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Title: *Radionuclide sources and levels in relation to soil properties in High Arctic environment*

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Soils play important role in accumulation of airborne radionuclides. Plutonium isotopes released by nuclear wepaons testing are still present in the environment,especially in soils.This provides a rationale for a better understanding of the behaviour and transfers of the radionuclides in the Arctic environment.Thawing,increased precipitation and elevated summer temperatures will enhance transport of radionuclides in to deeper layers of soils or across the landscape.

The aim of this study was to investigate activity concentrations and inventories of ^{137}Cs, ^{238}Pu, $^{239+240}$Pu and ^{241}Am in soil profiles from the proglacial zones of glaciers and from the tundra in the north-western part of the Wedel Jarlsberg Land (Svalbard), in the vicinity of Scott and Renard glaciers. Additionally, data on radionuclides are related to soil properties (pH, organic carbon content, grain size and mineral composition) that can influence radionuclide behaviour in soils. Our results show large differences in activities of artificial radionuclides between the proglacial zone of glacier and the tundra. Activities were particularly high in two soil profiles collected from the lateral and terminal morains of the Scott Glacier. The highest activities of ^{137}Cs, ^{238}Pu, $^{239+240}$Pu and ^{241}Am reached 305 ± 9 Bq/kg, 7.96 ± 0.83 Bq/kg, 0.40 ± 0.05 Bq/kg and 2.71 ± 0.17 Bq/kg, respectively. Concentration of these airborne radionuclides in the proglacial zone soils must have a secondary character related to reworking of mineral material in a highly dynamic environment of proglacial zone or can be connected with their accumulation in cryoconite material that has a large ability to retain trace metals. The cryoconites develop on the surface of glaciers and the material they accumulate is deposited on land surface after the glaciers retreat. On the contrary, artificial radionuclides in the tundra soils were concentrated in the uppermost, organic-rich soil levels showing their ability to retain airborne radioactive contamination. Activity ratios of ^{238}Pu/ ^{239,240}Pu and ^{241}Am/$^{239+240}$Pu help to identify sources of these radionuclides. Generally the average ^{238}Pu/$^{239+240}$Pu activity ratios were similar to the global fallout ratios for Svalbard of 0.025 but in some cases were higher. ^{241}Am/$^{239+240}$Pu activity ratios for the soil exceeded in many cases the global fallout ratio of 0.37. Simultaneous application of analyses of radionuclide content and soil properties provides valuable insights into the patterns of material transfers in the freshly uncovered proglacial zones.

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