



## Vertical distribution and temporal changes of Cs-137 in soil profiles under various land uses after the Fukushima Dai-ichi Nuclear Power Plant accident

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### JOURNAL OF ENVIRONMENTAL RADIOACTIVITY

巻: 139 ページ: 351-361 特別号: SI

DOI: 10.1016/j.jenvrad.2014.07.004

発行: JAN 2015

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### 抄録

We monitored the vertical distribution of Cs-137 in soil profiles under eight different land uses for the 2 y after the Fukushima Dai-ichi Nuclear Power Plant accident, and discussed the temporal changes in the early-stage of the migration and the determinants of the initial distribution. The soil samples were collected for four surveys using a scraper plate at each study site, which consisted of three forests (mixed forest, mature cedar, and young cedar), two grasslands (pasture and meadow) and three abandoned agricultural fields (farm land, tobacco field, and paddy field). The land use patterns have a large influence on some soil properties and the migration processes of Cs-137 above ground, resulting in different distribution of Cs-137 in those soil profiles. Specifically, the secondary deposition of Cs-137 from the coniferous canopy, retention of Cs-137 by litter layer, and the homogenization of Cs-137 concentrations in surface soil by natural soil mixing such as the disturbance by cattle grazing, roots growing and the formation of needle ice were important to cause redistribution of the deposited Cs-137. Only in the paddy field, the Cs-137 inventory in subsurface soils (5-10 cm) gradually increased and comprised 26% of the total Cs-137 in 2y, showing the downward migration of Cs-137 to subsurface soil. In the other sites, it was considered that Cs-137 were strongly adsorbed by soil particles and rarely migrated downward as soluble form. Vertical distributions during the first survey were able to be used as the initial distributions and were well fitted to the exponential equation. The distribution parameters alpha (relaxation depth) and beta (relaxation mass depth), calculated by the exponential equation were correlated with RIP ( $r = -0.806$ ,  $p < 0.05$ ), macro pore ( $r = 0.651$ ,  $p = 0.11$ ), and dispersible fine particle content ( $r = 0.856$ ,  $p < 0.05$ ). It indicated that the initial distribution would be influenced by the Cs fixation ability of soil, and the penetration process of water and particles in soils. (C) 2014 Elsevier Ltd. All rights reserved.

### キーワード

著者によるキーワード: Cs-137; Vertical distribution; Initial distribution; Scraper plate; Land uses

**KeyWords Plus:** FOREST SOIL; RADIOCESIUM; MIGRATION; FALLOUT; RADIONUCLIDES; SORPTION; SR-90; JAPAN; I-131

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## 助成金

助成金提供機関	助成金登録番号
FMWSE (Fukushima Radiation Monitoring of Water, Soil and Entrainment) of MEXT	

[助成金提供情報を表示](#)

### 発行者

ELSEVIER SCI LTD, THE BOULEVARD, LANGFORD LANE, KIDLINGTON, OXFORD OX5 1GB, OXON, ENGLAND

### 分野 / 分類

研究分野: Environmental Sciences & Ecology

**Web of Science** の分野: Environmental Sciences

### ドキュメント情報

ドキュメントタイプ: Article

言語: English

アクセッション番号: **WOS:000347596000036**

**PubMed ID:** 25106877

**ISSN:** 0265-931X

**eISSN:** 1879-1700

### ジャーナル情報

パフォーマンス傾向: [Essential Science Indicators SM](#)

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