Honours project proposal at EGRU, JCU

Alteration zonation in the Tennant Creek Mineral Field, Northern Territory

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Background:

The Tennant Creek Mineral Field (TCMF) contains many Cu-Au-Bi deposits and prospects that have high Au grade (a few g/t to 67 g/t Au) and are unusually rich in Bi. It is one of Australia’s large gold producers, having yielded >160 tonnes of Au since mining began in the 1930s, although no single deposit qualifies as world-class in size (Skirrow, 2000). The current resources include at least 124 tonnes Au, 280 kt Cu, 25 kt Bi and 48 tonnes Ag, based on the resources of 9 deposits compiled in Skirrow (2000).

There are >600 massive magnetite and/or hematite-quartz-chlorite ‘ironstone’ bodies in the TCMF. All of the major deposits in TCMF are either within or adjacent to ironstones, whereas only ~25% of ironstones contain economic Au-Cu-Bi resources. All significant known deposits are hosted by the Paleoproterozoic Warramunga Formation. Some ironstones are spatially associated with hematitic siltstone/shale strata and most of the deposits are (Skirrow, 2000)

Currently Emmerson Resources Limited (ERM) is carrying out exploration at Tennant Creek. The company has drill cores all over the TCMF and there are also limited surface exposures (often highly weathered) within out tenement area.

Aims:

Despite the great potential of this district, as demonstrated by the occurrences of numerous small- to medium-sized deposits, large deposits are yet to be found. There have been many studies but there are still some outstanding questions hindering a good understanding of the genesis and further exploration, for example:

1. What are the zoning patterns? Previous studies have reported dominantly white mica and chlorite alterations. Are there any zonations in the Short Wavelength Infra-Red (SWIR) spectral features of the white mica and chlorite?
2. Is hematite in surrounding shales/siltstones a far field signal of mineralisation, or is it a sedimentary feature?
3. Are the magnetic sediments the sources of Fe in the ironstones, or there are other sources, e.g., magmatic sources?

This project will address the first question. It will investigate the zoning patterns in alteration, thereby to help understand the deposits and facilitate exploration for more resources in this region.
Research methods:

The project will use the following technical routes and research methods:

1. Surface investigation and particularly logging of ~1500 to 2000 m of drill core along a cross section, to document the spatial distribution of various geological bodies and structures
2. Transmitted light and reflected light microscopy to identify ore and gangue minerals and examine textures and cross cutting relationships
3. SWIR spectral analysis and/or XRD analysis to identify clay minerals and extract numerical values of spectral features, e.g., white mica Al-OH absorption wavelength positions at ~2200nm, crystallinity, and chlorite Fe-OH absorption wavelength positions at ~2500nm.
4. SEM-BSE/CL/EDS imaging and analysis to examine the textures and cross-cutting relationships
5. Electron microprobe analysis of various minerals to obtain the major element compositions
6. Distinguish sedimentary vs. hydrothermal features

Company Support:

Emmerson Resources Limited will provide:

- Access to field, drill core and existing data
- Return economy class airfares for student and supervisors
- Accommodation, meals and OH&S while on site
- Sundry expenses associated with travel to site, including visas, transit accommodation, travel insurance
- Sample shipping from field to JCU
- Financial support to cover the analytical cost
- Linked vocational work for Honours student