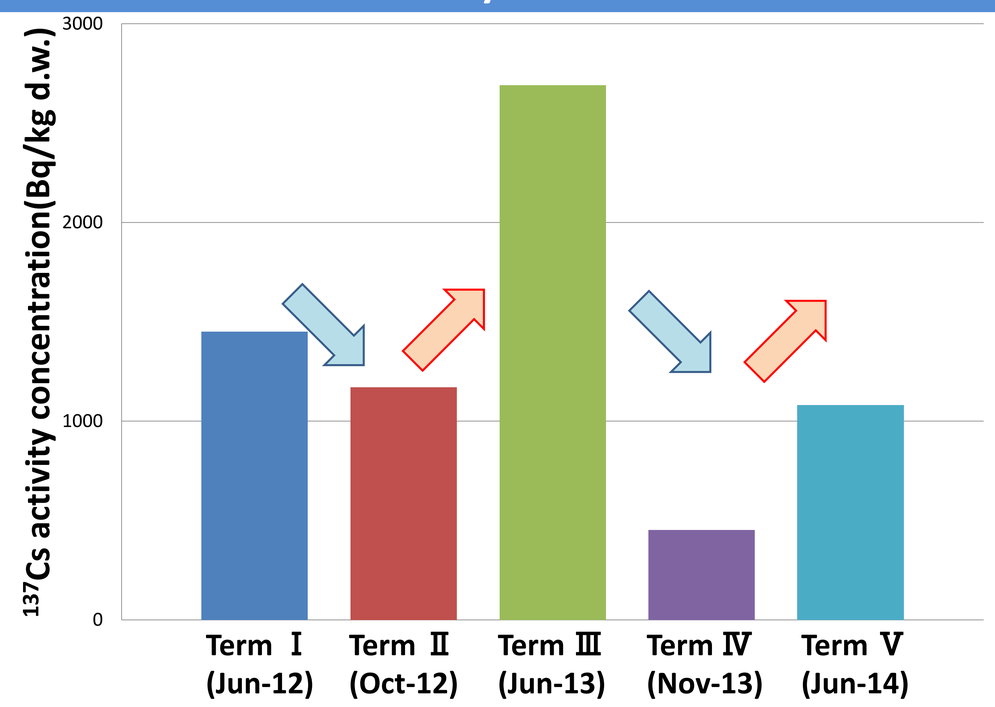

Fig. 3 Temporal variation of the average ^{137}Cs concentration in sediments collected from middle Abukuma river system

- From spring to autumn, ^{137}Cs concentration was decreased.
  →^{137}Cs-accumulated sediment ran off by autumn rain or typhoons ?
- From autumn to spring, ^{137}Cs concentration was increased.
  →High ^{137}Cs-accumulated plant litter or carcasses inflowed in winter ?

Correlation between ^{137}Cs and stable elements

- The negative correlation between ^{137}Cs activity concentration and Rb (a congener of Cs) concentration was shown.
- The negative correlations between ^{137}Cs and stable Cs and between ^{137}Cs and Ba (an isobar of Cs) were shown.

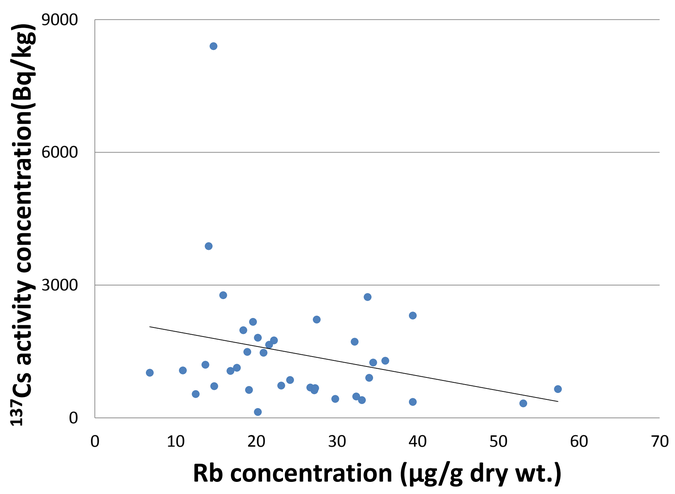

Fig. 4 The correlation between ^{137}Cs concentration and stable Rb concentration in sediments collected from middle Abukuma river system in term Ⅰ (June, 2012)

Antagonistic actions between ^{137}Cs and congeners and between ^{137}Cs and isobar were shown.

Materials and Methods

・Analysis of radionuclides

Dried at room temperature
↓
Sieved with 2-mm mesh sieve
↓
Determined the activity concentrations of ^{134}Cs, ^{137}Cs and ^{40}K with Ge semi-conductor detector

Ge semiconductor detector

・Analysis of trace elements

Dried at room temperature
↓
Sieved with 2-mm mesh sieve
↓
Digested with mixed acid of HNO_3 and HF
→
Determined the concentrations of Li, Mg, Ca, V, Cr, Mn, Fe, Co, Ni, Cu, Zn, Ga, As, Se, Rb, Sr, Mo, Ag, Cd, In, Sn, Sb, Cs, Ba, Tl, Pb and Bi with ICP-MS

(www.chem-agilent.com)
ICP-MS