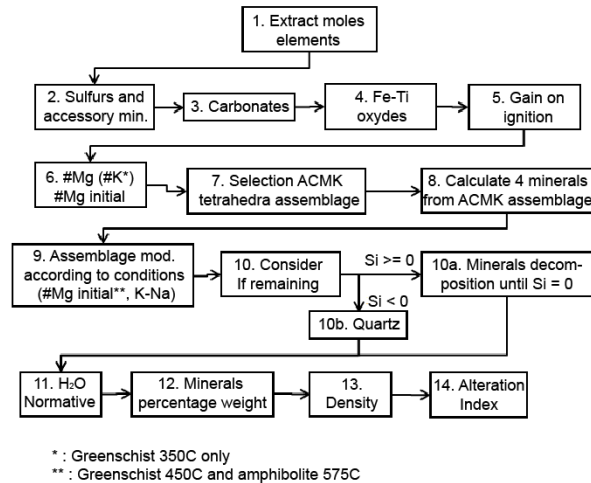# Project 2011-04: Software for processing lithogeochemical data (Lithomodeleur) - Phase 3

Lithomodeleur version 3.0 was delivered in April, 2012. This version includes several new features compared to version 2.0.

The most significant improvement in version 3.0 is the development of a new method of normative calculation for metamorphic rocks. The method is used in the treatment of hydrothermal alteration by calculating minerals potentially present and subtracting them from the lithogeochemical analysis of the rock. The calculation is carried out by an innovative use of ACMK tetrahedra and a system of linear equations to determine mineral assemblages. Several metamorphic diagrams from the literature and from thermodynamic modelling were used to create three metamorphic grades suggested by the norm. The three calculated metamorphic facies are: 1) middle greenschist (SV350), 2) upper greenschist

General calculation sequence of the norm used by Lithomodeleur.

(SV450) and 3) middle amphibolite (AMP575). The calculation sequence is given in the Figure above. Various tests carried out on the mineralogically well characterised (XRD or thin section) lithogeochemical samples show that the Lithomodeleur norm reproduces the actual observed mineral assemblages well. In addition to normative minerals, the program calculates normative CO_2 and H_2O, density and various alteration indices appropriate for each metamorphic level.

Another significant improvement in version 3.0 is the ability to create automatic processing models. The idea is to create automatically and sequentially a series of more or less complex preprogrammed processing models. All Lithomodeleur calculations can be included in the models: indices, diagrams, norms, queries, etc. The models are constructed using an intuitive graphic interface. Version 3.0 includes three predefined models. It is easy for users to create their own models according to their specific needs.

Sample processing model example based on the geochemical classification of IUGS volcanic rocks.

In addition to these two improvements, other tools were also added to Lithomodeleur: a tool to export Excel data to Access, a tool to perform mass balance calculations using a single precursor and a tool to calculate the mineral potential for Cu-Au porphyries using neural networks.

Lithomodeleur has already become an important and tangible tool for handling hydrothermal alteration data. Version 3.0 with its many improvements will make it a unique and indispensable tool in mineral exploration.

Project 2011-04: Summary	
Objectives	• To include a normative calculation for metamorphic rocks in Lithomodeleur. • To facilitate complex data processing in Lithomodeleur.
Results	• Lithomodeleur norm for metamorphic rocks. 3 facies: middle greenschist (SV350), upper greenschist (SV450) and middle amphibolite (AMP575). • Visual and intuitive processing models to carry out automatic and repetitive complex processing in Lithomodeleur. • Mass balance calculation tool using a single precursor. • Data export tool from Excel to Access. • Mineral potential evaluation tool for Cu-Au porphyries using neural networks.
Innovations	• New method for calculating normative minerals for metamorphic rocks. • Automatic and sequential processing module.