# CONSOREM

## Consortium de recherche en exploration minérale

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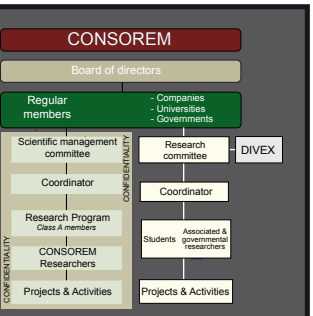



## What is CONSOREM ?

- Public Private partnership in applied research for mineral exploration
- Synergy between companies, governements and universities
- A unique research structure under industry control

## Objectives

- development of technologies and knowledge applied to mineral exploration;
- development of mineral exploration models;
- convey the knowledge towards the industry;
- training of highly qualified personnel in mineral exploration

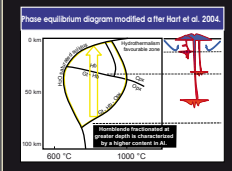
# CONSOREM'S RESEARCH: DEVELOPING EXPLORATION TOOLS

## METHODOLOGICAL TOOLS

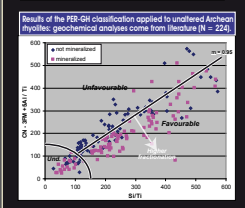
New methods developed or modified by CONSOREM. They are used in data treatments independently of the territory.

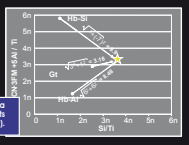
***Examples are:***

### The PER-GH classification: a new tool to evaluate the fertility of felsic volcanic rocks




A new method has been developed to promote the utilisation of major elements in order to evaluate the fertility of felsic volcanic environments for VMS deposits. Based on theories about the petrogenesis of felsic volcanites and the 'Pearce Element Ratio' (PER), it is suggested that fractionation of REE into garnet and hornblende at depth is reflected onto the major elements signature. The **PER-GH index,** an acronym for Pearce Element Ratio - Garnet/Hornblende, is used to discriminate between non-fertile, fertile and highly fertile environments. Since hydrothermalism promotes the effects of fractionation on element mobility, alteration will accentuate the favourability.

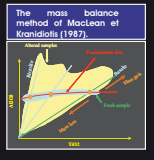



PER-GH diagram: the coordinates of a rhyolite sample are function of its differentiation history (fractionation).

PER-GH classification of felsic volcanites of the Abitibi sub-province: lower ratios (red dots) represent the more favourable environments. The database contains geochemical analyses (N = 24 579) from private and public sources.

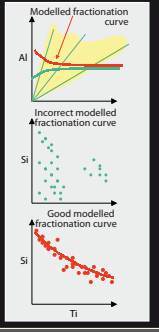
### The relative mass balance calculation: An approach in the treatment of hydrothermal alteration



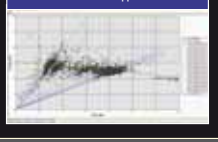

The mass balance method of MacLean et Kranidiotis (1987).

The **Relative Mass Balance (RMB)** calculation is an inverse method to test different fractionation curves. The tool is efficient to calculate gains and losses of specific elements by modeling the precursors' composition and fractionation trend of rocks in a specific area. The RMB method involves a trial-and-error process, and supposes that the precursors' Al/Ti ratios are initially unknown (as opposed to the conventional mass balance method).

Several possible fractionation curves are traced on an Al vs. Ti diagram. For each curve, representative samples are selected, and displayed on mobile element plots such as Si vs. Ti. If the samples corresponding to a certain fractionation curve on the Al-Ti diagram do not generate "coherent" mobile element plots, the prospective curve is rejected and another possibility is examined.




To make use of the relative mass balance calculation technique, CONSOREM has created a new software application.



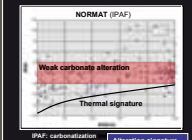
## DECISION TOOLS

Allow more easily the integration, comparison and analysis of data to evaluate the mineral potential of a specified region.

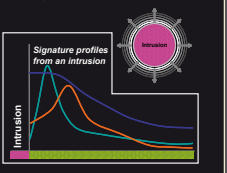
***Examples are:***

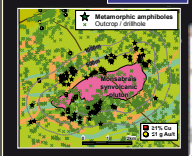
### Spatial Signal Analysis Software

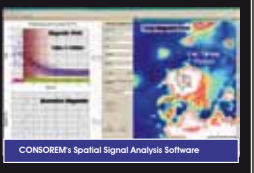
The **Spatial Signal Analysis Software (SSAS)** is used in the detection of geochemical, geophysical and mineralogical variations relative to a point, a line or surface, which represent geological items (faults, intrusion, etc.). It has first been developed to evaluate the role of intrusions in the mineralization process of different deposit types (Au and base-metals) in Abitibi, using private and public datasets.




Alteration signature around intrusions

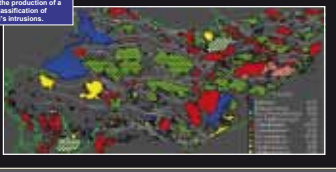


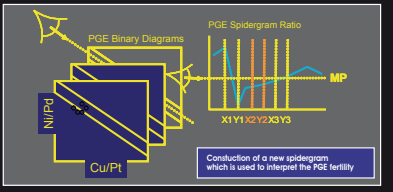



CONSOREM's Spatial Signal Analysis Software

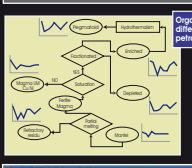
The application the SSAS led in the production of a new classification of Abitibi's intrusions.



### Interpretation of PGE fertile environments




Construction of a new spidergram which is used to interpret the PGE fertility




Organization chart summarizing the different spidergram profiles in relation with petrogenetic contexts

CONSOREM has developed a unique interpretation tool for PGE and Ni fertility. The new spidergram combines commonly used binary diagrams (Barnes et al. 1988) in order to interpret petrogenetic processes and discriminate fertile/depleted setting s. CONSOREM' s spidergram is used in conjunction with a database to compare profiles with a collection of data from different environments around the world.

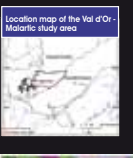
PGE Spidergram ratio software application

## TARGETING TOOLS

Result from the integration of different databases, and/or the acquisition of knowledge, which allow pre-competitive targeting on precise territories.

***Examples are:***

### Mineral prospectivity mapping using artificial neural networks for Au in the Val d'Or – Malartic area



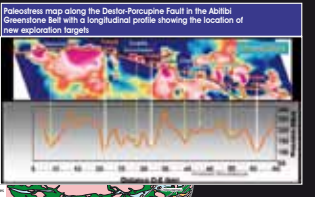
Location map of the Val d'Or - Malartic study area

**Artificial Neural Networks** can powerfully integrate and process large numbers of geoscientific layers. CONSOREM has applied this relatively new GIS technique to produce a mining camp scale mineral potential model for **orogenic gold in the Val d'Or – Malartic area** using lithogical, structural, and geophysical layers as inputs, and the location of known gold occurrences as data to be modelled. This prospectivity map provides new targets for gold exploration.

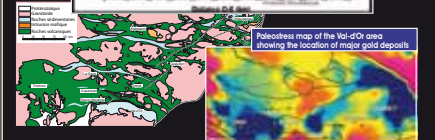
Detailed 1:50k geological map of the Val d'Or - Malartic area

Mineral potential model for Au in the Val d'Or – Malartic areaby artificial neural networks

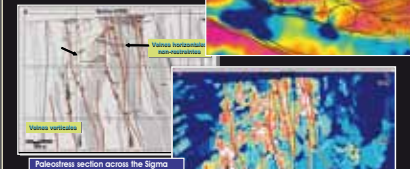
### Paleostress mapping to target orogenic gold deposits



Paleostress map along the Destor-Porcupine Fault in the Abitibi Greenstone Belt with a longitudinal profile showing the location of new exploration targets

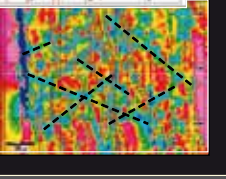


Paleostress map of the Val-d'Or area showing the location of major gold deposits






Paleostress section across the Sigma deposit in the Val-d'Or area



CONSOREM applies stress mapping techniques on several sites, along faults, across mines, and at the regional scale, in order to determine favorable parameters for orogenic gold deposits. Paleostress maps are constructed using the geomechanic modeler UDEC which simulates incremental displacements along discontinuities such as faults and lithologic contacts.