NSERC-CMIC FOOTPRINTS

Perrouty S, Enkin RJ, Morris WA, 2019, Use of petrophysical anisotropies for gold exploration in the footprint of the Canadian Malartic deposit, Québec, Canada, Abstract, GAC-MAC, Québec, QC

The presence of petrophysical anisotropies in metamorphosed and poly-deformed rocks of Precambrian to Phanerozoic orogenic belts has been known for many years but is yet to be used in geophysical interpretation and modeling. Collecting extensive petrophysical data is becoming a common practice in modern mineral exploration. However, geological structures are rarely considered during data acquisition, even though they control the formation and geometry of most ore deposits. A recent petrophysical and geophysical study demonstrated that the anisotropy of resistivity (derived from induced polarization) can be used to map structurally complex zones, which are prospective for gold mineralization in the footprint of the Canadian Malartic deposit. A similar approach has been used to integrate magnetic susceptibility measurements of 240 oriented samples of metasedimentary rock with geological structures and hydrothermal alteration mineralogy. The main structural fabric in the Canadian Malartic district consists of a NW-SE-trending penetrative foliation, marked by biotite and white mica and contemporaneous of a gold mineralization assemblage of quartz-microcline-albite-carbonates-pyrite-rutile. A syn- to post-mineralization metamorphic event resulted in pyrite being progressively replaced by pyrrhotite. The anisotropy of magnetic susceptibility indicates a strong magnetic fabric, oriented NW-SE and subparallel to the main structural fabric. Two methods (thermal demagnetization and isothermal remanence acquisition) were used to determine the magnetic mineralogy of this system, which is dominated by zones of pyrrhotite or magnetite. This work demonstrates that analyzing the anisotropy of magnetic susceptibility is complementary to petrographic and structural observations to determine the structural control and characterize the pyrrhotite distribution in the footprint of the Canadian Malartic deposit. Such advanced magnetic investigation could be used for regional-scale structural studies and mineral exploration elsewhere. Ultimately, petrophysical anisotropies should also be implemented in geophysical inversion codes to enhance 3D modeling of deformed environments.

NSERC-CMIC Mineral Exploration Footprints Project Contribution 207.

canadamining innovationcouncil

NSERC CRSNG