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Evaluation of 129I mobility in the crop field soil contaminated by the Fukushima Daiichi nuclear power plant accident

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Five soil cores from almost the same position in the crop field 20km apart from the Fukushima Daiichi nuclear power plant (F1NPP) for a period of May 2011 to June 2012 were analyzed. We previously know that the sampling site soil was tilled and well mixed by a farmer to the depth of 30cm until just before the F1NPP accident. Under the condition it is speculated that the crop field soil had been made homogeneous and then contaminated by F1NPP accident, so that the direct accumulation from the accident should be clearly observed. This was confirmed by the observations that depth profiles of 127I concentration (measured by ICP-MS), as well as carbon content (measured by NC analyzer), of these soil cores were roughly constant. In contrast, 129I (measured by AMS) concentration (or specific activity) was particularly high at the top most layer and immediately decreased exponentially along with depth. And below 10 cm depth, it went constant. This enhancement in the top 10cm layer can be considered as the direct accumulation from the F1NPP after the accident. Considering constant level at lower layer (0.0474mBq kg-1) as a background, 129I inventory was estimated as 46mBq m-2 (3.3×1013 atoms m-2). Similar 129I profile was also found in the soil cores of even one year and three months after the F1NPP accident. From these observations, it is concluded that accidental origin 129I had migrated little downward over the years, although the field should have experienced several times of rain and snow. More than 80% of the accidental origin 129I was still present within the top 5cm and more than 90% within the top 10cm.