Ultra low-impact geochemical method for greenfield exploration using snow

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New sample materials and geochemical analysis methods have been studied recently for mineral exploration in northern, vulnerable areas. One of the materials has been snow which covers the landscape several months each year, for example in southern parts of Finland from two to three months up to seven months in northern parts. The same situation is actual in large areas in the Northern Hemisphere, which increase the interest to use snow as a sampling media for mineral exploration.

The thickness of snow cover varies from some tens of centimeters up to one meter. Snowing periods and the snow properties are constant in a regional scale, which gives a good foundation for large and comparable geochemical exploration. Snow sampling is easy and quick, and it does not cause any environmental impacts.

Snow is composed of water coming from atmosphere. It also includes both local and long-distance components like dust, metal ions, hydrocarbons and even mineral particles. The lowest part of snow cover gives the most stable sampling media because of the longest deposition history and the coverage of the upper snow layers. In addition, the lowest layer is in contact with the ground and is influenced by the gases and heat coming from the underlying soil and bedrock.

Soil gasses, originating in the bedrock and travelling through the top soil horizons, accumulate into the bottom layer of snow. There are two ways to study geochemical signal of snow: hydrocarbons and metal-ions. The first ones can be determined using the Soil Gas Hydrogen (SGH) method, which is based on classification of large number of hydrocarbons into indicative groups for certain mineralization types. The second way is directly to measure the element concentrations in snow. Certain gasses transport elements with them and these elements give a signature of the underlying buried mineralizations. There are indications that some of these elements accumulate in the bottom layer of the snow pack which has been under the influence of the gas transport for the longest time. The amounts of the ions can be detected with the increased detection limits of the modern assay methods to the ppt levels of concentration.

These and other low-impact geochemical exploration methods are studied in the project ´Ultra low-impact exploration methods in the subarctic' funded by the Tekes.