

Correlation of Olary and Broken Hill Domains, Curnamona Province: Possible Relationship to Mount Isa and Other North Australian Pb-Zn-Ag-Bearing Successions

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Abstract

The 300-Mt Broken Hill Pb-Zn-Ag orebody is in the Broken Hill Domain, which, together with the contiguous Olary Domain, constitutes the southern part of the Curnamona province of eastern Australia. The Curnamona province is dominated by medium- to high-grade metamorphic rocks of the Paleoproterozoic Willyama Supergroup and is the focus of exploration for base metals, gold, and uranium. A robust chronology of the ~1720 to 1640 Ma Willyama Supergroup provides the basis for temporal correlations on a regional scale between the Olary and Broken Hill Domains, and possibly on an interbasin scale between the southern Curnamona province and the Carpentaria zinc belt in northern Australia (Mount Isa, McArthur River).

SHRIMP U-Pb zircon analyses from tuffaceous metasedimentary rocks provide ages for two new chronostratigraphic marker horizons in the Olary Domain. Firstly, the 1693 ± 3 Ma Plumbago Formation, and an equivalent metasilstone in the Broken Hill Domain, confirm earlier suggestions that the base metal-enriched Bimba Formation is stratigraphically equivalent to the Ettlewood Calc-Silicate Member in the lower part of the ~1685 to 1695 Ma Broken Hill Group. Secondly, tuffaceous sedimentary rocks in the Mount Howden Subgroup of the Olary Domain have a maximum age of 1651 ± 7 Ma, thus suggesting correlation with a similar lithostratigraphic succession in the middle Paragon Group at Broken Hill.

The lithostratigraphy, depositional ages, and inferred intervals of missing rock in the Curnamona province are broadly similar to the basin evolution of the Carpentaria zinc belt of northern Australia, suggesting possible chronostratigraphic correlations between Broken Hill and the Mount Isa-McArthur regions. The Broken Hill Group (~1695–1685 Ma) is considered to be time-equivalent to the Prize Supersequence in northern Australia, with possible implications for their respective depositional and metallogenic histories. Depositional ages from the middle Paragon Group (1655 ± 4 Ma, 1657 ± 4 Ma) at Broken Hill are closely comparable to the ca. 1655 Ma ages of tuff units associated with the Mount Isa and Hilton Pb-Zn-Ag orebodies (Gun Supersequence of northern Australia). The upper Paragon Group is considered to be the same age (ca. 1640 Ma) as that part of the Isa superbasin that hosts the McArthur River (HYC) deposit of the McArthur basin, the Walford deposit, and other Pb-Zn-Ag-mineralized sequences of the Lawn Hill platform.

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