

Comparing three methods of water extraction for determining major cation concentration in permafrost and active-layer soil

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Abstract

We examined eight permafrost samples using three different methods to extract water for the determination of major cation (Ca^{2+} , Mg^{2+} , Na^+ , K^+) concentrations. The analysis was conducted as an experiment to guide the selection of a method for a field campaign. Here, we present and interpret the data obtained from identical samples using three commonly used but different methods: (1) sampling supernatant water directly, (2) drying and then adding deionized water, and (3) adding deionized water directly. Each method has specific advantages and drawbacks that are strongly dependent on soil conditions.

The concentration of major cations obtained from (1) was twice as high as that obtained from (2). Conversely, concentrations obtained from (2) and (3) were relatively similar. Method (2) has the advantage of providing standardization for better comparability, but the disadvantage of possibly subduing high ion content present in soil water. Method (1) is desirable, however, not practical as some samples do not contain supernatant water. As a result, (1) and (3) were considered as appropriate methods to obtain water for the determination of the concentration of major cations in cases with strongly differing soil water contents.