

### **Unlocking the Hidden Potential of the Cargo Deposit: New Geochronological and Geochemical Insights from the Macquarie Arc**

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The Macquarie Arc within the Lachlan Orogen, central New South Wales, is recognised as Australia's most significant porphyry copper-gold (Cu-Au) province, hosting a total metal endowment exceeding 83 Moz of gold and 17.2 Mt of copper. The arc has been the focus of major exploration efforts and contains world-class deposits such as Cadia, Cowal, Northparkes, Marsden and Copper Hill.

Although historically considered a minor prospect, the Cargo deposit may represent a critical link between these major centres. Situated in a structurally complex region, Cargo exhibits features consistent with porphyry-style mineral systems, yet it has a subdued surface footprint. This may be attributed to structural overprinting and the presence of late-stage mineralising events that have complicated its recognition and exploration history.

This study presents new and ongoing petrological, geochronological and geochemical investigations of the Cargo system. Integrated U-Pb zircon geochronology, whole-rock geochemistry and petrography are being used to constrain the timing and evolution of multiple intrusive and mineralising events within this multiphase magmatic complex.

Preliminary results suggest that Cargo may represent a significant, underexplored porphyry system. Further analytical work, including U-Pb dating of monazite and apatite, as well as trace element analysis of sulphides and hydrothermal minerals, will refine interpretations of fluid evolution, magmatic oxidation states, and provide comparisons to better characterised systems such as Cadia and Cowal.

This integrated approach offers new insights into porphyry system development within arc terranes and carries broader implications for exploration targeting in regions with complex magmatic and structural histories.