Metal Earth in Chibougamau, NE corner of the Abitibi Subprovince: stratigraphy and magmatic-hydrothermal Cu-Au mineralization

Lucie Mathieu, UQAC - Universite du Quebec, Chicoutimi, Chicoutimi, Canada

The Chibougamau area, NE corner of the Abitibi Subprovince, is characterized by an abundance of Cu-Au magmatic-hydrothermal mineralizing systems. Several of these systems are investigated at UQAC with the support of the Metal Earth project (Laurentian University), which aims at unrevealing the key differences between well metal-endowed and less endowed greenstone belts. The "Metal Earth in Chibougamau" projects focus on magmatic-hydrothermal processes and on the petrogenesis of associated magmas, on the stratigraphy and structural geology of the region, and on several minerals (pyrite, zircon, amphibole, apatite) potentially useful to exploration models. One of these projects, which focuses on the Chibougamau pluton and its related Cu-Au mineralization, is presented in more details.
The Chibougamau pluton is a Neoarchean multiphase intrusion that is related to Cu–Au porphyry-style deposits. In Archean greenstone belts, porphyry is a marginal and poorly documented mineralization. Such deposits are, however, important in the Chibougamau area, where the main historical mining camp (Central Camp) is a magmatic-hydrothermal system. Understanding such systems requires documenting of the mineralising processes and the related magmatic rocks. This contribution focuses on the chemistry of pyrite (analysed using the laser ablation – LA-ICP-MS – of the LabMaTer laboratory, UQAC) and concludes that Te abundance and elevated Bi/Pb and Bi/Cu ratio characterise magmatic fluids input in the Chibougamau area. This contribution then focuses on the petrogenesis of the Chibougamau pluton to elucidate how the intrusion participated in Cu and Au mineralized systems. Using field descriptions, whole-rock analyses, and petrographic observations, we describe the source, emplacement mechanism, and chemical evolution of the Chibougamau pluton. The Chibougamau pluton is a TTD (tonalite-trondhjemite-diorite) suite that contains more K than most plutons of similar age. This suite was produced from a heterogeneous source; i.e., a hydrated basalt and possibly a metasomatized mantle. These are rare (and thus prospective) characteristics for an Archean intrusion. In addition, differentiation may have been sufficiently prolonged in the diorite phase to concentrate metals and fluids in the evolved magma. These magmatic constraints must now be tested against a renewed understanding of the Cu-dominated mineralized systems of the Chibougamau area.