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ABSTRACT

Context

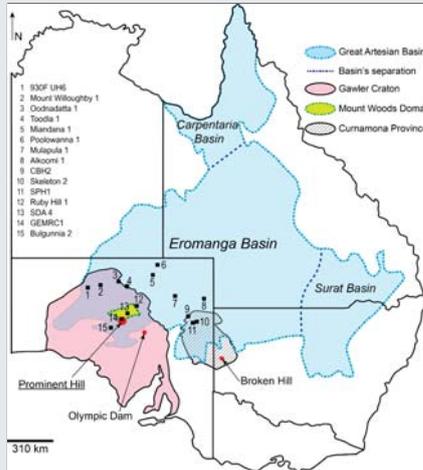
Although the world's known metal reserves are decreasing, the demand for metal resources is increasing. Consequently, it is essential to discover new deposits to be able to provide the amount of metal needed and supply industry. However, the best exposed and accessible deposits have been found, which now takes the exploration frontier into progressively more covered terrains. Exploration techniques using cover sequence materials are now becoming more common place, and are the focus of this project.

Aim

To understand the processes responsible for variable geochemical and mineralogical signatures within the Bulldog Shale and how they relate to buried mineralisation by comparing regional and mineralisation associated whole rock geochemistry data.

Results

- different chemistries and mineralogies found between the Cadna-owie Formation and the Bulldog Shale, and within the Bulldog Shale
- elevated values of pathfinders (Cu, Ni, Zn, U, Pb, W, As, REE) in the Bulldog Shale above the Prominent Hill deposit particularly in the weathered Bulldog Shale
- processes responsible for the footprint in the Bulldog Shale: adsorption on clays, element migration and redistribution, deposition linked to redox boundaries



Study area: South Australian part of the Eromanga Basin (Fig.1)

Major elements study: separation of the two formations in 3 different groups (Fig.2) based on their chemical particularities and visible on the Prominent Hill mine wall (Fig.3)

Results (Fig.2): Cadna-owie Formation: sand-rich clay-poor, minerals closer to micas in composition.

Bulldog Shale: clay-rich, can be divided in two: the weathered Bulldog Shale at the top of the formation composed of Kaolinite and Montmorillonite, and the unweathered Bulldog Shale composed of Montmorillonite and Illite.



1 Weathered Bulldog Shale
2 Unweathered Bulldog Shale
3 Cadna-owie Formation

Figure 3 Picture of the Prominent Hill mine wall presenting the difference of colours between the unweathered (black) and weathered (orange) Bulldog Shale

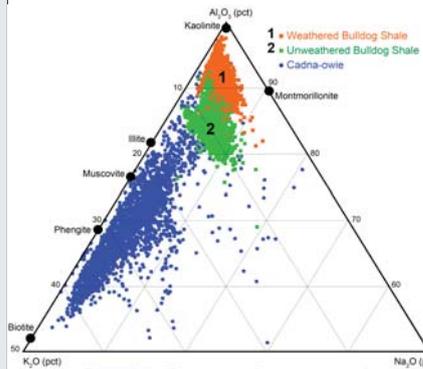


Figure 2 Ternary diagram showing part of the mineral composition of the Cadna-owie Formation, the weathered Bulldog Shale and the unweathered Bulldog Shale

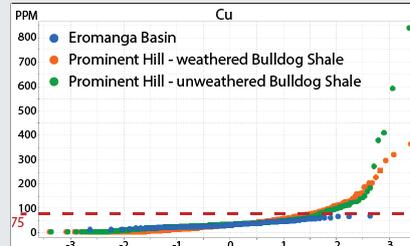


Figure 4 Elevated Cu in the Bulldog Shale above Prominent Hill

Trace elements study (Fig.4-7):
Most significant outcome: discovery of elevated pathfinders' concentration in the sedimentary formations above the mineral system
Processes involved: elements adsorbed on clays and deposited at the redox boundary between the weathered and unweathered Bulldog Shale.

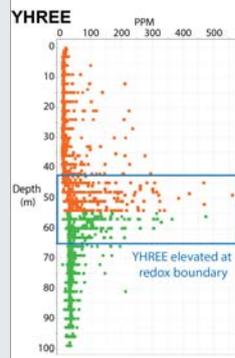


Figure 5 Elevated YHREE values at the redox boundary in the Bulldog Shale

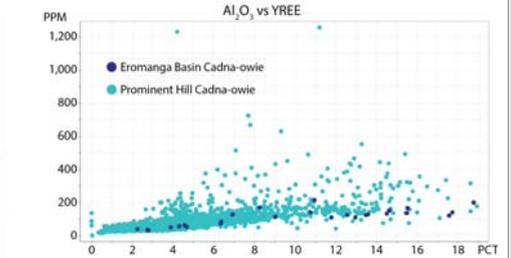


Figure 6 Positive correlation between Al and YREE in the Cadna-owie Formation

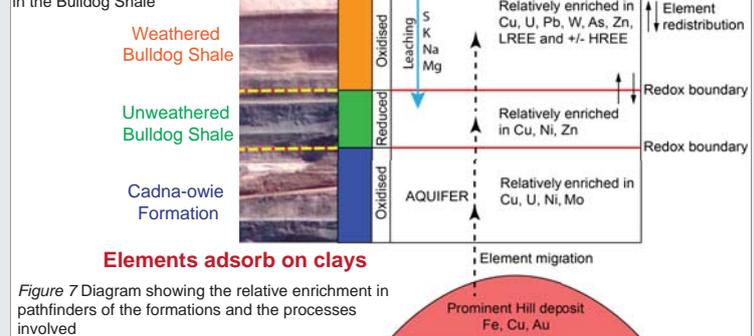


Figure 7 Diagram showing the relative enrichment in pathfinders of the formations and the processes involved

