Sr isotope compositions of carbonates in the Ernest Henry deposit, Queensland, Australia

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The Ernest Henry deposit is one of the best-known IOCG deposits in the world. It has a pre-mining resource of 166 Mt averaging 1.1 wt% Cu and 0.54 g/t Au and was open at depth (Ryan, 1998). The mineralization is mostly hosted in breccias, where K-feldspar altered clasts are cemented by biotite-carbonate-magnetite-sulfides (e.g., Mark et al., 2000; Williams et al., 2005). The breccia bodies grade out to crackle breccias and then veins. Carbonate is ubiquitous in mineralized breccia matrix, with more calcite in the ore lenses at lower elevation. It is also abundant in veins below the footwall contact of the current ore zones (e.g., Mark et al., 2000; Williams et al., 2005). Not only in Ernest Henry, but world-wide breccias are the main host of mineralization of large IOCG deposits (Williams et al., 2005; Oliver et al., 2011).

Regarding the origin of brecciation and mineralization in IOCG deposits, it has been proposed that CO₂ release directly from enriched mantle, or indirectly from mafic magmas, has played an important role in breccia formation and scavenging ore components from local wallrocks, particularly mafic rocks (Oliver et al., 2008; 2011). The hypothesis was mainly based on the interpretation of C and O isotopes of the carbonates from the Eastern Succession of the Mt Isa inlier, including Ernest Henry. To verify this hypothesis, we propose to analyse the Sr isotope compositions of the carbonate, to examine whether or not the carbonate has a mantle origin.

The project will carry out logging of drill cores, including the deep holes recently drilled by Xstrata/Glencore, sampling in and out of the orebodies and at various depths, alteration and ore petrography, sample preparation in the newly constructed clean lab at JCU, sample measurements using the MC-ICP-MS at JCU, and data interpretation and synthesis.

Glencore Xstrata will kindly cover the analytical cost and provide logistical support for field work, including airfare, accommodation, food, and sample shipping, plus some financial support to the student during field work.


References: