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Soil organic carbon redistribution in Japanese cypress (Hinoki) using radionuclides

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The forest cover of Japan (68%) is ranked among the highest of all nations, and its plantations, among the largest, are composed mainly of conifers (41%) dominated by hinoki and sugi tree species located in steep mountainous area. Given the huge carbon stores in this considerable land cover and the significance of the forest soil as a path in global carbon networks, understanding soil organic carbon (SOC) flux in forested areas is essential. We evaluated the potential of $\{^{210}\text{Pb}_{ex}\}$ and $\{^{137}\text{Cs}\}$ to assess SOC and soil erosion in hillslope forested area. Consequently, findings demonstrated a strong correlation between SOC and both radionuclides. But $\{^{210}\text{Pb}_{ex}\}$ showed a superior relation due to its chemical advantage to the cation exchanging site of the soil fabric. Using DM model, net soil and SOC loss of 0.7 ± 0.8 (SOC loss: 0.13 ± 0.16) and 1 ± 0.4 (SOC loss: 0.2 ± 0.08) $\text{t ha}^{-1}\text{y}^{-1}$ have been estimated based on $\{^{137}\text{Cs}\}$ and $\{^{210}\text{Pb}_{ex}\}$, respectively. In conclusion, due to strong relationship with SOC, natural and continues fallout nature and the presence of considerable concentration in the litter, $\{^{210}\text{Pb}_{ex}\}$ could be an alternative independent tracer to study SOC redistribution rate in forested hillslope starting from the very beginning of litter fall than $\{^{137}\text{Cs}\}$. This study contributes to efforts in developing a model to quantify water induced soil and SOC redistribution using $\{^{210}\text{Pb}_{ex}\}$ in forested area as a part of endeavor to credit and mitigate carbon-induced climate tribulations.

Keywords: Soil, SOC, radionuclide, redistribution, $\{^{137}\text{Cs}\}$, $\{^{210}\text{Pb}_{ex}\}$