

## **Storage and distribution of amorphous silica in permafrost soils of the Arctic**

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Silicon (Si) is found in most rock forming minerals and represents an important nutrient for both terrestrial plants as well as for aquatic and soil living microorganisms. Through plant uptake of Si, incorporation into biomass (as amorphous silica; ASi) and subsequent accumulation into soil, terrestrial ecosystems influence fluxes of Si through the land-ocean continuum. The buildup of ASi pools in soil through biological processes can be significant but little is known about storage, distribution and landscape partitioning in Arctic ecosystems. We hypothesize that the Arctic tundra and peatlands, ecosystems sensitive to climate change, may hold large stores of ASi in their soils, just as they do for orgC. Total storage, soil partitioning and distribution and landscape partitioning of amorphous silica (ASi) in relation to organic carbon (orgC), nitrogen (orgN) and phosphorous (orgP) were examined in permafrost soils of the Central Canadian Arctic.

Soil chemical analyses (ASi, orgC, orgN and orgP) have been performed on ~320 individual soil samples collected from both surface organic- and deeper mineral layers at 35 different sites. A limited number of samples were also subjected to light- and SEM microscopy.

In similarity to organic C, N and P we found the highest concentrations of ASi in bog peatlands and the lowest in lichen tundra. The depth distribution of ASi concentrations in bog peatlands indicate that the preservation of ASi particles is high in bog peatlands (and wet shrub tundra) as opposed to the other landscape types. Microscopic analysis of samples indicates that diatoms and plant phytoliths contribute largely to the ASi signal. Mean storage (kg ha<sup>-1</sup>) of ASi in the top 1 m did not differ largely between land cover types (except for lichen tundra storing much less than all the others). However, when partitioning storage between organic and mineral layers, bog peatlands store most of their ASi (plus orgC, orgN and orgP) in the organic layer while the remaining land cover types have the highest storage in the mineral layer. When up-scaling results to total storage (top 1m) in the study area (2210 ha), moist shrub tundra was found to store most of the ASi (41%) and org P (27%) while bog peatlands stored most of the org C (33%) and org N (38%).