U-Pb zircon geochronology of quartz-sealed faults at Mount Isa, northern Australia

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Faults are considered a key ingredient in the formation of many ore deposits. The region surrounding the Proterozoic post-orogenic copper orebodies at Mount Isa, northern Australia, is cross-cut by numerous regional-scale fault zones that contain zircon as an accessory phase. Recent work has demonstrated the ability of zircon to crystallise during relatively low temperature thermal events [1], so the laser ablation ICP-MS U-Pb technique [2,3] was applied in order to provide geochronological constraints on fault dilation, fluid flow and silica precipitation.

Zircon $^{207}Pb/^{206}Pb$ ages range from *ca.* 2950 to 1750 Ma, with major peaks occuring between 2600 and 2500 Ma, 2300 and 2200 Ma and 1950 and 1850 Ma. These dates are older than those expected if the zircons were hydrothermal and in most cases also predate the formation of the fault host rocks, thus entrainment of zircons from the wallrock is precluded.

The two oldest age groupings correspond to periods of crustal extension and felsic magmatism in the inlier [4,5,6] and the younger range represents another episode of felsic magmatism and the Barramundi Orogeny. No younger event signatures are visible in the data (apart from limited ages that represent a further period of crustal extension and basaltic volcanism). The data suggest that the post-peak orogenic hydrothermal fluids entrained zircons from rocks equivalent to the Barramundi Basement which presumably underlie the copper deposits at Mount Isa, and carried them into upper crust.

This study contributes significantly to the controversy surrounding the nature and significance of the basement beneath the Mount Isa Inlier and its potential contribution to later hydrothermal events on a regional scale.

References

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