Association of Applied Geochemists

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2013 STUDENT PAPER PRIZE

Pim van Geffen

The Association of Applied Geochemists (AAG) and SGS are pleased to announce that **Pim van Geffen** has won the 2013 SGS-AAG Student Paper Prize. This prize is awarded for the best paper published by a student in the AAG's scientific journal *Geochemistry: Exploration, Environments, Analysis* (*GEEA*), on work performed as a student and published within three years of graduation; the work must address an aspect of exploration or environmental geochemistry related to the mining industry. Pim's winning paper is based on research that he undertook for his PhD at Queen's University, Ontario, Canada.

His award-winning paper is entitled "Till and vegetation geochemistry at the Talbot VMS Cu-Zn prospect, Manitoba, Canada: implications for mineral exploration" and was published in 2012 in *GEEA* (vol. 12, p. 67-88). It was coauthored by Kurt Kyser, Christopher Oates, and Christian Ihlenfeld. The abstract of the paper follows:

> The Proterozoic Talbot VMS occurrence in the Flin Flon–Snow Lake terrane is buried under more than 100 m of Palaeozoic dolomites and Quaternary glacial till. Structurally controlled anomalies of Zn, Cu, Ag, Pb, Au, Mn, Hg, Cd, Co, Bi and Se in the clay fraction of till depth-profiles indicate upward element migration from the buried volcanogenic massive sulfide mineralisation and near-surface chemostratigraphic deposition. Principal component analysis and molar element ratios indicate that separation of the <2 µm clay fraction reduces chemical heterogeneity and increases trace-element yield relative to the <250 µm fraction of the till. The greatest anomalies occur at or below 30 cm depth and over faults, suggesting that elements were deposited in the till after upward migration through structures. The ratio Zn/Al in the <250 µm fraction can be used as a proxy for Zn in the clay fraction, producing high-contrast anomalies. Carbon isotopic compositions indicate that these anomalies are related to organic carbon in the clay fraction. Humus, moss and black spruce bark are of limited use for exploration in this environment, because they accumulate atmospheric Pb and Cd, most likely from the Flin Flon smelter at 160 km NW. Black spruce tree rings that formed before smelter operations commenced indicate Zn and Mn anomalies in an uncontaminated sampling material. Much of the initial vertical migration of elements to the surface at the Talbot prospect was driven by upward advection of groundwater through fractures in the dolomite, resulting from a combination of subsurface karst collapse and remnant hydrostatic pressure during glacial retreat.

Pim received a $1000 cash prize from SGS, a two-year membership in the AAG, our journal *GEEA* and newsletter *Explore*, and a certificate of recognition at the International Applied Geochemistry Symposium held last November in Rotorua, New Zealand.

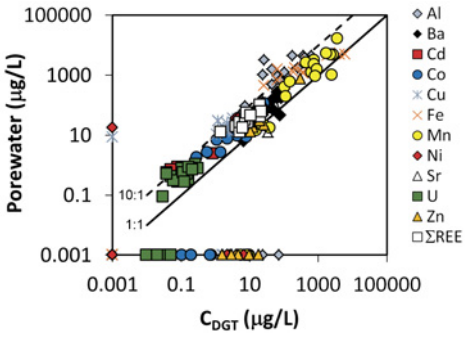
The AAG would like to thank SGS for, once again, generously supporting this prize.

David R. Cohen (d.cohen@unsw.edu.au)
Chair, AAG Student Paper Competition Committee

RECENT ARTICLE PUBLISHED IN *EXPLORE*

Andrew Lucas, Andrew Rate, S. Ursula Salmon, Nathan Reid and Ravi Anand (2013) Evaluating the diffusive gradients in thin films technique for the detection of multi-element anomalies in auriferous soils. *EXPLORE* 161 (December 2013)

Soil geochemistry is widely used for Au exploration as a first-pass evaluation of a prospective area; however, specific mechanisms for the formation of soil anomalies in transported overburden are not well understood. In particular, assessing the mobility and bioavailability of metals under natural conditions requires the development and evaluation of new tools. The diffusive gradients in thin films (DGT) technique is a method for measuring the mobility of metals in soils, but has not previously been assessed for geochemical exploration. The DGT technique presents several advantages for measuring element concentrations in soils, namely that DGT pre-concentrates metals via diffusive transport through the soil solution; induces resupply from elements bound to the solid phase; has very good sensitivity, especially when deployment times are extended; does not significantly alter the soil either chemically or physically; and has been demonstrated to behave analogously to plant roots for a number of trace metals. In this study, we applied the DGT technique for a range of elements, not including Au, to auriferous soil transects obtained from two Australian prospects, both of which are covered by transported overburden. The results of DGT-measured concentrations were compared with porewater concentrations at these two prospects (see Figure).



While metal concentrations measured in porewaters were higher than DGT-measured concentrations, the DGT technique was more sensitive overall. The data were also analysed statistically in order to determine whether anomalies were expressed in non-Au metals in these soils, with a number of elements (Cd, Co, Mn, Fe and Al) demonstrating significant differences between background and anomalous samples in the DGT and porewater datasets. This work has shown that DGT can be used for multi-element geochemical exploration in soils, and may also provide a useful estimation of bioavailability.

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A call for laboratory support...

The Association of Applied Geochemists (AAG) invites analytical laboratories to participate in pairing their analytical facilities with student projects to develop emerging geochemists and their science. The AAG Education Committee is seeking analytical laboratories to offer in-kind support to students in terms of analysis, while receiving acknowledgement on AAG's website and in the Association's EXPLORE newsletter.

"Today's students are tomorrow's clients"

If your laboratory is interested in learning more about this program, please contact the Chair of AAG's Education Committee, Erick Weiland Erick_Weiland@fmi.com