APGO @ University of Waterloo

ASSOCIATION OF PROFESSIONAL GEOSCIENTISTS OF ONTARIO

Building Strong Connections

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March 8, 2018

APGO's Networking Event in Waterloo

Hosted by David Leng, P.Geo., APGO South West Regional Councillour
5:30 p.m. - 8:30 p.m.
EIT Room 3142, Centre for Environmental and Information Technology Building (EIT)

Featuring Guest Speaker, Eric Grunsky, P.Geo.

Eric Grunsky is a professional geoscientist (P.Geo. British Columbia) whose career has included field mapping and applied research at: the Geological Survey of Canada, Ottawa, the Division of Exploration and Mining, CSIRO, Australia, the Alberta, British Columbia and Ontario provincial geological surveys. His research has focused on the application of multivariate statistical methods and spatial statistics applied to geochemical data. He was the recipient of the Krumbein Medal (2012) and the Felix Chayes Prize (2005) by the IAMG, in recognition for his work in applied geochemistry. Eric has published extensively in peer-reviewed journals and government reports. He has also presented numerous short courses for the interpretation of geochemical survey data. He is the Secretary General for the International Association for Mathematical Geosciences (IAMG) [2016-2020], a fellow of the Association of Applied Geochemists (AAG) and a member of the Geochemical Society. Eric is a Professor at the China University of Geociences, Beijing, China; an Adjunct Professor at the University of Waterloo, Canada and a member of the Science Advisory Board for the Canadian Mining Innovation Council Footprints Project.

Go to https://www.apgo.net/apgo-events to register for this free event.

5:30 p.m. - 7:00 p.m. - APGO business update and featured presentation

All attendees are invited to join us at the Graduate House for hors d'oeuvres at 7:00 p.m. until 8:30 p.m. Cash bar.

Contact information: Marilen Miguel at mmiguel@apgo.net

Presentation: The use of geochemical survey data for predictive geologic mapping at regional and continental scales

China University of Geosciences, Beijing, China
Department of Earth & Environmental Sciences, University of Waterloo

Multi-element geochemistry surveys of rocks, soils, stream/lake sediments, regolith and weathered materials are usually carried out by government surveys and mineral exploration companies at continental (1:1,000,000), regional (1:250,000) and local scales (1:10,000). The chemistry of these materials is defined by minerals and their subsequent modification by comminution, dissolution and weathering. A database of geochemistry, with up to 50 elements and sufficiently low detection limits, represents a multi-dimensional geochemical space that can be studied using machine-learning multivariate methods from which patterns are described (process discovery) reflecting geochemical/geological processes. These patterns form the basis from which predictive maps, using probabilities are created (process validation).

When assembling large regional datasets from various sources, it is imperative to understand the nature of the sample media, methods of sample preparation, laboratory digestion procedures and analytical instrumentation methods. Problems that are typically associated with the interpretation of multi-element geochemical data include the problem of closure, missing values, censoring and adequate spatial sample design. Methods and strategies for overcoming these problems are discussed.

Effective analysis and interpretation of the information that exists in geochemical datasets can be obtained from the use of multivariate statistical procedures for process discovery, machine-learning methods for process prediction and spatial mapping of the results. Geochemical and geological processes can often be recognized through the use of data discovery procedures such as the application of principal component analysis. The use of classification and predictive machine-learning procedures (neural networks, random forests) can be used to confirm lithologic variability, mineral ore zone alteration and zones of mineralization. The application of geostatistical methods define the geospatial coherence of the results.

Studies of multi-element geochemical surveys of lake/till sediments from Canada, and soils from, Northern Ireland, the National Geochemical Survey Australia and the North American Geochemical Landscapes survey data from the USA show that predictive maps of bedrock, buried tectonic assemblages, climate, soil humidity and ecosystems can be identified and validated.