Relationship between radiocesium interception potential (RIP) and other parameters such as cation exchange capacity, organic matter content, particle size, and mineral composition

*Yuichi Kurihara[1], Yoshio Takahashi[1], Fan Qiaohui[1], Keisuke Taniguchi[2], Hikaru Miura[1], Yuichi Onda[3]

1.Department of Earth and Planetary Science, Graduate School of Science, The university of Tokyo, 2.Centre for Environmental Creation Fukushima Prefecture, 3.Center for Research on Isotopes and Environmental Dynamics, University of Tsukuba

The solid-water distribution of radiocesium can be expressed by the distribution coefficient (Kd), but the Kd value is conditional depending on the condition of the solution such as major ion composition and concentration of cesium in the aqueous phase. On the other hand, radiocesium interception potential (RIP) is primarily important to show the solid-water distribution of radiocesium, because of the low total concentration of cesium in aqueous environment, where frayed-edge site is not saturated by the cesium.
In this study, the effects of cation exchange capacity (CEC), organic matter content, particle size, and mineral composition on RIP were discussed. Based on the laboratory studies using suspended sediment (SS) samples collected from various rivers in Fukushima area, we found the results from (i) to (iv):
(i) RIP is positively correlated with CEC, but some RIP values at higher CEC region were lower than those at lower CEC region, because the latter values were obtained from the SS with high organic content.
(ii) RIP is positively correlated with surface area, or negatively correlated with average particle size of SS samples. However, some RIP values with large surface areas were out of the trend written above, possibly because the smaller particles did not contain weathered mica that can strongly adsorb cesium.
(iii) However, the correlation of RIP against mineral composition indicated by the mica/quartz ratio is not very clear, suggesting that the role of bulk mineral content is not very clear. It is possible that the capacity needed for the cesium in water is not that large, which suggests that a small amount of mica-type mineral is sufficient to show the high affinity for cesium.
(iv) Finally, there was clear negative correlation between RIP and the organic content. This effect is explained by the coating of minerals by humic materials, which inhibits adsorption of cesium on the SS samples, as suggested in our previous study (Fan et al., 2014).
We found that the four parameters more or less affect the RIP value. Thus, multiple regression equation is needed to take into account the effects of the four parameters to obtain empirically the RIP value in each environment. We will give the results of the multiple regression equation in the presentation, by which we can discuss important parameters that control adsorption behavior of radiocesium in Fukushima area.

Keywords: Fukushima Dai-ichi nuclear power plant, RIP, cesium, cation exchange capacity

©2016. Japan Geoscience Union. All Right Reserved.