

Insights into the Delamerian Orogen Mineral Systems through Pyrite Chemistry.

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MinEx CRC is the world's largest collaborative mineral exploration research initiative, uniting industry, government, and research organisations. As part of its mission, the National Drilling Initiative (NDI) brings together geological surveys, researchers, and industry to drill in under-explored regions with high mineral potential, while also testing new exploration technologies.

The Cambrian–Ordovician Delamerian Orogen in central and eastern Australia is one such region, spanning five states but largely concealed beneath younger sediments. Limited surface exposure has led to minimal exploration, despite known mineral occurrences. To address this, two NDI drilling campaigns have been conducted in partnership with MinEx CRC member organisations. These include case studies in eastern South Australia in collaboration with the Geological Survey of South Australia and in the Loch Lilly–Kars area of New South Wales, in partnership with Geoscience Australia through the Exploring for the Future (EFTF) program.

The Delamerian Orogen formed during a significant tectonic shift being the transition from passive to active margin along eastern Gondwana. Known magmatic-hydrothermal and other mineral prospects occur along the eastern Delamerian margin therefore a larger collaborative project looking into these systems to assess critical mineral potential across the metallogenic province was established. As part of this research effort, samples from porphyry Cu-Au, volcanic-hosted massive sulfide (VHMS), orogenic gold, and orthomagmatic Ni-Cu-PGE systems from South Australia, Victoria, and New South Wales are assessed. In-situ analyses of pyrite show variations in texture and chemistry across these different deposit styles suggesting a complex paragenesis. Additionally, pyrite from mineralised systems not yet fully classified are being studied, offering new insights into their genesis. Together, these findings are shedding light on the broader mineral potential of the Delamerian Orogen and are key to guiding future exploration across this under-explored yet prospective province.