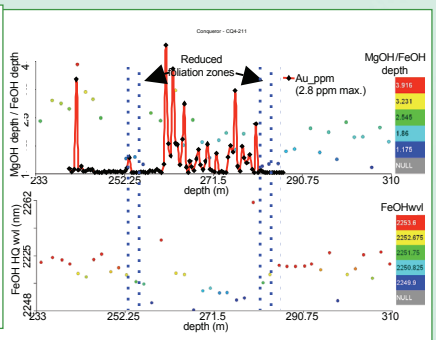
Finding the right structures: what HyChips can do for St Ives exploration

Introduction

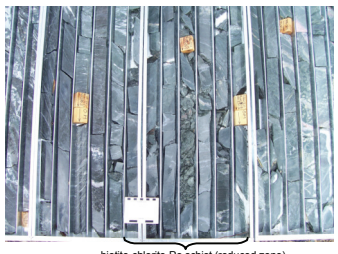
Finding the "right" structures to target in gold exploration has always been a challenge, as there are few methodologies that can spatially detect mineralisation-related structures. The HyChips method uses hyperspectral technology to quantitatively delineate alteration that is contained within gold-related structures. Paragenetic and structural analysis has shown that these reduced structures were active syn-post gold mineralisation (Roache and Yang, 2005; Roache, 2005). Down-hole spectroscopy pinpoints the location of these structures and puts them into a spatial context.

Down-hole hyperspectral case-studies

Two spectral indices, MgOH depth/FeOH depth and FeOH wavelength may be used to identify the spatial distribution of Au mineralisation-bounding foliation zones and Au mineralisation, respectively. Close spatial association between relatively low MgOH depth/FeOH depth values and FeOH wavelengths compared to unaltered host rock, will increase confidence in the prediction of Au mineralisation within mafic rocks.

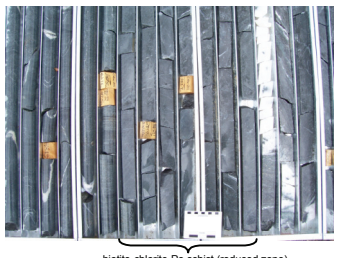


Hangingwall shear zone in CQ4-211 that is defined by a biotite+chlorite foliation, with relatively undeformed variolitic texture and mineralised quartz vein network in the hangingwall and footwall of the shear zone, respectively.

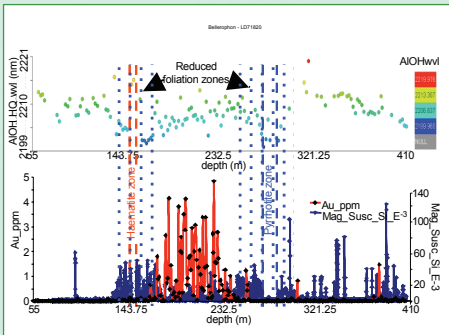


biotite-chlorite-Po schist (reduced zone)

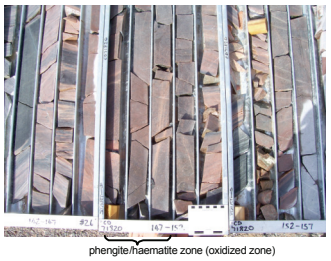
Footwall shear zone in CQ4-211 defined by a biotite+chlorite foliation, with mineralised quartz veins and relatively undeformed rock in the hangingwall and footwall of the shear zone, respectively.



biotite-chlorite-Po schist (reduced zone)



Magnetite alteration after haematite, intense foliation in the hangingwall and footwall to mineralisation, and low AlOH wavelengths at 135-160m and 250-300m, indicate that Au mineralisation is bounded by reduced foliation zones. Magnetite in other parts of the hole are related to late alteration of narrow mafic layers in the BLF.



phengite/haematite zone (oxidized zone)

Low magnetic susceptibility at 147-150m (LD71820) is dominated by haematite and high AlOH wavelengths, which is surrounded by foliated, muscovite-bearing rocks

paragonite/pyrrhotite shear zone (reduced zone)

Low magnetic susceptibility at 270-275m (LD71820) is dominated by pyrrhotite, an intense-foliation and low AlOH wavelengths

Conclusions

Paragenetic and hyperspectral constraints place reduced end-member structures within the footwall and hangingwall to gold mineralisation at the Conqueror and Bellerophon deposits at St Ives. Low MgOH depth/FeOH depth values and low AlOH wavelengths delineate the same structural generation within mafic and felsic rocks, respectively. There is potential to recognize other sites of gold mineralisation if we can delineate the architecture of these reduced structures on the camp-scale. Hyperspectral analysis of 100,000 m of RC and diamond core is currently being undertaken to ascertain the 3D geometry of these structures, as well as increase the understanding of the oxidized end-member alteration distribution.

References

Roache, T.J. 2005. Comparison of alteration and structure between Conqueror, Belleisle and Maximus: implications for exploration. Unpublished MERIWA 358 report to Goldfields St Ives. 26pp.

Roache, T.J. & Yang, K. 2005. Integrated structural and spectroscopic identification of foliation zones and alteration related to Au mineralization at St Ives, Kambalda, Western Australia. In: Hancock *et al.* (eds). STOMP - Structure, Tectonics and Ore Mineralisation Processes Abstract Volume. *EGRU Contribution* **64**, 114.

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