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Development of surficial, environmentally low-impact exploration methods for the sub-arctic environment

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Greenfield exploration is challenging in the vulnerable areas in the sub-arctic areas which are typically covered by glaciogenic sediments, large peatlands or sensitive treeless high-grounds. Mineral exploration field work using traditional geochemical sampling and analysis methods have restrictions due to different land-use interests and large conserved areas. At the Geological Survey of Finland (GTK), two projects focusing on new methodological development and testing were implemented in 2012-2015. They included new mineral exploration methodologies of sampling, analysis and interpretation of multiple geological, geochemical and geophysical datasets. The projects were “Novel technologies for greenfield exploration” (NovTecEx; 2012-2015) and “Ultra low-impact exploration methods in the subarctic” (UltraLIM; 2013-2015). The projects were financed by the Green Mining Programme of the Finnish Funding Agency for Innovation (Tekes), GTK and the University of Oulu in co-operation with Mining and exploration companies and Finnish Forest and Parks Service.

Both projects included a strong development component for the practical mineral exploration. In the NovTecEx project 2012-2015, eight tasks focused on developing mineral exploration concepts by utilizing the best available methods and practices to assess mineral potential or directly mineral deposits within vulnerable terrains. The results and methodological advances related to field sampling techniques and analysis, geophysical data interpretation and data mining gave companies and organizations practical tacks for grassroots mineral exploration at the regional and local scales [1]. In the UltraLIM project 2013-2015, the focus was in the most feasible geochemical sampling and analysis methods with the top soil mineral sediments, plants and snow for locating underlying mineralizations. For comparison of different sampling medias and leaches several known mineralizations in northern Finland were chosen as study sites [2].

The results prove that by using new techniques developed and tested in the NovTecEx project it is possible to improve cost-efficiency and simultaneously minimise the environmental impacts of field work and sampling. Those are supported by the results of the UltraLIM project which show the mineral soil horizons, peat, plants and snow to be feasible sampling media for mineral exploration in the glaciated terrains. Alongside with the final results, recommendations of low-impact sampling techniques coincident with multiple sample material collection, on-site field analysis methods, indicator mineral research, data processing and advanced spatial analysis methods were given.

References:

[1] Sarala P (ed.) (2015) Novel technologies for greenfield exploration. Geol. Surv. Finland, Spec. Paper 57.

[2] Middleton, M et al. (2016) Ultra low impact geochemical exploration methods in the sub-arctic. Geol. Surv. Finland, Rep. Invest. 224.

