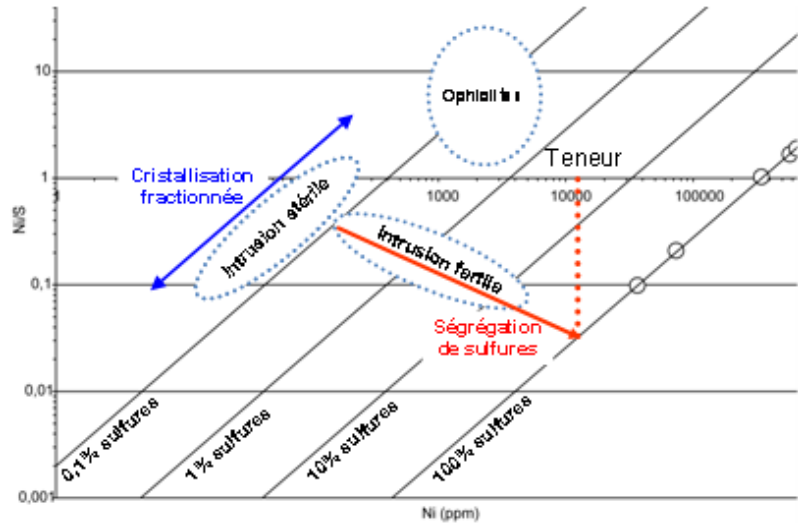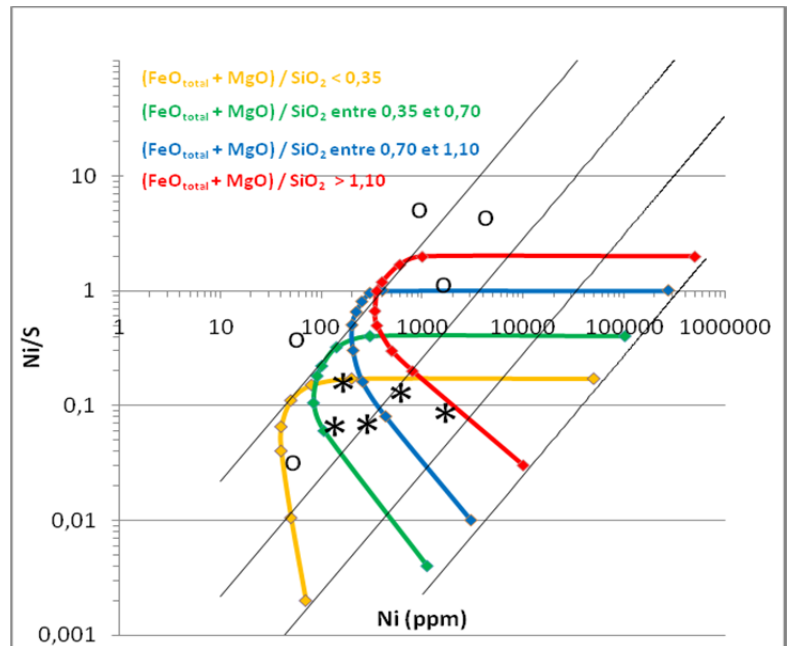# 2008-11: Cu-Ni fertility of mafic and ultramafic intrusions

The RA-EGP diagram developed by CONSOREM (project 2003-09) identifies fertile environments for PGE mineralisation and magmatic Cu-Ni mineralisation. Project 2008-11 is a continuation aimed at advancing farther the identification of favourable contexts for Cu-Ni. The main objective of the present project is the recognition of Cu-Ni fertility in mafic intrusions, ideally from sulphide poor zones and whole rock analyses.

Figure 1. Ni/S vs Ni diagram for assessing fertility of mafic/ultramafic intrusions for Cu-Ni mineralisation.

The innovative approach developed in this project exploits the concept of nickel sharing between olivine and sulphides. A new plot of Ni/S vs Ni lets us see the fractional crystallisation trend of a silicate magma and sulphide segregation (**Figure 1**). In Figure 2, samples are separated according to their mafic character ($FeO_t + MgO$)/SiO_2 ratio) into 4 classes, where the spread of values is equal, allows us to judge if the intrusion is fertile for Ni-Cu mineralisation, to evaluate the massive sulphide content quickly, even from samples containing less than 10% sulphur, and to define fertile and barren phases in a multiphase intrusion. Thus, samples from a fertile intrusion will be situated in the fertility field according to their mafic character, whereas samples from a sterile intrusion or phase will fall outside the field.

Figure 2. Cu-Ni fertility fields for intrusions based on their mafic character. Samples with a ratio between 0.35 and 0.70 located inside the field (*) are considered to be from a fertile intrusion, whereas samples located outside the field (o) are from a barren intrusion or phase.

Project 2008-11: Summary	
Objectives	• To recognise the composition of mafic and ultramafic intrusions that are fertile for Cu-Ni mineralisation, ideally based on zones poor in sulphides and from simple and low cost analyses (e.g.: whole rock).
Results	• Division of samples into 4 classes using the mafic index $(FeO_{total}+MgO)/SiO_2$ to evaluate the fertility of the intrusions using the Ni/S vs Ni diagram.
Innovations	• New diagram to evaluate the fertility of mafic/ultramafic intrusions and to predict the grade of associated massive sulphide.