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Apparent Diffusion Coefficients Consistent with Sorption Derived Based on Changes in Depth Profiles of Radiocaesium in Soil Contaminated by the Fukushima Nuclear Accident and Future Prediction of Depth Profile

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The accident at the Fukushima Daiichi Nuclear Power Plant occurred following the Great East Japan Earthquake in March 2011, and led to the release of volatile radionuclides (RNs) which were deposited on the surrounding environment in the Fukushima prefecture. The authors conducted twice investigations on the depth profiles of RNs in soil at 11 locations in the city of Nihonmatsu and the towns of Kawamata and Namie.

The apparent diffusion coefficients (D_a) of Cs-134 and Cs-137 were derived from changes in the depth profiles, and the distribution coefficients (K_d) also calculated from the relation with D_a . The calculated K_d -values ranged $1E4$ - $1E5$ ml/g, which were consistent with K_d -values (2,080-61,000 ml/g) obtained by a batch method. The D_a -values of both nuclides were approximately of order $1E-14$ m²/s and movement by diffusion was very slow. Furthermore, the authors simulated change in the depth profiles of both nuclides for 30 years following the accident.

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