Till Geochemistry and Lithogeochemical Exploration for a Concealed Kimberlite

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In regions where recent glaciation has buried kimberlites under glacial sediments, surface geochemical detection methods are better interpreted when coupled with a comprehension of the landscape formation processes. The glacial, post-glacial, and cryoturbation processes that have affected the landscape have, in turn, affected the dispersal of geochemical signatures in the till. Research at the Kelvin kimberlite, Northwest Territories, will refine exploration practices, resulting in reduced costs whilst improving discovery success.

The Kelvin kimberlite is located eight kilometers from the Gahcho Kué diamond mine in the Northwest Territories. The kimberlite is an inclined pipe cutting through granite gneiss host rock and sub-crops beneath a lake. It has a surface projection towards the NW more than 600m long concealed under bedrock and is not exposed at the bedrock-till interface. The site is covered in a veneer of till, 1-4m thick, and characterized by low relief (30m total), low shrubby vegetation, localised swamps, and frost boils.

Soil samples were collected from the oxidized upper B-horizon above the kimberlite, both up-ice, and up to 1 km in the down-ice direction. Samples were sieved to -180 microns and analyzed by four acid digest ICP-MS and aqua-regia digest ICP-MS. Results indicate the soils to be highly immature and identify the presence of subtle Ni-Cr-Mg±Nb trains originating from the lake side. These trains extend for >1km from source following an older and a more recent ice direction to the west and northwest. The material for the trains was abraded by the ice from the kimberlite, now sub-cropping beneath a lake. Diamond drill core of the granitic gneiss host-rock has been analyzed by hyperspectral imaging, fusion ICP-MS, total-carbon, and aqua-regia ICP-MS to identify and quantify alteration mineralogy associated with the kimberlite and assess lithological host-rock variability which may contribute to surface anomalies.