

Mapping porphyry Au-Cu and epithermal Au mineral systems in areas of complex regolith cover, Lachlan Fold Belt, New South Wales, Australia

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The Eastern Lachlan Fold Belt is host to world class porphyry Au-Cu and epithermal Au deposits. Exploration for analogous deposits in this belt is hampered by burial of prospective bedrock beneath complex Tertiary regolith cover. This study has focussed on developing methodologies for mapping the bedrock that lies beneath this cover. A mineral systems approach to assessing the regions mineral prospectivity was also trialed.

Several small Au-Cu and Au deposits occur in the study area, variably concealed beneath shallow (<150 metres) regolith cover. The minerals system approach involved acquisition of geochronology data to determine the age and nature of primary bedrock and intrusive magmatism (U-Pb), sulphides in Au and Au-Cu ore deposits (Re-Os), and overprinting brittle-ductile deformation and metamorphism (Ar-Ar). Lithology, structure and alteration was mapped in prospective areas using high resolution airborne magnetics, Airborne EM, γ -ray radiometric and gravity datasets, with constraint provided by drill hole information. Shallow-penetrating and deep crustal seismic reflection datasets were acquired to ascertain likely fluid and magmatic pathways and offsets.

Additional constraints were achieved by gathering data on primary magma geochemistry, volcanic architecture, crustal levels of emplacement of magmas, and level of formation and preservation of vein systems. Alteration mapping and fluid inclusion studies within epithermal systems enabled vectors to concealed porphyry intrusions to be constructed.

Regolith studies were included as an integral component of the mineral system. Relationships between regolith materials and hydrothermal alteration were examined in this context. Secondary physical deposits (eg., in palaeochannels) and chemical (hydromorphic dispersion) haloes were also used to identify primary bedrock targets.