Mineral Mapping Through a Ni-Cu Ore-Bearing Intrusion

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Layered intrusions can host several ore deposit types, including magmatic Ni-Cu sulphide deposits. Exploration of these deposits can be difficult as they represent small targets with ore bodies that are usually confined to the base or within a small layer of the host intrusion. Subtle changes in mineral chemistries of the major silicate minerals, minor and trace minerals have the potential to track interactions with the sulphide melt. Therefore, the variability in mineral chemistries and in modal mineral abundances could potentially be used as a vectoring tool towards Ni-Cu sulphide ore horizons in layered intrusions.

The Mirabela layered intrusion, located in NE Brazil [1, 2], is the pilot case study for this research. The intrusion is host to the stratiform disseminated Ni-sulphide bearing Santa Rita orebody which is up to 180 m in thickness and lies just below the ultramafic-gabbro contact [2]. Six drillholes from Mirabela have been sampled across, and where possible, above and below the orebody and these samples were analysed petrographically and using a Tescan integrated mineralogy analyser (TIMA). The TIMA data was processed to accurately identify and quantify the modal mineralogy and individual mineral chemistries throughout 43 samples. This data was evaluated using CSIRO’s XTMineral app to test for drillhole-scale mineral abundance gradients. Together with trace element data collected from pyroxene, amphibole and biotite obtained via LA-ICP-MS analysis, modal mineralogy data was used to assess the mineral zonation across the Mirabela intrusion and to investigate potential links between sulphide mineralisation and a hydrous component.

[1] da Silva et al. (1996). Congresso Brasileiro De Geológia, 39, 217-220.
[2] Barnes et al. (2011). Economic Geology, 106, 1083-1110.