

The behaviour of radio-Cs in the Abukuma riverine system emitted from the FDNPP

Aya Sakaguchi^{1*}, Hokuto Iwatani¹, Kazuya Tanaka², Haruka chiga¹, Qiaohui Fan¹, Akinobu Kadokura¹, Yoshio Takahashi¹

¹Graduate School of Science, Hiroshima Univ., ²ISSD, Hiroshima Univ.

As a consequence of the Fukushima Daiichi Nuclear Power Plant (FDNPP) accident, a huge amount of radio-Cs was discharged into the environment. Especially for the Abukuma riverine system, which is the largest river in the Tohoku-area and can be a dominant water resource of this region, the watershed of this river has been seriously contaminated. To observe the fate/behaviour of radio-Cs in this region, we analysed Cs-137 in aerosol, soil, river suspended solid and sediments and water samples. In addition to the analyses of Cs-137 in natural samples, the adsorption/desorption experiments were conducted for analogous to natural system.

From the observations of riverine samples in the period from June/2011 to Dec./2012, it was found that Cs-137 dominantly existed in particle fraction rather than dissolved fraction. This is the opposite result of the situation of Ukraine in one to two years after the Chernobyl accident, and might be due to the differences of the content of organic matter in soil between Japan and Ukraine. This possibility is supported by our results of adsorption/desorption experiments of Cs and humic-acid on clay minerals. The concentration of Cs-137 in particulate fraction (Bq/L) in river water was decreased with date. However, the concentration in a suspended solid (Bq/g) was not decreased. So, it can be said the decrease of the concentration for Cs-137 (Bq/L) is apparent one rather than decontamination of river water. The concentration of dissolved Cs-137 (Bq/L), in Dec./2012, is one to two order of magnitude smaller than that in June/2011. This result suggested that the more soluble fraction was leached immediately after the accident, and a small amount of Cs-137 has been leached from soil steadily. Actually, we recognise the existence of Cs with some chemical species from the results of long term leaching-experiment of surface soil and aerosol. The difference of chemical species can show the specific leaching/desorption behaviour of Cs in the environment.

Using our results for riverine system and flow rate of Abukuma river, the amount of drained off Cs-137 from the river to the ocean was estimated as 13 TBq in the last two years. By the result of long term leaching-experiment of surface soil with seawater, it is estimated that about 20% of discharged Cs-137 to the ocean would be leached in the sea water.

Keywords: FDNPP, Cs-137, Abukuma Riverine system